Jan A. P. Hoogervorst

Enterprise Governance and Enterprise Engineering

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“It’s all generated, maybe, [the general lack of respect for the people trying to solve problems] by the fact that the attitude of the populace is to try to find the answer instead of trying to find a man who has a way of getting at the answer”.

— Richard P. Feynman, Physicist and Nobel Price winner (1918–1988)

[Feynman 1998, p. 66]

Contents

Preface

Enterprises – our overall label for businesses, companies, organizations, or (governmental) institutions and their alliances – have a significant effect on the prosperity of modern society. Enterprise performance and strategic success exerts a far wider effect than merely the enterprise itself. Unfortunately reports about strategic success are not overly positive: the majority of the strategic initiatives appear to fail, meaning that enterprises are unable to derive success from their strategy. These high failure rates are reported from various domains: total quality management, business process reengineering, six sigma, lean production, e-business, customer relationship management, (information) technology introductions, and mergers and acquisitions. Whereas all too often, unforeseen or uncontrollable events are presented, for the sake of convenience, as the causes of failure, we will argue in this book that strategic failure is mostly the avoidable result of inadequate governance resulting in inadequate strategy development and implementation. To worsen the case, future enterprises will have to operate in an even more dynamic and global environment than the current ones. They need to be more agile, more adaptive and more transparent. They will also be held publicly accountable for every effect they produce. Strategic failures will thus manifest a more profound societal impact.

This book centers around two themes:

- The way *governance* should be perceived and arranged in view of enterprise strategic success and the ability to change and adapt
- The notion of enterprise *design*, and specifically enterprise architecture, for creating conditions for enterprise strategic success and creating the ability to change and adapt to future, still-unforeseen internal and external enterprise developments.

Governance

Three governance themes continue to enjoy broad attention: corporate governance, IT governance and enterprise governance. These themes are addressed from within their respective disciplines and are virtually never treated in a unified and integrated manner, which does not in itself contribute to strategic success. The same holds for the topics of IT architecture and enterprise architecture. Roughly speaking, the three governance themes have the following focus. Corporate governance concerns the totality of measures (internal and external) for safeguarding the financial/economic interests of shareholders. A typical aspect within the corporate governance perspective is *compliance*: the adherence to pertinent rules and legislation. The theme of IT governance has been around for decades, whereby the *business and IT alignment* notion is addressed frequently: deployment of IT such that 'business value' is created. Given the similarly high failure rate of IT introductions, IT governance does not appear to be overly successful. The enterprise governance theme appeared in the literature more recently, based on the obvious insight that, rather than compliance, enterprise *performance* is far more determining for safeguarding shareholders interests.

I aim to show that virtually all approaches to these governance themes share the same underlying characteristics. These characteristics are criticized strongly. A radically different perspective is offered for effective governance. Only within this different perspective can the enterprise effectively:

- arrange itself for adapting to future, unforeseen developments
- stimulate and utilize the creative and intellectual capacities of employees
- address the core reason for strategic failures.

Design

A plethora of literature indicates that a core reason for strategic failures is the lack of coherence and consistency among the various components of an enterprise, which precludes it from operating as a unified and integrated whole. The crucial and necessary condition of coherence and consistency is emphasized with various labels, such as 'internal congruence', 'organizational alignment', 'structural fit' or 'structural conflict' in the opposite case. The higher the degree of fit – or congruence – among the various components of the enterprise, the more effectively the enterprise is likely to operate. Our basic premise is that enterprise unity and integration does not come 'incidentally', but has to be *designed*. The design aspect, which we introduce under the label *enterprise engineering*, must thus be a central area of attention when effectuating governance. Only within the focus on design, can the notions frequently mentioned in the literature of IT architecture and enterprise architecture be addressed meaningfully.

Talking about design often appears to be associated with machine-like characteristics that have a mostly negative connotation: bureaucracy and inflexibility. However, since enterprise arrangements should not be based on any incidental developments, design must be interpreted broadly and regarded as any intentional action to create desired enterprise arrangements or enable desired enterprise developments. Service and customer orientation, quality, productivity, flexibility, process excellence, lean production, compliance, motivated and involved employees, or lower operational costs do not come of their own accord, or because someone at the top has 'declared' it so. Rather, the enterprise must be designed such that these areas of attention are successfully operationalized. Enterprise design thus has a much wider scope than merely the structural-functionalist foundation.

In view of the above, this book focuses on the organizational aspects of effective governance, and within that perspective on the conditions and concepts (theory and methodology) that establish unified and integrated enterprise design The approach presented in this book has also been practiced. Personal experiences in various management positions have shaped my thinking in this respect. I am indebted to many people with whom I enjoyed the creative, enriching and fruitful dialogs about the topics addressed in this book, either in relation to their practical application, or in relation to lecturing or speaking about the subject matter. There are ample reasons to continue the dialog: hopefully the themes addressed in this book provide perspective for further development. The underlying motto is provided by the social-psychologist Kurt Lewin: nothing is as practical as a good theory.

Jan Hoogervorst

Learning Objectives

Essential learning objectives are summarized per chapter. These learning objectives aim to create the capacity to apply the insights, theories and methodologies within the reader's own organizational setting, and create the ability to acknowledge and assess the associated conditions for success.

Chapter 1: Introduction

- Grasp the notion of enterprises as 'organized complexities'
- Have an initial understanding about why the concepts of 'enterprise governance' and 'enterprise engineering' are relevant for addressing organized complexity
- Appreciate the notion of 'design' and understand that design is not necessarily associated with creating a machine-like enterprise
- Understand the essential difference between 'governance' and 'management'
- Have an initial understanding about the nature of the corporate, IT and enterprise governance themes and their relationships
- Comprehend why the three governance themes must be treated from a unifying perspective: enterprise governance
- Understand the concept of 'organizational competence' for the notion of the competence-based governance perspective to be detailed later.

Chapter 2: Mechanistic and Organismic Perspectives on Governance

- Fully comprehend why and how typical characteristics of Western thought have influenced society strongly and ways of organizing and governance within enterprises, and comprehend the limits of this type of thinking
- Appreciate the different outlook of Eastern thought and the associated different perspectives on organizing
- Acknowledge the linkage between complexity and dynamics on the one hand, and uncertainty on the other, and appreciate that much of traditional control in enterprises is a myth, such that other forms of control are required
- Seeing that traditional control and the excessive focus on planning are two sides of the same coin
- Understand that traditional management attention is misdirected to employee performance rather than to enterprise performance, and appreciate that the latter necessitates a focus on design
- Appreciate that strategy development is a learning process rather than a planning one, and understand the importance of the competence-based approach to governance in view of strategic transition barriers, and in view of adequately addressing complexity, dynamics and uncertainty

- Fully support the notion that employee involvement and their self-organizing capacities are essential for enterprise success
- Understand the difference between the mechanistic and organismic way of organizing, and see the importance of the latter concept and the associated crucial role of employees
- Acknowledge that some aspects of mechanistic thinking are relevant for creating the structural-functionalistic operational core of the enterprise, and understand this to be necessary, but not sufficient
- To see it as inevitable that the organismic way of organizing similarly implies the organismic perspective on governance
- Fully comprehend why the traditional mechanistic approaches to governance are inadequate.

Chapter 3: Enterprise Essentials

- Appreciate essential characteristics of enterprises and the non-trivial issues of functionalization versus coordination, and differentiation versus integration, and understand the necessity of the organismic perspective on governance and organizing for resolving these non-trivial enterprise issues
- Fully grasp that the organismic perspective on organizing is associated with a fundamentally different enterprise design
- Appreciate the inherent dynamics, complexity and uncertainty associated with the modern enterprise context, and understand the crucial capacity of the competence-based governance approach for addressing the characteristics of the modern enterprise context
- Understand that the requirements posed by the modern enterprise context – to operate in a unified and integrated manner over increased operational extendedness – further necessitates a focus on design
- See the difference between the rational/planning view on strategy development and the generative thinking/learning view, appreciate the inadequacy of the rational/planning view and understand why the generative thinking/learning view on strategy development necessitates arranging governance as an organizational competence
- Grasp the essence of two different categories of strategic choices, and understand that operationalizing strategic choices necessitates (re)design
- Fully apprehend the core reason for strategic failures and the crucial importance of a comprehensive governance perspective
- Understand the importance of enterprise unity and integration as an essential area of attention for the governance competence
- Appreciate the relevance of the central governance role, and the positioning of this role at the level where unity and integration are required
- Understand why local self-organization and central governance are not necessarily conflicting, and appreciate that effective self-organization necessitates central governance (not central planning) for certain aspects

- Grasp the limitations of the 'structure follows strategy' maxim, and understand the importance of the enterprise enablement concept, and its association with the organismic way of organizing (design to change)
- See the importance of employee behavior in view of the central role of employees within the organismic perspective on organizing and governance, and appreciate essential characteristics of employee behavior
- Understand that culture, management/leadership practices, and enterprise structures and systems, are central elements of the employee behavioral context that determines employee behavior, and appreciate that these elements are critical success factors for the organismic way of organizing
- Grasp the essential difference between leadership and management, and understand why leadership is alien to the mechanistic view on governance
- Appreciate that the behavioral context determines the effectiveness of governance relationships
- Fully comprehend the paradigm shifts associated with modern enterprises, mandating the argued organismic perspective on governance.

Chapter 4: System Thinking

- Understand the core aspects of the system notion, and the structural-functionalistic, the interpretative, and the system dynamics approaches within system thinking
- Appreciate the importance of system thinking for addressing the organized complexity of enterprises, and for establishing unity and integration
- Comprehend the difference between functional (teleological, black-box) and constructional (ontological, white-box) perspectives on systems
- Fully grasp the distinction between the descriptive and the prescriptive (normative) views on architecture, and appreciate the importance of the prescriptive view for effectuating the role of architecture in system design, while acknowledging that the notion of architecture is thus necessarily associated with the system concept
- Understand the phases of system realization and the notions of function and construction architecture in relation to function and construction design
- Grasp the process of architecturing (defining architecture) and see the essential difference between architecturing and designing
- Comprehend the notions of 'areas of concern' and system 'design domains' with respect to system behavior, and fully apprehend that architecture addresses one or more areas of concern, and applies to one or more system design domains
- Understand the generic system design process and the role of architecture, and appreciate the difference between requirements and architecture
- Appreciate the heuristic, participative characteristics of the architecturing process, and understand how architecture principles must be formulated and published in order to provide effective design guidance

- Grasp the essence of an architecture framework, and fully understand why many frameworks published in the literature are questionable
- See that system thinking is not necessarily associated with machine-like characteristics, and appreciate that pertinent to enterprises, system thinking does not exclude the notion of emerging enterprise developments (through self-organizing capabilities).

Chapter 5: Corporate Governance

- Appreciate the origin of the corporate governance theme and the crises that have put this theme within the public eye
- Grasp the internal versus external, and the narrow versus broad perspectives on corporate governance
- Appreciate the focus of corporate governance reform, and grasp its partly problematic nature, and fully apprehend that the financial/economic focus is in and of itself unable to safeguard the interests of shareholders
- Fully comprehend the conceptual and methodological inadequacy of the corporate governance perspective – and the associated focus on the economic value of the enterprise – for addressing enterprise performance
- Understand why effective corporate governance can only be arranged within the overall context of enterprise governance
- See that corporate governance is associated with the mechanistic view on organizing and governance, and understand the limitations of the COSO framework in this respect
- Fully understand the necessary IT and enterprise design perspective in which corporate governance requirements for compliance and internal control are addressed concurrently.

Chapter 6: IT Governance

- Understand why the theme of IT governance has continued to be a problematic issue for many enterprises
- Appreciate the revolutionary character of IT progress and the IT governance paradox
- Comprehend the issue of ‘business and IT alignment’, and understand why traditional approaches to this issue are ineffective for bringing about alignment
- Grasp the importance of IT enablement, and appreciate that this notion is alien to the mechanistic perspective on IT governance, but can only be effectuated within the organismic, competence-based view on governance
- Fully apprehend that traditional approaches to IT governance are associated with the mechanistic view on enterprises, and understand thoroughly the limitations of these traditional approaches
- Understand the core reason for IT strategic failures and the absence of any positive relationship between the amount of IT investments and enterprise performance

- Completely understand that IT alignment, IT enablement and the value of IT follow from unity and integration of IT design and enterprise design, and thereby appreciate that IT governance must be placed within the overall context of enterprise governance
- Understand that performance of IT systems can only be defined in terms germane to IT systems and cannot be expressed in terms of enterprise performance, and fully comprehend that addressing the latter performance requires an enterprise-wide design perspective within which IT performance is addressed concurrently
- Appreciate organizational contextual conditions for effective IT governance
- Fully understand the different roles, characteristics and tasks of the IT governance core competencies, and appreciate the importance of the competence-based approach
- Understand the role and tasks of IT architecture management, IT project portfolio management and IT program management
- Appreciate the enterprise IT system design domains and their relationship with IT architecture, be able to utilize these domains (or define them) for one's own organization, and can define architecture relevant for the design domains, such that architecture addresses areas of concern relevant for IT systems
- Fully grasp the inadequacy of the linear, top-down and planned approach to IT strategy development, and appreciate the collaborative, iterative and concurrent character of activities, whereby IT strategy develops in an emerging fashion, reflecting the generative/learning perspective on strategy development
- Appreciate the IT governance process and understand the role of formal governance meetings
- Understand why IT governance must be positioned as a central organizational competence, and appreciate this central role within the context of reducing IT legacy complexity
- Appreciate the characteristics (and limitations) of the CobiT framework for IT governance, and understand our view on IT governance maturity.

Chapter 7: Enterprise Governance

- Fully understand the necessity of enterprise governance and the role of enterprise engineering
- Understand the two pillars of enterprise engineering: enterprise ontology and enterprise architecture, and appreciate the importance of enterprise architecture for operationalizing strategic choices
- Comprehend (as an introduction to more in-depth literature) the essentials of the enterprise ontology theory and methodology for establishing the (implementation-independent) structural-functionalistic foundation of an enterprise, and understand the various aspect models of an enterprise

- Appreciate the difference between, and complementary nature of, business rules and enterprise architecture
- Understand the enterprise design process, and the communicative role of enterprise architecture for bridging the gap between the management-oriented functional perspective, and the constructional perspective on enterprises
- Fully apprehend that enterprise architecture must be developed for addressing strategic choices and objectives pertinent to areas of concern coherently and consistently, be able to apply the design domains within one's own organization, and define architecture pertinent to these domains, such that architecture addresses strategic choices and areas of concern
- Grasp the different notions about enterprise architecture mentioned in the literature, and appreciate that only the normative, prescriptive view on enterprise architecture can address strategic objectives pertinent to areas of concern, and can ensure enterprise unity and integration
- Fully understand the process of architecturing in the case of enterprises, and understand the associated areas of concern and enterprise design domains
- Understand that enterprise architecture comprises four sets of architecture: business architecture, organization architecture, information architecture and technology architecture, which are associated with the four main enterprise design domains: business, organization, information and technology
- Comprehend the specific scope of these architectures and their definitions
- Understand the further detailing of the main enterprise design domains in sub design domains, for which architecture must be determined, and be able to appreciate the architecture examples given pertinent to the design domains
- Fully understand the different roles, characteristics and tasks of the enterprise governance core competencies, appreciate the importance of the competence-based approach, and acknowledge the complementary and overall guiding role of the enterprise governance core competencies for effectuating IT governance
- Understand the role and tasks of enterprise architecture management, enterprise project portfolio management and enterprise program management
- Fully grasp the inadequacy of the linear, top-down and planned approach to enterprise strategy development, and appreciate the collaborative, iterative and concurrent character of activities, whereby enterprise strategy develops in an emerging fashion, reflecting the generative/learning perspective on strategy development
- Appreciate the enterprise governance process and formal governance meetings
- Understand that the service-oriented architecture approach fits neatly within the outlined enterprise governance approach, its core competencies and processes, and understand that conversely, the service-oriented architecture approach necessitates the argued form of enterprise governance
- Fully apprehend that the notion of enterprise ontology – the modeling of the enterprise essence, independent of its implementation – greatly facilitates

the definition of (generic) services within the service oriented architecture concept
- Appreciate enterprise governance maturity levels
- Understand the different categories that determine personal competencies in general, and appreciate the knowledge areas and personal competencies of the enterprise governance staff.

Chapter 8: The Praxis Illustrated

- Comprehend the (pro)active role of the enterprise governance competence for (1) making sense of the market, consumer, and operational challenges the case's fictitious company is facing and (2) defining new strategic perspectives, and areas of concern that must be addressed
- Understand how the enterprise engineering methodology is used by the governance competence, and being able to translate the approach outlined in the case to one's own organizational context
- Recognize the importance of ontological models for grasping and depicting the operational essence of the company after its transformation
- Appreciate the functional and constructional requirements that are to be addressed in design, and understand the difference between requirements and architecture
- Comprehend the crucial role of architecture, that must be defined by the enterprise governance competence, for operationalizing the company's ontological models into the design of construction models that can be implemented, while concurrently addressing the areas of concern
- Appreciate that the definition and publication of architecture, in the formal structure sketched, provides the coherent and consistent reference for ensuring the company's unified and integrated operation, and forms an important basis for defining the company's commodity infrastructure and services
- Acknowledge that the company's developments progress in an emerging manner, and that design rather than planning is of primary concern, and that design activities form the basis and rational ground for the company's project portfolio.

Part I: Basic Concepts

1 Introduction

We will start by arguing the importance of enterprise governance and enterprise engineering in addressing the organized complexity of enterprises. This demonstrates the essential purpose of these themes, and clarifies the notion of design. Anticipating the specific subject chapters, the governance topics currently discussed in the literature will be introduced briefly, providing an initial sketch of the essential characteristics of these topics and the manner by which governance is generally effected. The brief introduction will also provide sufficient insight to appreciate the close mutual relationships between the various governance topics. This offers the rationale for the argued integrated approach, whereby each governance topic is not treated in isolation, but addressed jointly in a mutually coherent and consistent manner within the overall concept of enterprise governance. As our starting point, governance will be positioned as an organizational competence, with central attention to enterprise design. Finally, the setup of the further chapters will be elucidated.

1.1 Our Central Themes

1.1.1 A World of Problems

Humans face a variety of problems. Attempts to solve them require at least an approach matching the nature of the problem. For the type of problems addressed in this book, we believe many approaches to be fundamentally at odds with the inherent nature of these problems. To carve out our problem area of concern, we will limit ourselves to problems characterized by some degree of *organization* and *complexity*. These characteristics are difficult to define precisely, but for our discussion we will associate ‘organization’ with formal, non-random relationships between entities, and ‘complexity’ with the number of relationships. Using these characteristics, three problem areas are particularly noteworthy [Weinberg 2001]. The first area concerns problems characterized by relatively limited complexity, but a high level of organization. The limited complexity signifies that there are few interdependencies – relationships between certain aspects that manifest being organized – while the high level of organization indicates that these relationships are formal and predictable. Examples are problems associated with the operation of machines and mechanisms. The limited complexity (few interdependencies) allows these problems to be addressed through analytical (mathematical) methods. In view of the relatively low complexity, Weinberg has coined the term ‘organized simplicity’ to identify problems of this nature [op. cit.]. Opposing this problem area is that of problems characterized by a high level of complexity, but a low level of organization. The high level of complexity indicates that there are numerous interdependencies, but the low level of organization implies that the interdependencies are non-formal and random in nature. This is the area of 'unorganized complexity', whereby the random nature of the numerous interdependencies allows these problems to be addressed through statistical means [Weaver 1967, Weinberg 2001]. So, despite the random, unpredictable character of individual interdependencies, the totality of the 'unorganized complexity' can be understood and predicted. For example, gas molecules in a closed space, certain aspects of (car or telephone) traffic, or life insurance, pose problems that can be addressed this way. Between these two problem areas lies the large area of problems of 'organized complexity' [Weaver 1967, Weinberg 2001]. Here there is a high level of complexity, hence many interdependencies, as well as a high level of organization, indicating that the interdependencies have a formal relationship to a significant extent. The problems in this area are therefore too complex for analytical methods, and too organized for statistical methods. Expressed differently, a core problem confronting modern science is developing a theory and associated methodology for addressing problems of organized complexity [Weaver 1967, Bertalanffy 1969]. Many biological and societal problems are problems of 'organized complexity'. Figure 1 shows the three problem areas discussed schematically.

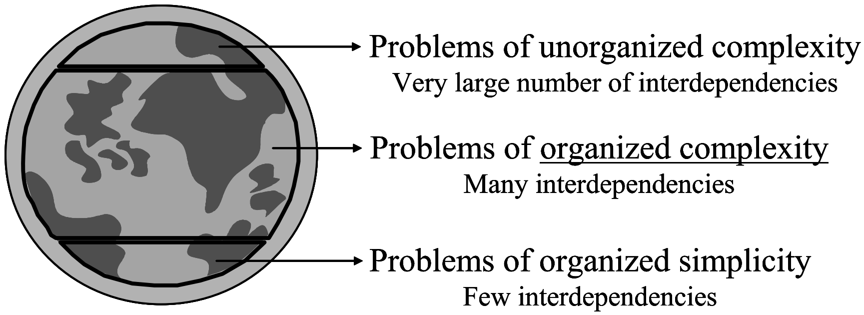


Fig. 1.1. A world of problems

1.1.2 Enterprises as Organized Complexities: Enterprise Governance and Enterprise Engineering as Crucial Concepts

Why Enterprise Governance and Enterprise Engineering?

Essential aspects of an enterprise will be outlined in Chapter 3. For now, the notion of 'enterprise' can be interpreted as an overall term to identify a company, organization, business or governmental institution. Hence an enterprise is an intentionally created entity of human endeavor with a certain purpose. Enterprises are organized complexities: they are highly complex, as well as highly organized entities. In the nine-level scale of complexity defined by Boulding, enterprises rank among the highest complexities (level eight) [1956]. On this scale, the bottom-three lowest complexities are: (1) static frameworks, (2) mechanisms and machines, and (3) machines and mechanisms with control devices. Despite the significant difference in complexity between enterprises and the bottom-three complexities, much thinking about enterprises is at level 1–3, assuming that enterprises behave as static frameworks or mechanical (control) systems [Tsoukas 1994b]. This 'mechanistic' approach, and our critique of it, will be a central theme in Chapter 2.

The core problem with organized complexity is the necessity of taking into account numerous aspects and interdependencies that jointly form an organic whole. Many authors argue that the system approach, which we will outline in Chapter 4, is the only meaningful way to address the core problem of organized complexity, hence the only meaningful way to study and develop enterprises [Bertalanffy 1969, Gharajedaghi 1999, Rechtin 2000]. According to Ackoff, failing strategic enterprise initiatives are thus due to the fact that the initiatives are fundamentally "anti-systemic" [1999].

As stated, an enterprise is an intentionally created entity of human endeavor with a certain purpose. The intentional character points to being purposefully organized: the arrangement of things such that the enterprise purpose is realized. One might say that being organized points to a certain *order*, which is manifest in the enterprise *design*. It seems plausible that enterprise order does not (generally) occur incidentally, which is precisely the reason for referring to the intentional character of enterprises. Hence, guiding authority – enterprise governance – is required to bring about the desired order. Since order is manifest in design, enterprise design is obviously a central area of attention within enterprise governance. Enterprise design must also be such that the enterprise purpose and goals are realized successfully. Neither will this occur incidentally. Evidently, adequate design requires a formal design theory and associated methodology. For that we will advocate the notion of enterprise engineering. Figure 1.2 shows our line of thinking and the central themes of this book: enterprise governance and enterprise engineering. Our aim is to contribute to addressing the problem of organized

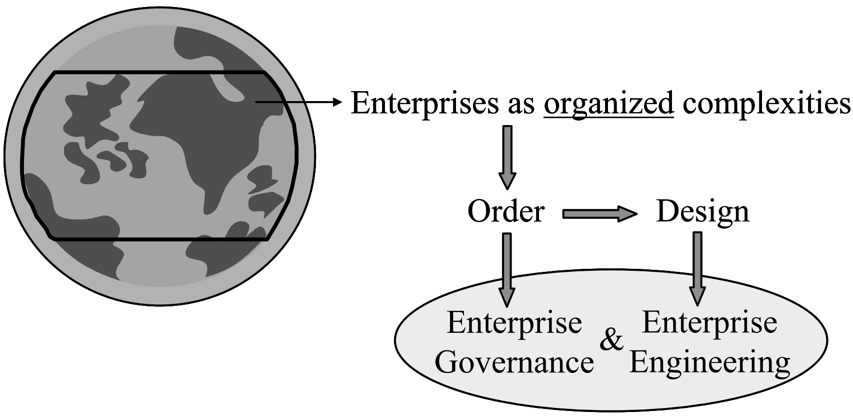


Fig. 1.2. Enterprises as organized complexities

complexity effectively in the case of enterprises, by providing a fundamentally different view on governance than is customary, and by introducing the concept of enterprise engineering.

Clarifying the Notion of Design

For some, the term 'design' in the context of enterprises has uncomfortable connotations. The term is associated with mechanistic approaches to enterprises: arranging them as if they are machines. The 'social engineering' label is sometimes used to identify the mechanistic view on organization and management [Tsoukas 1994b]. This approach essentially equates management with control, with the associated conviction that by using certain 'controls' management is able to steer the enterprise (top-down) within the desired range of control. The enterprise is thereby assumed to be an objective entity, external to management, that like a machine, merely needs to be controlled. This viewpoint and its roots will be discussed and criticized in Chapter 2. There we will present a fundamentally different perspective that, among other things, acknowledges the non-planned, emerging character of many enterprise developments. Such developments rest for a large part on the capacity for self-organization. In view of this, the question thus becomes: can we do away with design altogether? Our answer is an emphatic no.

First, the reliable delivery of enterprise products and services requires some sort of formal arrangements on which this delivery (also) depends. We fail to see how, for example, transport, educational, health care, utility, or governmental products and services – on which society depends daily – or the production of material goods, can take place reliably if left totally to incidental, emerging processes whose outcome is unpredictable. Put another way, some underlying structural-functionalistic foundation is obviously necessary, but is insufficient, as we will show in Chapter 2. This is precisely the reason for the inadequacy of the mechanistic perspective on enterprises. In our view, arranging the structural-functionalistic foundation necessitates design.

Secondly, as we will show in Chapter 2, non-mechanistic enterprise characteristics are essential for enterprise strategic and operational success, as well as for the ability to innovate and change. These characteristics concern non-planned, emerging developments, which rest on the capacity for self-organization, as indicated earlier. It seems plausible that innovation, flexibility, the ability to change and the capacity for self-organization are not provided by any incidental set of enterprise characteristics. On the contrary, such capacity rests on specific enterprise conditions, as we will corroborate in Chapter 2. It would seem imprudent to leave the creation of these conditions to chance: spontaneous, incidental developments. Again, these conditions must be created intentionally: they must be designed. Hence enterprise design must also enable future, yet unknown, enterprise change and adaptation. The notion of enterprise design should thus be interpreted broadly and seen as devising "courses of action aimed at changing existing [enterprise] situations into preferred ones" [Simon 1969, p. 111]. Ultimately, on one hand design concerns understanding the intentions that are to be operationalized, and on the other, arranging that to happen. As Winograd and Flores put it: design concerns “the interaction between understanding and creation” [1987, p. 3]. The discipline of enterprise engineering should thus be viewed broadly from this perspective.

1.1.3 Enterprise Engineering

In Chapter 3 we will discuss the rather poor success rate of enterprise strategic initiatives: the majority fail. Research has shown that strategic failure is mostly the avoidable result of inadequate strategy implementation. Rarely is it the inevitable consequence of a poor strategy. A plethora of literature indicates that a core reason for strategic failures is the lack of coherence and consistency among the various components of an enterprise, which precludes it operating as a unified and integrated whole. Seriously enough, it is precisely these aspects which gain importance in view of enterprises collaborating over more extended domains. Unity and integration are thus necessary conditions, though difficult to realize, for successfully operationalizing strategic initiatives. This begs the question as to how success can be established. Put another way, which theory and underlying methodology offers an effective approach for implementing strategic initiatives successfully? For reasons outlined later, we contend that the emerging discipline of enterprise engineering offers a fruitful first onset.

The current situation of theory development about enterprises strongly resembles that of information sciences around 1970. At that time new insight emerged that changed the perception on information technology and its utilization. Since then a distinction between *form* and *content* of information has been made. This breakthrough marks the transition from the era of ‘data systems engineering’ towards the era of ‘information systems engineering’ [Dietz 2005].

Referring to this breakthrough is relevant for two reasons. First, the crucial technology that shapes modern enterprises is information technology. Indeed, relationships between collaborating actors in enterprises are largely informational relationships. Work is not merely automated, but ‘informated’ [Zuboff 1989]. Second, there is a growing insight that the central notion about the utilization of information technology in relation to enterprises has to do with entering into, and complying with, ‘commitments’ by social actors (e.g. customers, employees, business partners, suppliers). These commitments are entered into through the expression of communicative (coordinative) actions. Examples are: the *request* (to realize or produce something), the *promise* (to honor the request), the *statement* (that the requested is produced), and the *acceptance* (of the produced) [Dietz 2006]. These communicative actions can be explicit or implicit. Again, a new insight emerges: as earlier the content of information was placed above the form of information, now the *intention* of information (communication) is placed above its content. Thus the various responsibilities, qualifications and authorizations associated with commitments and their communicative actions become clear. This new insight marks the transition from the era of ‘information systems engineering’

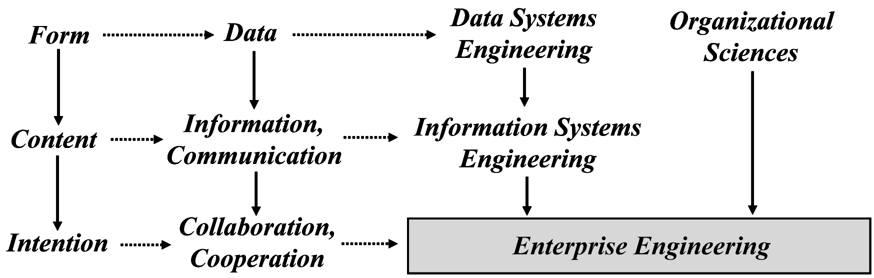


Fig. 1.3. Roots of enterprise engineering

towards the era of 'enterprise engineering'. Since the traditional organizational sciences have much to say about enterprise arrangements, such a transition towards enterprise engineering enables the fruitful fusion of information systems engineering and traditional organizational sciences. Figure 1.3 shows this reflection schematically.

We indicated previously that a major problem facing modern science is the development of a theory for addressing organized complexity. Enterprise engineering aims to comprehend enterprise complexity – and thereby master it – and can be seen as a developing discipline – domain of knowledge, concepts, theory and associated methodology – for analyzing, designing and creating enterprises. Enterprise management is often only interested in *what* the enterprise should realize, not in *how* that should be accomplished. This disparity is not without danger, since the required unity and integration necessitates the latter perspective first and foremost. Enterprise engineering intends to address the design perspective in a formal, methodological way. Two important concepts underpin enterprise engineering: *enterprise ontology* and *enterprise architecture*. These concepts will be outlined in subsequent chapters. Briefly stated, they concern the following. Enterprise ontology focuses on the essence of an enterprise, fully independent of its actual or possible implementation. Appreciably, this will greatly reduce the complexity, hence reducing the difficulty of comprehending enterprises. Enterprises must ultimately be designed such that they can be implemented. In view of the enterprise purpose and its objectives, it seems obvious that not just any arrangement of the enterprise will suffice. On the contrary, enterprise design must satisfy specific requirements. Enterprise architecture is a crucial concept in this respect and provides normative guidance for design, in order for the enterprise to operate as a unified and integrated whole, whereby various enterprise objectives must be satisfied. An important objective was mentioned earlier: enterprise engineering must address not only operational aspects having to do with producing enterprise products and services, but enterprise engineering must also address the ability of the enterprise to address future, yet unknown developments successfully: design must enable enterprise change and adaptation.

The concept of engineering an enterprise has been emphasized notably in earlier publications. For example, as far back as several decades ago James Martin stated that "Enterprise Engineering is an integrated set of disciplines for building or changing an enterprise, its processes, and systems" [1995, p. 58]. With deep insight he foresaw that "A new type of professional is emerging – the enterprise engineer" [op. cit., p. xii]. Underlying the approach advocated by James Martin was the notion that enterprise success necessitates unity and integration of various enterprise aspects, a notion we will likewise emphasize throughout this book. Despite the similar use of the term 'enterprise engineering', our approach nonetheless differs in various aspects. The difference lies primarily in our emphasis on the formal theory and associated methodology for enterprise design, as well as in our focus on the characteristics of effective governance for making the enterprise engineering approach successful.

1.2 Growing Attention to Governance

1.2.1 Three Governance Themes

An Internet search for the term 'governance' will be fruitful: the number of hits is so high that an average human life would be too short to investigate them all. Some analysis teaches however that the results contain considerable overlap, and that essentially they boil down to three governance themes: corporate governance, IT (information technology) governance and enterprise governance. Anticipating the more elaborate discussion, we will introduce these three themes and their typical characteristics briefly.

Corporate Governance

Concisely stated, the 'corporate governance' theme centers around the way companies are managed and controlled [Solomon and Solomon 2004]. Corporate governance is therefore associated strongly with (top) management of companies. This governance theme has a long history, and has its roots in issues arising from the separation between owners (shareholders) and management of an exchange-listed company. While shareholders expect management to act in shareholders' interests – as an 'agent' of the shareholders – actual experience indicates otherwise, at least in shareholder perception. Management acts according to its own agenda when it comes to the company's strategy and development [Berle and Means 1932]. This is the core of the so-called 'agency problem' identified as the first crisis in corporate governance. Such a crisis raises the question as to how corporate governance must be arranged so that management acts in the interests of shareholders.

After the first crisis, a second crisis manifested itself at the end of the last century. Where the first crisis could be attributed to a difference of opinion between management and shareholders about the company's strategy and development, the second arose from severe forms of fraudulent actions, greed, corruption and the appropriation of company financial means for dubious (including private) purposes. Dramatic consequences followed, among them the downfall of companies, inflicting severe damage on many affected parties.

The ‘corporate governance’ theme received prominent attention as a result of the second crisis, together with a call for governance reform. Proposed changes are translated for a considerable part into rules and legislation, among them the well-known American Sarbanes-Oxley legislation. Given the origin of the crisis in corporate governance, the type of discussion about this theme and the character of the proposed reform, the corporate governance theme manifests strong dominance in the financial/accounting and auditing profession. The perspective is heavily structurally oriented, focused on internal risk management and control in financial/economic developments. Formal reporting and auditing play an important role, including compliance: satisfying rules and legislation on corporate governance. Such rules and legislation are directed for a considerable part to the responsibilities of (top) management towards shareholders. As indicated earlier, the notion of corporate governance is therefore associated strongly with (top) management. Corporate governance can thus be regarded as the totality of internal arrangements, as well as external rules and legislation, for control and risk management that ensures that companies are addressing their responsibilities towards shareholder interests effectively.

IT Governance

Information Technology (IT) – sometimes also identified as Information and Communication Technology (ICT) – has affected society and enterprises dramatically, and will most likely continue to do so. From a historic perspective, IT developments can be characterized as ‘revolutionary’, specifically by observing the enormous progress from the 1980s onward. In view of the revolutionary character – and the subsequent need to pay attention to these developments – the IT governance theme surfaced as an area of interest at the end of the 1980s and beginning of the 1990s. Self-evidently, the considerable and revolutionary influence of IT makes guiding IT development important: IT governance. One might thus interpret the attention paid to IT governance in a positive sense: such innovative use of IT that competitive advantage is established. History teaches however that attention paid to IT governance is generally driven by more disturbing concerns, such as:

- The advantages of IT investments are unclear or controversial
- Vague relationships between IT investments and enterprise strategic intentions
- IT systems limit enterprise flexibility
- IT developments are often technology driven
- Unproductive relationships exist between IT users and IT professionals
- Long lead times for IT developments
- High costs for IT developments and operation.

Supposedly, adequate IT governance would then rectify the aforementioned drawbacks. One speaks of ‘business and IT alignment’: the state of perfect fit between business requirements and the response of IT. The question is nonetheless, *how* the state of alignment is established. Many IT governance approaches provide a structurally oriented answer to this question, whereby IT governance is viewed as “the process by which decisions are made around IT investments” [Symons 2005]. Others claim that IT governance is about “specifying the decision rights and accountability framework to encourage desirable behavior in the use of IT” [Weil and Woodham 2002]. These structurally oriented perspectives seem to suggest that once the framework for decision-making is defined, IT developments will progress in the desired manner. What those IT developments are, and how they are established remains unclear however.

Inevitably, the aforementioned IT governance perspectives associate IT governance strongly with management responsibilities and their assumed decision-making prerogative. It is stated for example, that “IT governance is the responsebility of the board of directors and executive management. It is an integral part of enterprise governance and consists of leadership and organizational structures and processes that ensure that the organization’s IT sustains and extends the organization’s strategies and objectives” [IT Governance Institute 2003]. A comparable perspective appears from the notion that “IT governance is the organizational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensure the fusion of business and IT” [Grembergen and Haes 2008, p. 5]. Similarly as with corporate governance, the visions regarding IT governance are thus almost exclusively associated with (top) management of enterprises. It apparently only concerns structures for decision-making and responsibilities for IT developments. This book will present a different perspective on IT governance.

Enterprise Governance

This is a theme of more recent origin. The way the concept of ‘enterprise governance’ is presented in the literature currently bears a strong relationship to the previously discussed corporate governance theme. Put another way, proponents of corporate governance have recently been advocating the enterprise governance notion. The background for this new focus lies in the insight that fraud and the publication of misleading (financial) information are evidently not in the interests of shareholders, but that failing strategic developments and implementations likewise – and probably even more so – form a considerable risk for shareholders. Remarkable in this context is the outcome of a study among a thousand enterprises into sharp fluctuations in their share prices. Two-thirds of the fluctuations appeared to be connected to strategic issues, whereas only one-third involved financial and operational risks [Ernst and Young 2002]. So the strategic and operational performance of the enterprise is therefore included in the governance perspective. Alongside the traditional focus on compliance, governance must also be concerned with performance. The International Federation of Accountants sees enterprise governance as the combination of corporate governance (focused on *compliance*) and ‘business governance’ (focused on *performance*) [IFAC 2004]. The notion of business governance remains unclear however. Enterprise governance is considered as “the set of responsibilities and practices exercised by the board and executive management with the goal of providing strategic direction, ensuring that objectives are achieved, ascertaining that risks are managed appropriately and verifying that the organization's resources are used responsibly" [IFAC 2004, p. 10]. Within this view, the realization of performance has to do with planning, decision-making and risk management. The aforementioned definition resembles the structural, management-oriented governance approaches discussed in brief above. Enterprise governance is viewed as an 'accountability structure', dealing with compliance, performance and responsibility [Fahy et al., 2005]. Within this outlook it has even been suggested that external financial auditors who verify compliance with rules and legislation from the corporate governance perspective, should also verify and assess the enterprise strategy!

Appreciably, the enterprise governance view sketched above fits the formal, planning, and management-oriented approach to enterprise development neatly. It is about (strategic) planning, decision-making, forecasting, budgeting, risk and performance management, as well as milestones and timelines [IFAC 2004, Fahy et al., 2005].

Our view on enterprise governance presented in this book aims likewise at bringing 'compliance' and 'performance' into an integrated perspective, but nonetheless differs fundamentally from the aforementioned approach. First, the enterprise governance perspective outlined previously provides no indication – let alone a formal methodology – for realizing the unity between compliance and performance. Second, as we will discuss thoroughly later, enterprise performance does not follow primarily from attention to planning, decision-making, risk management and accountability structures, but is determined primarily by a coherent and consistent enterprise design. Third, within the aforementioned enterprise governance perspective, no coherent attention is paid to IT developments.

1.2.2 The Difference Between Governance and Management, Governance as an Organizational Competence

The term 'governance' is used with different denotations. On one hand the term refers to the totality of processes and (administrative) systems that determine how an organization or society operates. On the other, the term is used to identify activities that differ from the operational execution, and whereby governance is considered as a guiding capacity that determines the manner by which operational activities are performed. We will use the latter interpretation.

The origin of the term 'governance' lies in the Latin word *gubernáre*, meaning to control, in the original meaning, the control of a ship. Governance can thus be considered roughly as regulating or controlling 'something'. That 'something' depends on the specific governance perspective, and might be IT, but also the organization as a whole. So, one refers to IT governance, corporate or enterprise governance respectively.

It is important to distinguish 'governance' from 'management'. The latter term has its origin in the Latin word *manus* (hand). Hence to differentiate 'management' from 'governance' we will view the notion of management in an operational, executing sense. Put another way, management deals with *executing* activities, whereas governance deals with *guiding* those activities to safeguard their adequacy and correct execution [Dalles and Bell 2004]. Within this distinction, IT management focuses on the effective delivery of IT products and services for example, while IT governance concentrates on guiding principles regarding that delivery, as well as on the strategic development of IT, such that IT can be utilized competitively, now and in the future [Grembergen and Haes 2008].

Often the aforementioned distinction is not strictly adhered to: the terms 'governance' and 'management' are used interchangeably. The term 'management' can also refer to both an activity or a group. Some of the governance definitions given above used the term 'management' to identify a group of persons fulfilling a governance role. In short, the terminology is not always clear. Nonetheless, the distinction given is useful, whereby the regulating, guiding characteristics of governance imply that governance activities should be conducted from, or associated with, the overall authority and control of an enterprise or society (legislation). As indicated previously, this viewpoint often implies that governance is linked with enterprise (top) management. Although the governance definitions given refer to organizational structures and processes, they suggest that governance is primarily a 'management' affair. However we will argue the opposite in this book: governance is primarily an organizational competence – a coherent whole of organizational skills, knowledge and technology – anchored in the competencies of employees. The character and activities of this competence will be discussed in later chapters.

1.3 Relationships Between Governance Perspectives

Paragraph 1.2.1 introduced three different perspectives on governance briefly. This paragraph will outline their mutual relationships, and thereby provide arguments to present the various governance perspectives in a unified treatment. The mutual relationships are depicted schematically in Figure 1.4 and will be discussed below.

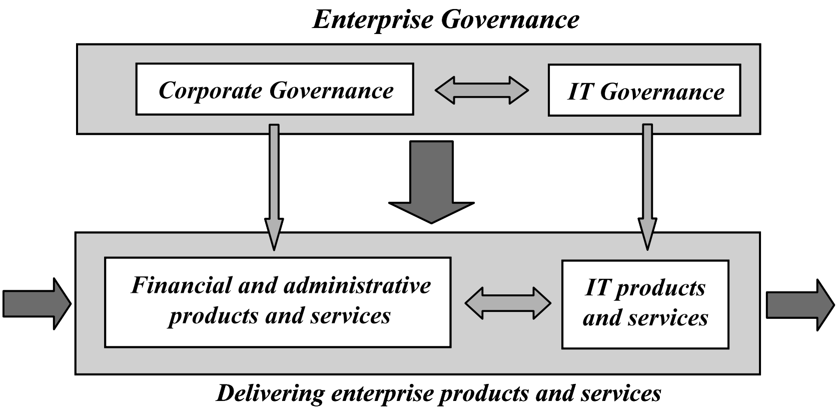


Fig. 1.4. Relationships between the various governance perspectives

1.3.1 Corporate Governance and IT Governance Relationship

An important aspect of corporate governance indicated previously concerns the arrangement of internal control, viewed as the totality of (financial) arrangements and associated activities geared towards financial prudence and the adherence to pertinent rules and legislation for safeguarding the interests of shareholders. The Sarbanes-Oxley legislation formulates stringent requirements for financial reporting and the formal top management testimonial that said reporting reflects the actual state of affairs.

Understandably, many IT systems are for a considerable part, if not exclusively, involved with initiating, authorizing, handling, storing and reporting on financial transactions. Put another way, important aspects for adequately arranging corporate governance rest on the adequate arrangement of IT systems, such that corporate governance requirements can be satisfied. One might consider obvious attention areas like [IT Governance Institute 2004b]:

- Security management and data classification
- Identity management (authentication and role-based authorization)
- Data management and data warehousing (data integrity).

Another reason for the strong relationship between corporate and IT governance lies in the fact that IT systems are generally not developed primarily from a corporate governance perspective. Rather, those systems are developed for supporting customer and operational processes, but at the same time provide essential data which is relevant to corporate governance considerations. Consequently the quality of the development, implementation and operation of IT systems must be such that corporate governance requirements can be fulfilled concurrently. Moreover, changes in IT systems might have considerable implications for the integrity and completeness of (financial) data. Aspects of the design, implementation and operation of IT systems thus have a bearing on the ability to satisfy corporate governance requirements. Hence corporate governance entails important implications for the total spectrum of IT governance. The overall enterprise responsibility in this respect is not alleviated if parts of IT services delivery are outsourced to third parties.

Our considerations indicate that enterprise design requirements regarding compliance – satisfying corporate governance rules and regulations – are not unique in the sense that they are only defined from the corporate governance perspective. On the contrary, fulfilling compliance follows likewise (and primarily) from design requirements that are already defined on other grounds, such as areas pertinent to information security and data management mentioned earlier. This implicit relationship between design requirements from compliance considerations and those from the design of IT systems constitutes the second reason for the strong mutual relationship between corporate and IT governance.

1.3.2 Corporate Governance and Enterprise Governance Relationship

The internal aspects of corporate governance reform concern the structure and manner of control in view of shareholders' interests. This begs the question as to how these interests are best served. Fraud and the publication of misleading (financial) information is evidently not conducive to shareholders interests. However as indicated earlier, failing strategic developments and implementations are likewise – and probably even more so – damaging to shareholder interests, and do not enhance the enterprise economic value. Some authors on corporate governance therefore bring enterprise strategy development and execution within the scope of corporate governance.

Roughly, two approaches can thus be identified: (1) a narrow perspective on corporate governance that is focused primarily on top management supervision and compliance in view of financial/economic aspects and associated reporting, and (2) a broad perspective on corporate governance that also includes the enterprise strategy and execution. In the latter case, corporate governance reform is also argued based on examples of failing enterprise strategies, since internal control is viewed to have failed in adjusting the enterprise strategy timeously [Jensen 2005a]. In the opinion of some authors therefore, effective governance and top management supervision implies that supervising directors must concern themselves with the assessment and analysis of the enterprise competitive market in which it operates, with the internal organization, as well as with personnel and political issues, including the associated information and knowledge, to be able to assess the enterprise strategy as suggested by top management. Supervising directors should have a special staff for conducting these tasks effectively [MacAvoy and Millstein 2004]. Comparably, Coley et al. state that from the broader perspective, good corporate governance entails [2005]:

- A valid business concept that addresses customers and the products and services to be delivered
- Goals, plans and means to realize strategic initiatives effectively
- Systems ensuring that important obligations regarding 'stakeholders' (customers, employees, suppliers, owners, etc.) can be honored
- Complete and timely reporting about enterprise performance for owners and the lager community of investors.

It is emphasized therefore, that success regarding corporate governance not only has to do with legislative aspects, but also with the development and execution of a valid business concept [Coley et al. 2005]. This inevitably leads to an enterprise-wide perspective.

According to Prahalad and Doz, enterprise value creation rests on three mutually related pillars [2005]. First, the portfolio of products and services. Second, the business model reflecting the internal enterprise logic with which – through the portfolio of products and services – economic value is created. Finally, the governance model that not only guides the development of the portfolio of products and services, but also guides the organizational arrangements that brings the products and services forward. These arrangements point to the notion of enterprise competencies, discussed in paragraph 1.4.2.

Evidently, corporate governance in the broad sense concerns enterprise strategy development, the subsequent design of the enterprise, the definition of relevant programs and projects for realizing the design, and the implementation of programs and projects. Hence, within this view, corporate governance concerns not merely internal structures and systems for (financial) control, reporting and risk management, but the broad perspective concerns the strategic development of the enterprise itself. Aspects that concern enterprise (strategic) development – with business, organizational, informational and technological aspects – require a perspective that encompasses the enterprise in all its facets, from design and implementation to actual operation. This points to the themes of enterprise governance and enterprise engineering, which we will discuss in Chapter 7. We submit that the broad view transcends the corporate governance theme and the financial/economic perspective of its proponents considerably: adequate enterprise performance and the control of risks in the financial/economic domain require an approach that surpasses this domain fundamentally and conceptually, which approach thus inherently *cannot* be developed within the financial/economic domain and its associated concepts and thinking. When discussing corporate governance more thoroughly in Chapter 5, the fundamental limitations of the financial/economic perspective in this respect will become manifest.

Comparably as with IT governance, the strong mutual relationship between corporate governance and enterprise governance follows additionally from the fact that design requirements for the enterprise as a whole must also concurrently address requirements following from compliance considerations. Indeed it seems rather problematic to arrange the enterprise, with enterprise governance as the guiding capacity, and then afterwards and separately to incorporate requirements and conditions following from corporate governance. On the contrary, requirements and conditions following from corporate governance must form an integrated part of enterprise design, and are thus addressed concurrently. As such, corporate governance is an integral part of enterprise governance. One might consider requirements on process design to safeguard coherent and consistent process execution and control. For example, through minimizing reconciliation, the avoidance of process reversals, or the assurance of non-repudiation, coherent and consistent process operation is ensured, which at the same time improves the coherence and consistency of financial/economic data.

1.3.3 IT Governance and Enterprise Governance Relationship

The definition of IT governance given by the IT Governance Institute explicitly mentions enterprise governance: "IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives" [IT Governance Institute 2003]. It remains unclear however how enterprise governance must be understood. Nonetheless, it seems plausible that IT governance should be an integral part of enterprise governance since IT developments must ultimately support current enterprise developments and must enable future developments. Developments in the area of e-business are a well-known example. Ineffective forms of IT governance are partly due to a lack of formal embodiment of IT governance within enterprise governance.

A more formal foundation for the strong mutual relationship between IT governance and enterprise governance can additionally be argued as follows. When discussing the background for the attention for IT governance the questionable results of IT investments were mentioned. A clear positive relationship between enterprise performance and IT investments seems to be absent [Strassmann 1990, Pisello and Strassman 2000]. In the chapter about IT governance we will argue that the lack of a positive relationship is the inevitable consequence of the suboptimal use of IT. That means applying IT whereby a mismatch exists between the possibilities and capabilities of IT and the enterprise context in which IT – more specifically the IT system – is utilized. So, the introduction of an IT system for local, distributed decision-making by employees hardly seems effective in a context where decision-making is seen primarily as a (central) management prerogative. Likewise, the introduction of a system for customer relationship management appears less meaningful in an enterprise context devoting little attention to customer satisfaction. A call center where employees are rated by the number of customers 'served' per hour is an example.

Research indicates that enterprises which merely introduce IT and 'leave it at that' hardly realize enterprise performance improvements. However, considerable improvements can be obtained if the introduction of IT is accompanied by changes in enterprise design, such that unity and integration between IT functionality and the enterprise context is created [Brynjolfsson and Hitt 1996]. To quote the authors on 'Information Economics': "To achieve real lasting impact from information technology, the business itself must change." [Parker and Benson 1988, p. 44].

These observations show that IT systems and their functionality must be designed concurrently and in unity with the enterprise context. This constitutes the fundamental grounds for the strong mutual relationship between IT and enterprise governance.

1.4 Design- and Competence-Oriented Governance

1.4.1 The Focus on Enterprise Design

We have argued the focus on design based on the notion of an enterprise as an organized complexity. Both aspects are addressed through design: the process towards being organized, while at the same time mastering complexity. As will become apparent in the following chapters, the focus on design has enormous practical implications, and is associated directly with strategic and operational enterprise success. A fairly recent McKinsey report argued that "Most corporate leaders overlook a golden opportunity to create a durable competitive advantage and generate high returns for less money and less risks: making organizational design the heart of strategy" [Bryan and Joyce 2007, p. 21]. Hence, "Organizational design, we believe, should be about developing and implementing corporate strategy" [op. cit., p. 25]. Others have argued the competitive potential of enterprise design comparably [Nadler et al. 1992, Hammer and Champy 1993, Johansson et al., 1993, Nadler and Tushman 1997]. Above all, strategic success necessitates a unified and integrated enterprise design, whereby enterprise architecture will prove to be a crucial concept, as mentioned earlier, and will be corroborated throughout this book. As previously emphasized, enterprise design should not only address current (strategic) objectives, but should enable change and adaptation in light of future, yet unforeseen developments. For one thing, the very notion of governance advocated in this book manifests such design.

However, the short introduction of governance topics discussed in the literature showed that the focus on design was notoriously absent: governance approaches are heavily formal, structural and management-oriented. Put another way, the question as to how the enterprise must be arranged is virtually not addressed. The primary focus is on internal control, decision-making and accountability structures. These characteristics and their limitations will be discussed thoroughly in later chapters, thereby corroborating our conviction that the structural, management-oriented governance perspective cannot arrange the necessary unity and integration previously emphasized. To put it somewhat graphically: the various enterprise aspects cannot be 'talked or decided together'. Defining decision-making and accountability structures is not without merit, but unity and integration between various enterprise aspects – the business, organizational, informational and technological arrangements – have to do with the *design* of the enterprise as a whole. Such design does not follow from structural provisions for budgeting, planning and decision-making. For successful enterprise governance, attention to enterprise design (and enterprise engineering as the design methodology) must thus take the the central position. In a similar vein, the McKinsey report cited above points to the situation that CEOs traditionally focus on structural arrangements for enterprise change, however, "They would be better off by focusing on organizational design" [Bryan and Joyce 2007, p. 22].

Further, the focus on design is also essential for addressing strong mutual relationships between the various governance topics illustrated in paragraph 1.3. A unified approach is evidently necessary for addressing these relationships. Publications from the various governance-related disciplines are not conducive to a unified approach however, a theme manifestly lacking in these publications. Understandably, unity and integration can only result through the overall encompassing enterprise governance perspective, whereby the focus on design actually effectuates the necessity to treat the three governance topics in a unified manner.

1.4.2 Enterprise Governance Competence

Probably the first source for the heightened attention to the notion of competence at the enterprise level was publication of the book *Competing for the Future* written by Hamel and Prahalad [1994]. They argue that an enterprise must not be seen as portfolio (group) of individual business units, but rather more as a portfolio of competencies. In their eyes, it is the competencies that define (unique) opportunities for enterprises and the capabilities to exploit them. Strategic issues thus do not (or not only) concern what has to be done to maximize revenue or market share for a given product-market combination, but primarily (or also) concern which competencies must be acquired in light of possible future revenue and opportunities. Hamel and Prahalad introduce the concept of core competencies within this conceptual framework. These are competencies that underpin the dominant position of the enterprise regarding the delivery of products and services. Conversely, new opportunities necessitate the development of new core competencies. So strategy development is not only about defining possible initiatives pertinent to products and services, but also about defining the necessary competencies.

Hamel and Prahalad characterize an enterprise competence as the integrated whole of enterprise skills, knowledge and technology, more than as a singular skill, knowledge domain or technology [1994]. The essence of an enterprise competence lies in the *integration* of important qualities. Integration is key, and the determining factor for competitive advantage. Notably, this aspect also points to design since integration does not occur spontaneously. Failing enterprise strategies are attributed to entering new business domains that require core competencies that the enterprise does not (yet) have [Javidan 1998]. Comparable observations are made by Ciborra: "Unique sources of practice, know-how and culture at the firm and industry level can be the source of competitive advantage, rather than the structural analysis of internal assets and market structures" [2002, p. 32].

The notion of enterprise competencies connects closely with the so-called resource-based view on enterprises. This view holds that the different resources of enterprises enable them to follow different strategies. Put another way, the different resources make up different core competencies. A broad spectrum of resources can be identified: (1) physical resources, such as buildings, machines, technology and other means, (2) human 'resources' with their skills, knowledge and experience, and (3) cognitive resources, such as the enterprise culture or brand image [Javidan 1998]. Four levels of enterprise abilities are identified. The basic level is the *resources*, seen as the building blocks of the enterprise competencies. Next, the *enterprise skills* that are considered to be the ability to exploit the resources. Exploitation of resources takes place within a certain enterprise functional domain, such as engineering, production, communication, marketing etc. Integration of enterprise skills over multiple functional domains constitutes the third level, the level of *enterprise competencies*. Within this scheme, the fourth level of *enterprise core competencies* is established when competencies are shared and integrated over individual business units [op. cit.]. Hence, core competencies manifest themselves at the overall enterprise level through integration of various enterprise competencies.

Central to the notion of competence is the *integration* of various enterprise resources. In view of the above, we define an enterprise competence as *an integrated whole of enterprise skills, knowledge and technology*. Understandably, competencies must be organized: they are thus an organizational capacity or ability to produce something. And as previously mentioned, integration does not occur spontaneously: intentional activities are required for integration to happen. These activities were broadly identified earlier as 'design' [Simon 1969]. To a considerable degree, (tacit) knowledge and skills accrue over time. This has to do with enterprise learning discussed in Chapter 2. Not all aspects of an enterprise competence can thus be designed as being operational from the initial start. Nonetheless, conditions conducive to enterprise learning must be designed.

Appreciably, an enterprise competence is not merely about form, but primarily about substance, manifested through products and services the competence brings forward. So one might consider an enterprise competence for producing furniture, transport services or growing plants. In Chapter 2 we will outline the fundamental difference between the structural, management-oriented governance perspectives already briefly discussed, and the competence-based perspective on governance. Since enterprise competencies rest on employee competencies, employees will be shown to be the crucial determinant for successful enterprise governance. We will provide various fundamental arguments for the necessity of competence-based governance, among them (1) the ability to deal with complexity, dynamics and the associated uncertainty, and (2) the ability to establish a unified and integrated enterprise design. As Mason and Mitroff observe, problems of organized complexity need a broad perspective on their solution; they must be handled in a holistic or synthetic way, whereby only an organizational competence can deal with the multitude of mutually related issues of organized complexity [1981].

Our notion of enterprise governance is expressed by the following definition:

> *Enterprise governance is the organizational competence for continuously exercising guiding authority over enterprise strategy and architecture development, and the subsequent design, implementation and operation of the enterprise.*

The word 'guiding' in this definition aims to express that strategy development is not the exclusive domain of the enterprise governance competence. Rather, as we will argue extensively, strategy development is an emerging process that rests to a considerable extent on enterprise-wide involvement of employees and the enterprise competence to stimulate and utilize their creativity. However, we aim to show that governance guidance is required for enabling that strategy development to happen, and for implementing strategic choices effectively in a coherent and consistent way.

The underlying viewpoints and concepts for arguing the competence-based approach to governance will be discussed in detail in subsequent chapters. Our further discussion includes outlining the viewpoints and concepts that enable successful strategy development and implementation. The next paragraph provides the outline of the further chapters.

1.5 Outline of Further Chapters

Chapter 2: Mechanistic and Organismic Perspectives on Governance

Our brief introduction to the three governance themes stated previously – corporate, IT and enterprise governance – indicated the strong structural, control and management oriented focus. This focus is associated with one of the two fundamental perspectives on organizing discussed comprehensively in this chapter: the mechanistic and organismic perspective. It will be shown that these perspectives have an all-determining influence on the way governance is perceived and operationalized. We will argue that the dominant governance perspective is related to the deep-seated characteristics of Western thought (in contrast to the briefly outlined characteristics of Eastern thought), and as such is deeply ingrained in the Western managerial 'mental map'. This mental map therefore has a high tenacity and impedes the recognition of its limitations. In view of these limitations, the myth of traditional control in enterprises is sketched. These reflections form the basis for presenting the alternative, organismic, competence-based perspective. As will be illustrated, this perspective centers around employee involvement and their creative, self-initiating potential. Reflections on enterprise productivity, quality, service, and learning and innovation aim to argue the importance of employee involvement and self-organization. Ultimately, enterprise success – also with respect to governance – rests on employee competencies, even more so within the modern enterprise context. Appreciably, the views outlined in this chapter determine our competence-based approach to governance discussed in later chapters.

Chapter 3: Enterprise Essentials

Since enterprises (companies, organizations or institutions) are the focal point of corporate, IT and enterprise governance, Chapter 3 reviews some core facets of enterprises. Our discussion in this chapter focuses on what an enterprise essentially is, when enterprises emerged initially as entities, and the important (design) characteristics of enterprises. Two core, non-trivial problems facing every enterprise will be identified. In doing so, we address the question if, and to what extent, universally applicable – not culture-bound – theories about enterprises are possible. Various facts of enterprise development are then reviewed. Important changes consider the context in which modern enterprise operate. This context appears to be highly dynamic and complex, and as such implies significant paradigm shifts pertinent to the way enterprise must be viewed. It will be argued that these paradigm shifts entail important consequences for the (strategic) development and arrangement (the design) of enterprises. Those considerations also provide grounds for the employee-centric, competence-based governance approach. Two fundamental perspectives are introduced on the nature of strategic choices. Conditions for implementing strategy choices successfully will be discussed. Unity and integration will turn out to be important conditions. These conditions necessitate the positioning of governance as a central organizational capacity, which raises the issue of central governance versus local freedom. Different perspectives on the relationship between enterprise strategy and design are introduced, which are associated with the mechanistic and organismic perspective on governance respectively. Since the employee-centric, organismic governance perspective rests on employee self-organizing capacities, the importance of employee behavior and the behavioral context will be highlighted. Important paradigm shifts in views on enterprises are then summarized.

Chapter 4: System Thinking

Unity and integration – the consistency and coherence between the various enterprise facets – were identified in Chapter 3 as essential conditions for implementing strategic choices successfully. Such conditions necessitate viewing the enterprise as a system. Comparable considerations hold for the unity and integration of IT systems. Approaches outlined in the chapters about IT and enterprise governance thus rest to a large extent on system thinking. From a general perspective, this chapter therefore outlines some core aspects of system thinking, whereby unity and integration are emphasized as important system characteristics. References to enterprise system aspects will be provided for illustrative purposes. The crucial concept of *architecture* is introduced for safeguarding unity and integration during system design. We will outline what architecture essentially is, and show the difference between architecturing and designing. The reference context for architecturing and the formulation of architecture principles are also discussed, including the meaning and relevance of an architecture framework. Finally, the question will be addressed as to whether the emphasized emerging nature of various enterprise developments is consistent with the systemic perspective on enterprises.

Chapter 5: Corporate Governance

Recent financial scandals have placed the corporate governance theme strongly in the public eye. We will highlight backgrounds and show how the notion of corporate governance has developed historically, and discuss important suggestions for corporate governance reform. Remarks made about the suggested reform argue that reform initiatives are partly useful and partly rather problematic: bureaucracy, high costs, questionable usefulness, or even risky. It will be illustrated that, paradoxically enough, the financial/economic focus of corporate governance in fact makes this approach unsuitable to fulfill its main purpose adequately: safeguarding the interests of shareholders. For that, the broader perspective on enterprise governance will be argued. From this broader perspective, the well-known COSO framework for corporate governance will be analyzed and commented upon. Finally, we will deal with the question as to how the requirements following from corporate governance (compliance) can be addressed. This will show that effecttuating corporate governance must take place within the context of overall enterprise governance and design.

Chapter 6: IT Governance

After initial observations on the motivation for the IT governance theme, a short historic overview of IT developments is presented, showing that from an initial purpose in the area of calculating, IT has developed into a pervasive technology that affects virtually all societal and enterprise facets fundamentally. The developments outlined show how IT governance could grow into a problematic phenomenon, and makes plausible why 'business and IT alignment' has turned out to be a theme addressed frequently in the literature. This theme and a number of IT governance approaches are then discussed. We will illustrate that IT governance approaches are primarily structurally oriented, having their focus on control and decision-making structures. The limitations of that approach will be argued. This serves as the foundation for arguing that realizing real business value through IT can only be accomplished through a focus on design, whereby IT architecture provides normative guidance. This will be emphasized as a core aspect of the competence-based IT governance perspective. Three essential core competencies within the IT governance competence are identified. Those competencies are the answer to the limitations of the structural, control-oriented IT governance approach, and are the answer to the necessary design focus. Pertinent to the IT governance core competencies the overall governance process will be illustrated, and related formal meetings are indicated. Support competencies are mentioned briefly. Under the label 'enterprise engineering', the design focus will be formally addressed in Chapter 7. In view of the IT governance core competencies and their tasks, the central position for the IT governance competence will be emphasized. We will show that central IT governance is essential for reducing and avoiding IT legacy complexity. Finally, the often promoted IT governance CobiT framework is discussed, and an outlook on IT governance maturity will be presented.

Chapter 7: Enterprise Governance

From an overall governance perspective, encompassing corporate and IT governance, the notion of enterprise governance is introduced. After a short summary of the arguments for enterprise governance given in the previous chapters, core aspects of the enterprise engineering theory and methodology will be presented. This will be advocated as essential 'tooling' within the enterprise governance competence with the purpose of establishing unified and integrated enterprise design. Two foundational topics of enterprise engineering will be discussed: enterprise ontology and enterprise architecture. Within the enterprise ontology approach, we will focus on essential enterprise transactions and their associated processes. The notion of business rules will be discussed in relation to enterprise processes, whereby the difference with enterprise architecture is outlined. Special attention will be paid to enterprise architecture and enterprise design domains. Four main enterprise design domains are discussed: business, organization, information and (information) technology. As an illustration, examples of sub-design domains and the associated architecture within the four main design domains will be given. The enterprise governance core competencies are discussed thereafter. These competencies will turn out to be comparable with those of the IT governance competence, and can be seen as their complement. The importance of the enterprise governance competencies will be illustrated comparatively as with IT governance, while levels of enterprise governance maturity are introduced. Since the service-oriented governance approach is gaining increasing attention, we will show that such an approach necessitates enterprise governance, and fits within the argued competence-based view. Finally, we will address the relevant personal competencies on which the enterprise governance competence rests. Competencies of the enterprise architect are our prime focus.

Chapter 8: The Praxis Illustrated

This final chapter illustrates the inherent nature of enterprise governance and enterprise engineering by demonstrating some core facets of the praxis of these concepts within the context of a fictitious company, one facing considerable dynamics and uncertainty necessitating a fundamental company transformation. The case aims to show that it is not so much the top-down, management and planning oriented governance approach which is crucial for making sense of the dynamics faced, and defining how the transformations should progress, but the enterprise governance competence, and more specifically, the strategy and architecture competence. In the praxis of exercising governance, topics that the competence should address and resolve will be shown to manifest themselves in an emerging fashion. Not all the topics discussed in the previous chapters can be illustrated within the case description's limited space. So, we will limit ourselves to indicating how the core concepts outlined in this book can be applied. In doing so, the case aims to substantiate the importance of the competence-based perspective on governance, within which enterprise design is a central area of attention.

2. Mechanistic and Organismic Perspectives on Governance

Two fundamental perspectives on organizing are discussed comprehensively in this chapter, since these perspectives have an all-determining influence on the way governance is perceived and operationalized. It will be shown that the dominant perspective on governance can be related to deep-seated characteristics of Western thought that are deeply ingrained in the Western managerial 'mental map'. This mental map thus has a high tenacity and impedes the recognition of its limitations. In view of these limitations, the myth of traditional control in enterprises is sketched. Foregoing reflections form the basis for presenting the alternative perspective, which is reminiscent of the contrasting aspects of Eastern thought. As will be illustrated, this perspective centers around employee involvement and their creative, self-initiating potential. Reflections on enterprise productivity, quality, service, and learning and innovation, aim to argue the importance of employee involvement and self-organization. Ultimately, enterprise success – also with respect to governance – rests on employee competencies, even more so within the modern enterprise context. Some fundamental organizational choices are presented. Appreciably, the views outlined in this chapter determine our approach to governance discussed in later chapters.

2.1 Mechanistic Thinking

2.1.1 Characteristics of Western Thought

Four aspects of Western thought are particularly noteworthy regarding the mechanization of governance: reductionism, logic-deductive thinking, rationalism and determinism. *Reductionism* holds that complex 'wholes' can only be understood through knowledge of –simpler – constituent aspects or elements. Conversely, knowledge of parts implies understanding the whole. Closely related is the notion of *logical-deductive thinking*, which might be viewed as moving rationally from 'the general to the specific'. This points to *rationalism*, expressing the belief that reason is the prime source of knowledge and the route to an objectively knowable world. Finally, the notion of *determinism* boils down ultimately to the belief in identifiable causes that necessitate the current state of affairs, whereas this current state itself – through causal relationships – determines the future state of affairs. These aspects – or modes of thinking – will be reviewed briefly from their historical context in order to appreciate their strong influence, and to illustrate how this thinking is manifest in the governance, design and operation of enterprises.

Appreciably, roots of Western thought can be traced to ancient Greece. One might argue that the search for elemental, primordial building blocks of nature manifests itself in the reductionistic investigative approach to knowledge. Empedocles thought of four basic elements – earth, water, air and fire – while Leucippus and Democritus considered ‘atoms’ as fundamental building blocks. The common theme in Pythagorean thinking about reality was the dominant role attributed to numbers, considered as the origin of all things. As Aristotle is supposed to have said: “Things are numbers” [Dijksterhuis 1986]. Numbers relate to arithmetic and geometry, mathematics in general, areas where true knowledge can be obtained according to Plato. Knowledge refers to ideal archetypical forms or qualities (Ideas) that do not follow from imperfect observations through our senses, which merely give an impression of that ideal world. In other words, “The Ideas are thus the fundamental elements of both an ontology (theory of being) and an epistemology (theory of knowledge): they constitute the basic essence and deepest reality of things, and also the means by which certain human knowledge is possible” [Tarnas 1996, p. 10]. In a reductionistic sense, “The fundamentals of existence are the archetypical Ideas, they constitute the intangible substrate of all that is tangible” [op. cit. p. 12].

Aristotle had a more empirical focus and associated knowledge with concrete objects. Nature should thus be explained in terms of nature itself. In line with the Platonic view, objective knowledge is *a priori* knowledge, ‘independent’ of the knowing subject. Knowledge thus refers to things ‘as they are’. Hence the inquiring subject can only deduce from truth that ‘already exists’. Within both the Platonic and Aristotelian view true knowledge is based on the logic of deduction [Russell 1967]. This concurs with Parmenides’ “declaration of the autonomy and superiority of the human reason as judge of reality” [Tarnas 1996, p. 21]. Determinism can, for example, be noticed in Aristotle’s theory about moving objects, leading ultimately to a – in itself unmoved – prime mover. Movements are caused by forces transferring potentiality into actual realization. Overall, a typical characteristic of ancient Greek thought was “a sustained, highly diversified tendency to interpret the world in terms of archetypical principles” [Tarnas 1996, p. 3]. As such, “The Greek universe was ordered by a plurality of timeless essences which underlay concrete reality, giving it form and meaning” [op. cit. p. 4].

Building on the ancient Greek intellectual heritage, an enormously influential contribution to the considerable impact of rational, deterministic reasoning comes from the work of the French mathematician and philosopher René Descartes. Through a pure reductionistic process of methodical doubt, assumed truths about the world as it was experienced were reserved as possibly being untrustworthy. Only the act of thinking itself was initially “clear and distinct” and therefore certain. Hence rational thinking as a method of obtaining knowledge gained its primacy. Fundamental truths about the world could thus be discovered via processes of rational thought [Donner et al. 1968, pp. 103–104]. In the words of Descartes, “I wanted to establish any firm and permanent structure in the sciences” [In: Tillman et al. 1967, p. 6]. Descartes set up a number of methodological rules for establishing this firm structure, with the following being of particular interest. First, never to accept anything as true unless it presented itself as "clear and distinct". Naturally mathematical axioms satisfied this rule, but the principle of determinism was also seen as clear and distinct, since "Everything must have a cause which is at least as real and perfect as its effect" [In: Beck 1952, p. 62]. Descartes' second rule exemplified logic-deductive thinking and reductionism since encountered difficulties are to be divided "into as many parts as possible, and as might be required for easy solution" [op. cit., p. 61]. Further, the totality of being can only be understood scientifically by starting with points that are immediately obvious. Hence the complexity has to be reduced. The views expressed by Descartes clearly manifest themselves in the four modes of thinking previously mentioned.

Two basic dichotomies emerged from Cartesianism, namely the separation between mind and body, and between the thinking subject and the world. The influence of these two fundamental reductions of a larger whole in different elements can hardly be overstated. As a consequence of the second dichotomy, the thinking subject and the external world were not seen as dynamically interrelated, but the external world was considered a separate object governed by deterministic laws, and already and forever 'filled' with absolute truths awaiting discovery by the rational mind [Luypen 1971]. So, water *was* 'already' H_2O, and we had only to wait for chemistry to tell us that [op. cit.]. It is not the meaning of things which is to be the object of scientific study, but rather their orderly relation as expressed by certain deterministic and mathematical laws. Russell considered Cartesianism as "rigidly deterministic" [In: Donner et al. 1968, p. 104]. Similarly Capra notes, "The mechanistic view of nature is thus closely related to a rigorous determinism" [1991, p. 56]. Further, in line with the Aristotelian view, "Scientific descriptions were believed to be objective, that is, independent of the human observer and the process of knowledge" [op. cit., p. 330].

The distance created by the Cartesian split between the inquiring subject and the world, combined with the need to regain certainty, created a value pattern to investigate and control the world actively. Hence the mechanistic view is considered to be connected to a value pattern to control everything [op. cit.]. Indeed, as Schein notes, central to the Western culture is the value "that nature can be controlled and manipulated" [2004, p. 101]. Since the starting point for acquiring knowledge is the individual subject, being distinct from the surrounding world and other subjects, inevitably the individual subject is centric to all thoughts. Not surprisingly, individualism is considered a typical Western cultural aspect [Hofstede 1986, 1991, Schein 2004].

2.1.2 The Mechanistic Worldview

Causality Everywhere Assumed

According to Auguste Comte's 'Three Stages of Knowledge', after the theological and metaphysical stage, rational and deterministic thinking formed the final and ultimate stage of positive 'scientific knowledge' [Beck 1952, p. 123]. Essentially, the affirmation of objective deterministic relationships gives rise to the 'machine' metaphor as the explaining model. Thomas Hobbes argued in his book *Leviathan* (1651) that the conception of reality is bound to be a mechanistic one since the movements of physical objects will turn out to be sufficient to explain everything in the universe. Human beings are considered physical objects, sophisticated machines, all of whose functions and activities can be described and explained in purely mechanistic terms. In a similar vein, the great mathematician Pierre Laplace voiced the ultimate deterministic view that "An intellect which at a given instant knew all the forces acting in nature, and the position of all things of which the world consists – supposing the said intellect were vast enough to subject these data to analysis – would embrace in the same formula the movements of the greatest bodies in the universe and these of the slightest atoms; nothing would remain uncertain for it, and the future, like the past, would be present to its eyes" [In: Capra 1991, p. 57]. Successes of Newtonian mechanics, specifically cosmology, contributed further to an unshakable belief in the mechanistic approach. A striking example might serve as an illustration. Various physicists, such as Copernicus, Brahe and Kepler, contributed to the development of mathematical expressions concerning the movement of celestial bodies. However the movement of Uranus did not satisfy the mathematical laws. Rather than questioning these laws, the odd behavior of Uranus could be explained by predicting the existence of a yet undiscovered planet. The position of this planet was computed and – after telescopic instruments became powerful enough – eventually found at the predicted position [Feynman 1965]. Better evidence for the perceived correctness of the mechanistic approach is hardly conceivable. Since "the physical world was entirely objective, and solidly and unambiguously material, it was inherently measurable" [Tarnas 1996, p. 278]. Investigations thus became predominantly quantitative. Combined with the growing development of mathematics, the whole approach led to an impressive mechanistic cosmological world view [Dijksterhuis 1986]. As a result, the world was supposedly to be seen as an orderly machine, observed by 'separated' subjects. Human beings were not only seen as 'machines' but the human mind itself was brought within the mechanistic mode of thinking [Turing 1982]. Starting around the early fifties, cybernetic theorists "thought themselves capable of reconciling the world of meaning with the world of physical laws. Thanks to them, the mind would at last find its rightful place in nature" [Dupuy 2000, p. 4].

An exclusive reductionistic and deterministic stance is still advocated. Biologist Edward Wilson for example claims that all real phenomena, from galaxies and planets to people and subatomic particles, are based on material processes that are ultimately reducible to a small number of fundamental natural laws that explain everything. All explanations for everything are causal and all cases are material and reducible to the laws of physics [1998]. As Richard Tarnas observes, the irony of modern intellectual progress is that man's genius developed theories that are deterministic in nature and thus "steadily attenuated the belief in his own rational and volitional freedom" [1996, p. 332]. The contrast between free will and determinism is one that has dominated philosophy since its beginning.

Influence on Sociological Thinking

These views also influenced the way society was being studied. The underlying paradigm was the belief in an objective world where interactions can be described in causal terms, and where prediction and control are paramount. Comte was therefore looking for "laws of social physics" [Hassard 1993, p. 6]. Laws were to be found via the methods of positive science, based on the principle that true knowledge in the form of law-like relationships between observable phenomena, can only be established via the accurate accumulation of empirical data. Scientific rationality was promoted by Comte as "reasoning and observation combining as the means of knowledge" [op. cit., p. 7]. Hence Comte laid foundations for the positivistic approach to sociology, since "Scientific rationality forms the basis for the regulation of social order" [op. cit., p. 16]. Later, John Stuart Mill advocated the same principle by claiming that "Social sciences should be modeled upon the principles of Newtonian mechanics" [op. cit., p. 8]. Mill clearly expresses a reductionistic view by identifying individuals as "basic atoms" governed by the "laws of psychology" from which laws that relate to society can be inferred [op. cit., p. 9]. Also others, such as Pavlov and Skinner, argued that human behavior could also be understood by using the machine metaphor, and using mechanistic principles of stimulus and response [Atkinson et al. 1993]. The cybernetic movement further voiced the belief "that the phenomena of behavior and of mind are ultimately describable in the concepts of the mathematical and physical sciences" [Dupuy 2000, p. 87]. Sociologist Talcott Parsons thus believed that cybernetics "represented the final stage in the unification of the physical and social sciences" [op. cit., p. 155]. In view of the above, not surprisingly, "The widespread hypothesis that all the complexities of human experience, and of the world in general, would ultimately be explicable in terms of natural scientific principles increasingly, if often unconsciously, took on the character of a well-substantiated scientific principle itself" [Tarnas 1996, p. 332].

With reductionistic and deterministic thinking fairly embedded within the social sciences, it became almost inevitable that organizations were, and are, also seen as machines [Morgan 2006].

2.1.3 Mechanistic Thinking Manifest in Enterprises

The Machine Bureaucracy

In the introductory chapter, an enterprise was identified as a complex entity of human endeavor engaged in purposeful activities. As such, enterprises were probably in existence since the beginning of mankind. Generally though, the term enterprise or organization is considered to be of more recent origin, and refers to coordinated production activities at the onset of the industrial revolution more than a century ago, as we will sketch in the next chapter. Although some theorists such as Adam Smith and Charles Babbage addressed issues pertinent to these coordinated production activities prior to the industrial revolution, the development of the industrial organization as a result of the industrial revolution more thoroughly initiated methodical thinking about enterprises [Niebel 1982].

Three theorists largely dominated this initial thinking: Henri Fayol, Frederick Taylor and Max Weber. Taylor emphasized economic rationality using work analysis resulting in standardized, routine and repetitive tasks [1912]. Around the same time, Fayol published his general principles of management concerning coordination, control and planning, whereby specialization and division of labor are emphasized [1916]. The ideas of Taylor and Fayol exemplify a reductionistic approach focused on the minute division of labor and units of (managerial) control. Other contemporaries followed likewise by studying work efficiency and allowable physical workloads. Of these contemporaries, Frank and Lillian Gilbreth were known for their extensive contribution in the area of time and motion studies [Niebel 1982]. Division of labor was accompanied further by a hierarchical structure with managerial positions as linking pins for – in a deterministic sense – passing down orders and securing worker contributions [Barnard 1938]. Additionally, Weber addressed organizational issues from the sociological perspective, stressing the importance of impersonal relationships and bureaucratic principles [1924]. Types of relationships other than impersonal relationships could impair objective, rational approaches to organizational issues. In line with the instrumental view, bureaucratic structures expressed "the dominance of a spirit of formalistic impersonality", whereby "the dominant norms are concepts of straightforward duty without regard for personal considerations" [op. cit., p. 15]. Enterprise performance is thus considered to be higher the more employees behave according to formal, predefined work patterns.

Despite their different perspectives, all theories were nonetheless highly congruent in their practical consequences, as well as with respect to their underlying anthropological views. Said theories essentially consider workers as mere production resources, who – according to prevalent anthropological views – dislike work and are only willing to conduct, and capable of conducting, simple tasks under the controlling force of coercive rules and regulations. This perspective is well known as McGregor's 'Theory X' about human resources [1960]. This instrumental approach eliminated employees as a source of ideas and meaningful contributions, as exemplified by the organization of work in simple segmented task structures, resulting in the depersonalization of work itself by a separation of thinking and doing. As Morgan notes, the mechanistic approach "tends to limit rather than to mobilize the development of human capacities, molding human beings to fit the requirements of mechanical organization rather than building the organization around their strengths and potentials" [2006, p. 30].

Other theories also supported or influenced the mindset on enterprise design. We might refer to the economic transaction or exchange theory according to which people are only willing to supply labor in exchange for some economic reward. Based on the fundamental economic principle itself, people will try to satisfy needs with the lowest possible sacrifices, and are guided by self-interested behavior. The transaction view connects neatly with the design of coercive organizational rules and regulations, since workers would try to satisfy financial needs with the lowest possible effort. According to the agency theory, the relationship between employer (principal) and employee (agent) is to be governed by contracts in order to deal with the different interests of both parties [Pfeffer 1994]. Employment relationships are thus anything but based on trust. Rather, relationships are based on distrust, which further drives the need to regulate and formalize [Locke 1996]. Transaction cost economics merely reduces the relationships within an enterprise to the framework of contracting [Pfeffer 1994]. This fits the requirement for impersonal relations as advocated by Weber. Evidently, these concepts shaped ideas about managerial tasks, which were viewed predominantly in terms of direct control and authority, having to do with explicit task direction, discipline and supervision. In line with the views illustrated above, enterprises are basically seen as 'machines', with a clear causal relationship between input and output, whereby employees act as 'parts' of the machine. Mintzberg identified organizations designed and operating according to these principles as 'machine bureaucracies' [Mintzberg 1989]. Arguably, the traditional mechanistic approach – with a pervasive tendency to control and formalize – contributes strongly to enterprise inertia. Figure 2.1 aims to convey the mechanistic character of the machine bureaucracy.

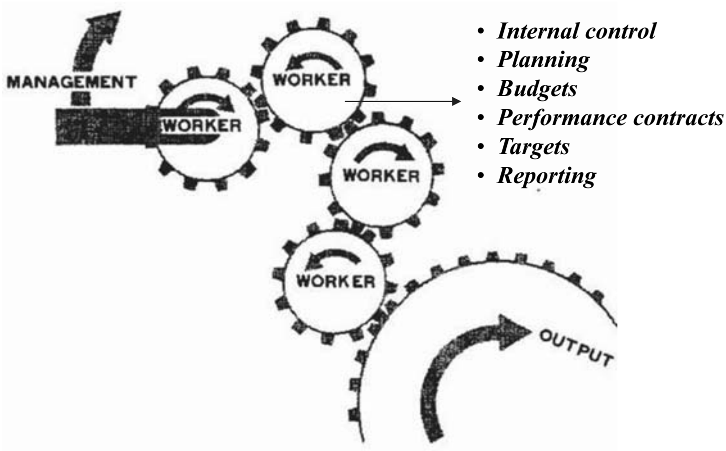


Fig. 2.1. The machine bureaucracy [McLennan et al. 1987]

Underlying Concepts

The characteristic elements of traditional Western thought discussed above are fundamental to these perspectives on organizing, as illustrated. No doubt the whole economic theory is based on the premise of rational decision-making and rational motives. As indicated, the enterprise design advocated by Taylor, Fayol and Weber strongly resembles reductionistic and deterministic thinking. Not so much employee involvement and commitment, but monetary rewards in exchange for work, is seen as the guiding causal and rational principle by which employees act. This assumption is obviously manifest in performance-related pay: linking individual effort to monetary reward [Lawler 1990]. In a reductionistic sense, work is divided into units of activity governed by detailed rules and instructions that aim to secure causality between tasks and outcome, carried out by employees in an instrumental manner without the need nor the desirability to think. Job descriptions focus on tasks to be executed, rather than on the contribution of individual employees to the overall enterprise purpose.

Reductionism can further be noticed in the form of 'departmentalism': the focus on functional units rather than having a process orientation, hence division of labor rather than integration of labor. Departments are evaluated and analyzed in isolation with locally oriented (financial) criteria that inherently ignore and do not support major process and value-added improvements [Kaplan 1990, Brancato 1995]. Seddon speaks of the "management factory" with the focus on internal control, planning, budgets, performance contracts, targets and reporting, whereby the associated information is abstracted from employee work [2005, p. 3]. We will discuss these approaches further in paragraph 2.2. Lack of an integral, unified and holistic perspective results in local 'gain' at the higher expense of the larger whole. Fragmentation of knowledge and tasks almost inevitably leads to fragmentation of responsibilities, or even to the absence of any process or overall responsibility at all. As we will argue in Chapter 3, lack of unity and integration – the absence of coherence and consistency among enterprise facets – is the core reason for failing (strategic) enterprise initiatives. The reductionistic mindset treats the enterprise as an isolated entity and obscures seeing the enterprise and its environment as a whole of interrelated aspects.

Rather than seeing the enterprise as organic, dynamic, whole and ambiguous, with relationships that are parallel, simultaneous, connected and interdependent, reality on the contrary is viewed as mechanical, static, segmented and rational [Tsoukas 1994a]. It is assumed that enterprise reality can be captured objectively, and can be controlled and made predictable via structural linear cause and effect chains. Adequate labor output can therefore be arranged via such chains, while enterprise problems can allegedly always be resolved via proper structural measures. Consequently, attempts are made to arrange enterprise effectiveness through the structural perspective, such as the distribution of work. Ultimately, beliefs based on determinism hold that there is a definite sequence of actions that will produce a predefined result, and that the same actions will again give the same results. The dominant views on governance that will be discussed in subsequent chapters plainly reflect these convictions.

Determinismd also underlies many of the views on operational planning and strategic planning. Hence the enterprise future is supposedly predictable and controllable through planned activities: causal chains to secure a desired outcome. All too often however, as we will argue further below, the assumed deterministic principle proved to be a fallacy [Hendry et al. 1993, Mintzberg 1994]. Further, determinism seems to drive a short-term orientation, since the shorter the time horizon, the more easily deterministic relationships can be assumed. So enterprise performance is measured in retrospect via a limited set of short-term (financial) parameters that are supposed to predict future performance. Long-term continuous improvements and investments relative to quality, the reduction of throughput time, the design of new processes, and the development of human resources are often in conflict with short-term (financial) units of measure [Barker 1995]. Notably, in line with the objective world view, the actuality is assumed to be captured through managerial accounting, whereby figures are considered unambiguous symbols truly reflecting enterprise reality. The maxim thereby is greater understanding through greater detail. All too often however, these assumptions are dangerously naïve and counterproductive as we will illustrate in paragraph 2.3.3. One might argue that the two Cartesian dichotomies between mind and body, and between the thinking subject and the world, mentioned earlier, likewise have their enterprise manifestations. The enterprise is viewed as an objective entity that management should manage based on objective enterprise data. Further, the enterprise and its environment are seen as two independent entities: the enterprise delivers products and services to the environment and reacts to stimuli from that environment. These stimuli are considered to exist independent of the enterprise.

As we have sketched earlier, firmly rooted in the principles of Western thought is the concept of logical-deductive thinking as the traditional foundation of knowledge. Particularly influential in this respect is the principle of the 'exclusive third', stating that either something is the case, or is not the case. In other words, a statement or proposition is true or not true, excluding a third possibility: 'tertium non datur'. Equipped with such a dichotomous either-or view, reality is constructed via mutually exclusive concepts. So for example, it is assumed that employee freedom cannot go together with proper enterprise order and control, or that adequate enterprise control would necessarily imply limited flexibility. Control can be either central or decentral. Likewise, you can have either product standardization at low cost, or product customization at high cost. According to Porter, enterprises should have a strategic orientation based on either 'cost leadership', or on 'differentiation' (offering unique products or services), or based on 'focus' (narrow market segments) [1985]. Organizations are not conceptualized as potentially being able to apply seemingly mutually exclusive concepts [Quinn 1988]. Rather than allow holistic, integrative and inductive thinking, simultaneously using apparently contradictory concepts, enterprises are viewed "as full of irreconcilable trade-offs" [Davis 1987, p. 85]. The either-or principle blocks a view of enterprises as being both control and people oriented, seeing people aspects both as ends as well as means, being control oriented while maintaining an adequate level of flexibility, focusing on quality as well as on efficiency, or showing both a human as well as a structural-functionalistic focus.

Detached from the overall purpose, clearly the whole instrumental approach had "the consequence of destroying the meaning of work itself" [Mintzberg 1989, p. 142]. Henry Ford supposedly justified the machine character by stating that "A great business is really too big to be human". Not surprisingly, central to mechanistic thinking is the tendency to undervalue the human element in enterprises. This results directly from the anthropological and epistemological concepts used, as well as from the resulting management practices and rules and regulations, arranged intentionally to diminish human input by restricting employees to conducting prescribed tasks. Or as Henry Ford is supposed to have stated, "All that we ask of our workers is that they do the work set before them". In this view, human aspects are thus by nature subordinated and instrumental to enterprise goals, while human capacities are considered useful because and insofar as activities are not yet transferable to machines [Fromm 1955]. One might observe that the prevailing social, economic and educational conditions at the time Taylor, Fayol and Weber formulated – and Henry Ford practiced – their views, these apparent organizational arrangements were effective, and enabled growth in employment, productivity and wealth.

The Tenacity of the Mechanistic View

As illustrated, the mechanistic approach exemplifies an instrumentalist view on human capacities in enterprises. Allowed only fragmented tasks, attempts are made to make people as consistent and reliable as machine parts, conforming to the ‘corporate mold’. The whole approach has generated its own justification and became a self-fulfilling prophecy. Work that requires only mechanical input stifles creativity and initiative. This absence of mentally-involved employees created a justification in itself for the existence and continuation of the traditional approach. Indeed, the traditional mindset still appears to be the prevalent one, fully congruent with the argued roots of mechanistic thinking. As a typical example, the US Performance and Results Act “requires federal agencies to develop strategic plans, performance plans, performance measures, annual performance plans and annual performance reporting”, with a focus on “linking organizational goal-setting and performance measurement to individual planning and appraisal” [US Government 1993]. Apparently, from the top down, the blueprint for the governmental ‘machine’ has been defined. As Doz and Thanheiser observe, “Despite the ‘modernization’ of corporate structures and systems, the mindset of managers appears to have remained remarkably similar to the Taylorist model developed at the beginning of the century” [1993, p. 296]. Thus principles that follow from “a machine-like concept of the organization still dominate managerial practice” [ibid.]. Similarly, Zuboff and Maxmin state that “Corporations continue to operate according to a logic invented at the time or their origin, a century ago” [2002, p. 3]. Various sources corroborate these observations. Documented cases have been published showing how the traditional mechanistic, top-down ‘command-and-control management paradigm’ has led to higher costs and poor service quality [Seddon 2005]. Others have compiled evidence illustrating that traditional mechanistic thinking has also permeated public institutions such as healthcare, education and government [Brink et al. 2005]. Said permeation has perverted these institutions to a considerable degree. Under the label ‘new public management’ government has produced its own mechanization with intense focus on measurability, performance indicators and subsequent output control [op. cit.]. Employees ‘devote’ considerable time to generating management-required data in this respect, rather than devoting attention to the inherent purpose of their job, a situation labeled by Drucker as “job impoverishment” [1992a, p. 86]. Almost a century after Taylor, Fayol and Weber, not much seems to have changed. Adherence to the Theory X outlook mentioned earlier still lingers. Many managers appear to have a negative image of employees: unwilling to work and only to be coerced through material stimulation and to be disciplined through control [Brink et al. 2005]. As will become apparent, the governance perspectives that will be discussed in later chapters provide ample evidence of the prominence of mechanistic thinking.

2.1.4 Elements of Eastern Thought

The adjective 'Western' in our reflection about the characteristics of Western thought suggests that essentially different characteristics are associated with what can generally be identified as Eastern thought. Numerous publications have shown that to be the case [Libbrecht 1996, Billington 1997, Osborne 2006]. These differences pose a problem for the Western-educated mind to understand Eastern philosophy, given the huge cultural and language differences between the East and the West [Osborne 2006]. Hence we will only briefly address some characteristics of Eastern thought insofar as they enable appreciation of the different views on organizing.

According to Osborne, "Eastern philosophy is a multi-faceted set of ideas that deeply reflect the complex societies they grew out of" [2006, p. 4]. There are many schools of thought that have their origin in ancient India and China. Characteristic for Indian thought are Hinduism and Buddhism. Their common aspect is seeking enlightenment through self-discovery. The word 'Buddha' means 'the awakened one' [Billington 1997, p. 51]. The world is permeated with suffering, not just seen as pain or sorrow, but (also) as dissatisfaction and unfulfillment. Enlightenment is sought since the ability of the world to satisfy human needs and escape from suffering is only temporal. While Hinduism can be seen as a collection of mythological and socio-religious thoughts, Buddhism is more concerned with the practical aspects – a rule of life – about alleviating the perils of human existence [Libbrecht 1996, Billington 1997]. Buddhism spread to other countries, among them China, where an important school became known as Zen. Zen Buddhism also became important in Japan. In addition to Zen Buddhism, two other strands of Chinese thought can be mentioned: Confucianism and Taoism. Specifically within our scope of interest – the influence of Eastern thought on ways of organizing – both Confucianism and Taoism are of primary concern.

We have seen that a typical characteristic of Western thought is the assumption of an objectively knowable world. Science should reveal objective truths – hence the growth of knowledge – that already 'exist' independently of the investigating subject, but merely had to be discovered. Interestingly, the Greek word *theörein* means 'distant, not involved observing' [Libbrechts 1996]. The word 'theory' in Western thought expresses this distance. Unlike the Western, objective view, the Eastern view sees knowledge as tacit, subjective and intuitive [Nonaka and Takeuchi 1995]. This latter type of knowledge is difficult to acquire systematically and logically. Contrary to the Cartesian split, tacit knowledge is integrated and emphasizes the oneness of mind and body [op. cit.]. As we have sketched, Western epistemology holds that knowledge can be obtained by reductive and deductive reasoning, and that absolute truth can be deduced from "rational reasoning grounded in axioms" [op. cit., p. 21], whereby the thinking self is separated from the objective world, as indicated above. Nonaka and Takeuchi indicate that this form of Cartesian rationalism can hardly be found in Japan. Japanese thinking includes the "oneness of humanity and nature" [op. cit., p. 27], and is based on the view that "True knowledge cannot be obtained by theoretical thinking but only through one's total mind and body" [op. cit., p. 30]. Disfavoring theoretical thinking can be traced back to Zen Buddhism, which is typical of Japanese thought, rejecting intellectual effort as a way to finding enlightenment [Billington 1997].

Eastern thought is noticeably more concerned with 'the whole', hence the Eastern search for knowledge has always been more holistic: "Eastern thought resolutely believes in the interconnectedness of all things and the need to escape from the limits of individualism" [Osborne 2006, p. 16]. The integrated, holistic view asserts that the wholeness of knowledge cannot be reduced to the summation of knowledge about smaller parts [Locke 1996]. Reductionism thus seems a typical characteristic of Western thought.

Within Chinese thought, obtaining knowledge refers to the *Tao* (the 'way'). This difficult concept is understood mostly as the way of man: an outline of moral behavior, but the concept also has a metaphysical meaning as "the all-embracing origin of all things" [Billington 1997, p. 90]. Followers of the Tao practice the essence of the Tao philosophy: "to lose the sense of ego in union with the Tao" [op. cit., p. 102]. Following the right path is manifest through deeds. In that sense, the Tao is about practicing life itself [Libbrecht 1996]. Gaining knowledge is not about accumulating facts, but about elevating human nature [Osborne 2006]. Distinct from the Western focus on how things are – their *being* – the Eastern tradition focuses on change and growth, hence focuses on *becoming*. Associated with this distinction seems the observation that within Chinese physical thinking the concept of waves dominated, rather than atoms [Needham 1982].

Chinese thought tends to be 'both-and', rather than 'either-or' [Billington 1997]. Taoists did not consider logical reasoning as important. Other than the Western logical, rational, either-or thinking previously mentioned, anti-rational elements are identified for example as characteristics of the Japanese culture, such that logical consistency is not valued, while "The notion of 'objectivity' does not exist" [Locke 1996, p. 273]. As the story goes, the words 'objective' and 'subjective' were foreign to the Japanese language and had to be translated since no words for these concepts existed [ibid.]. Multiple, even contrasting perspectives are held simultaneously. Contrary to the 'mono-optic' Western view, the Japanese view is considered to be 'poly-optic' [Hampden-Turner and Trompenaars 1994, p. 137]. In accordance with the Taoistic viewpoint, knowledge appears to be more related to the process of acquiring knowledge, than to establishing a singular fact [op. cit., p. 138].

Various writers have identified the influence of Confucianism [Withane 1991, Jacobs et al. 1995]. This philosophy emphasized social rank and ethics, and provided guidance for acting towards a good and just society. Confucianism aimed at the balance between social harmony and individual integrity, with a focus on (1) social ethics, (2) the virtues of wise rulers, (3) well-governed people, and (4) family relationships [Osborne 2006, p. 95]. It is about fulfilling one's duty, righteousness, honesty and uprightness, and respect for persons and a sense of mutuality and loyalty in any relationship, rooted in piety and obedience [Billington 1997]. These views focus more on society than on the individual. Confucianism maintained a system that produced a strong sense for order and relationships. Everybody has his or her place in the societal order, whereby social harmony is achieved if people behave according to position or rank. Whereas the Western mindset is directed to objects and the physical world, with the intention of ordering aimed towards explaining and controlling, the Eastern view is focused on intersubjectivity and social virtue [Kwee Swan Liat 1973, Zürcher 1973, Libbrecht 1996]. Interpersonal actions are therefore not guided by reason, but by social situations [Locke 1996]. Unlike the Western propensity to order and control the world, in the Eastern view the natural order of nature is accepted, in which humans should fit harmoniously [Zürcher 1973, Libbrecht 1996]. Norms and behavior are based on tradition (needed for social stability) and interdependence (needed for social cohesion) [Billington 1997, p. 138].

It seems plausible that the focus on society and its relationships, combined with the Taoistic viewpoint on the process of growth and becoming, would bring forward an *organismic*, rather than a mechanistic world outlook. Such an organismic outlook has been argued by various writers. Libbrecht speaks about the "organicist" worldview [1996, p. 64]. Comparably, Nonaka and Takeuchi observe that "Most Western views of human relationships are atomistic and mechanistic, [while] the Japanese view is collective and organic" [1995, p. 31]. In a similar vein, Capra notes that "In contrast to the mechanistic Western view, the Eastern view of the world is organic" [1991, p. 24].

Closely related to the processual and organismic view is the Eastern *cyclic* perspective on time – the Tao rhythms of Yang (e.g. active, expansion, growth, birth) and Yin (passive, recession, decline, death) – as compared to the Western linear concept of time [Billington 1997]. Within the cyclic perspective on the nature of phenomena, there is no search for external causes: the cycle itself brings events forward. Within the Taoist view, change is not the consequence of some external force, but innate in all things and situations [Capra 1991].

Understandably, the views summarized briefly above are expected to be manifest in the arrangement and governance of enterprises. Indeed, a considerable weight of evidence seems to confirm this expectation. Since it is mostly Japanese enterprises which have been investigated, Japanese examples are presented frequently as examples to contrast the Western and Eastern approach to organizing and management.

Given the organismic, rather than mechanistic world outlook within Eastern thought, a similar distinction is expected between Eastern and Western enterprises and their management. According to Morgan, Western management is indeed significantly more mechanistic in orientation than Japanese management [2006]. Comparably, it is argued that the organismic way of organizing is favored in Japan [Locke 1996]. Whereas the American approach treated 'scientific management' as objective knowledge to which workers are to be subordinated, the Japanese accepted and involved workers as co-developers determining the way of organizing [Locke 1996]. We will argue the importance of the organismic way of organizing in paragraph 2.4 and show this to be an employee-centric concept.

With reference to the Western value pattern to control, Western management favors the use of specific, planned objectives (e.g. ‘management by objectives’), versus the Japanese use of *emerging* objectives [Morgan 2006]. Emerging objectives result from learning, hence from new knowledge gained. Rather than via a rational process, “New knowledge is born in the midst of ambiguity and redundancy” [Nonaka and Takeuchi 1995, p. 12]. We recognize the Taoistic (way, process) viewpoint, as well as the viewpoint that change is an innate capacity of things, hence, an innate capacity of enterprises. Japanese management practices are arguably more process (way, path, method) oriented, in comparison with Western management which is more output (bottom-line) oriented. Since processes are a key focal point in the Total Quality Management philosophy, the Japanese success in this area can likewise be appreciated. The notion of ‘emergence’ will be discussed further in paragraph 2.3.5. Specifically related to the rational/planning versus the emerging/learning perspective on strategy development (based in the innate capacity for change), Chapter 3 will indicate that Eastern companies favor the emerging/learning perspective.

The Confucian influence can also be noticed. Congruent with the Confucian view, “Management is the benevolent use of power to foster order and harmony” [Sullivan 1992, p. 76]. Maintenance of the social order is secured further by adhering to certain rites [Jacobs et al. 1995]. The holistic perspective mentioned earlier has also been related to Confucianism as a result of its focus on general rather than specific aspects [Withane 1991]. Employees should thus have knowledge about overall objectives, functions and responsibilities of the organization, rather than focusing on a narrowly-defined specific task domain [op. cit.]. In addition, Confucianism is said to create loyalty, obedience and a work ethic that focuses on cooperation, diligence and learning for the benefit of society [Jacobs et al. 1995]. Rather than ‘competitive-individualism’ [Morgan 2006], harmony follows from avoidance of social strife (team work), worker satisfaction and development [Withane 1991]. Intrinsic motivation is favored, whereby employees express self-satisfaction [op. cit.].

For the Western mind, the characteristics of Eastern thought are puzzling to some extent. For example, the limited attention to logic reasoning and the inclusion of opposing aspects in one unified concept can be hard to comprehend. Nonetheless, within our scope of discussion, the value of these thoughts lies in their practical organizational operationalization, such that they point to a different, and often valuable, way of organizing. For example, as we will illustrate (and have mentioned before), the Western inability to include opposing aspects in one unified concept has led to one-sided, myopic organizational approaches that are detrimental to enterprise performance and the ability to change. Hence, the limits of mechanistic thinking will be discussed in the next paragraphs insofar as they imply dysfunctional consequences for enterprises. The alternative, organismic perspective is promoted to remedy the drawbacks of the typical, mechanistic Western approach. The issue of whether such an alternative approach can be applied successfully within Western organizations will be addressed in Chapter 3. Notably, in itself this manifests an approach to unite seemingly opposing approaches in a unified concept about governing and organizing enterprises.

As we will also emphasize later, our critical reflection is thus not a plea to disregard the valuable aspects of Western thinking. Much of scientific progress is the result of this type of thinking. Moreover, the depreciative aspects of the traditional Western mindset about organizations, to be discussed in the next paragraphs, do not imply that the characteristics of Eastern thought are without drawbacks. No system of thought is evidently without unfavorable aspects. It is argued for example, that the structure of social order in Eastern cultures created docile obedience since decisions made by persons higher in the social order are not to be questioned because these persons are considered as having ethical integrity, using power correctly [Jacobs et al. 1995]. This type of governance can easily degenerate into paternalism [op. cit.]. Also, the sincerity of loyalty is doubted and considered often no more than "submission to inevitable and not easily assailed managerial power" [Sullivan 1992, p. 72]. Emotional breakdown, or even death as the result of excessive overwork are not uncommon aspects of the intense pressure to conform [Kahn 1991, Sullivan 1992]. Kahn points similarly to the lack of initiatives following from the group focus. So, "Autonomy is not freedom to take initiatives, but to comply with one's duties within the context of the group" [1991, p. 20]. Conformity and group focus make people predisposed to copy, expressing the lack of creativity. Nevertheless, our focus is not to address dysfunctional aspects of Eastern thought within enterprises, but to address dysfunctional aspects of the dominant Western thought within enterprises. For that, the following critical reflection is the first step.

2.2 Limits to Mechanistic Thinking

Deep-seated characteristics of Western thought have been briefly reviewed to appreciate their considerable impact on thinking about enterprises and their design. This section argues for the importance of a complementary view. The perspectives given below aim to counterbalance the belief in certainty and exactness that underlies many forms of human thinking and action. Examples from other disciplines might relax the belief in predictability based on an assumed existing order, and might also relax the unquestioned validity of an exclusive mechanistic approach towards organizing. References to other disciplines show that certainty is not omnipresent in areas traditionally perceived as showing clear, orderly, unambiguous and deterministic relationships. Examples will also show the likelihood that there is a connection between complexity and multiple interdependencies on one hand, and uncertainty, indeterminacy, disorder and ambiguity on the other. These complementary views should have a significant – if not paradigmatic – impact on the design of enterprises.

2.2.1 Uncertainty and Interconnectedness

The 'Hard' Sciences

Limits to causal, deterministic principles and the presence of uncertainty, disorder or chaos, are manifest in physics and mathematics. To start with the latter, uncertainty has been encountered even in formal mathematical logic, since Gödel argued conclusively that even within consistent axiomatic mathematical structures, it is possible to formulate mathematical propositions correctly that can neither be proven nor rejected [Nagel and Newman 1958, Hofstadter and Dennet 1982]. This uncertainty shakes mathematical foundations since any formal consistent mathematical system is "limited to the amount of truth" it is capable of delivering [Casti 1990, p. 279]. Notably, the two-level either-or logical conviction denies the conditions described by Gödel.

A well-known example of uncertainty in physics is expressed by Heisenberg's uncertainty principle, stating that fundamental uncertainty exists about the position and impulse of moving objects. At the atomic micro level, rather than exact descriptions of elementary particles behavior, this uncertainty implies that only probabilities exist [Alonso and Finn 1968]. As Capra notes, at the atomic and subatomic level, certainty is lost. Rather matter has a "tendency to exist", while events have a "tendency to occur" [1991, p. 68]. Equally fundamental, quantum theory teaches that the Cartesian split between a subject and the world, or between an observer and an assumed objective reality, as discussed in the above, no longer holds. The observer and the observed are interconnected. So, "In modern physics the universe is thus experienced as a dynamic, inseparable whole which includes the observer in an essential way" [op. cit., p. 81]. Unlike the objective impression, this reality is characterized by a "universal interconnectedness of things and events" [op. cit., p. 138]. Ultimately, "participation instead of observation" is the idea in modern physics [op. cit., p. 141].

The Social Construction of Reality and Meaning

The previously mentioned notion about the interconnectedness of the observer and the observed implies that the observer influences the 'reality' to be observed. Said phenomenon is also manifest at the social level, since it is argued that reality is "socially constructed" [Berger and Luckmann 1967]. Things are not simply 'given'. According to Kant, the external world merely provides sensory stimuli (the phenomena). Our mind orders and gives meaning to these stimuli through categories and concepts. We cannot describe the world as it is: things 'themselves' (the noumena) are unknowable [Russell 1967, Donner et al. 1968]. In the extreme: our thinking 'forms' nature, rather than nature forming our thinking. Humans observe, interpret, try to understand and give meaning to phenomena through concepts (and language) established and agreed through social interaction. People and their contexts are thus not independent entities, but are in a relationship of mutual creation, such that "People are both products of their contexts and participants in the shaping of those contexts" [Hosking and Morley 1991, p. 7]. As

Winograd and Flores emphasize: “Any individual, in understanding his or her world, is continually involved in activities of interpretation. That interpretation is based on prejudice (or *pre-understanding*), which includes assumptions implicit in the language that the person uses. That language in turn is learned through activities of interpretation” [1987, p. 28]. There is no subject-independent objecttive knowledge. The fact that Eskimos have many words for different kinds of snow does not mean that these categories of snow are given objectively. Rather, these categories and the associated language are defined through experiences grounded in social interaction. Refuting the possibility of subject-independent knowledge is by no means asserting “that our discourse can deal ultimately only with our subjective thoughts and feelings” [op. cit., p. 51]. There is a ‘consensual domain’ of shared meaning [ibid.]. So, within this consensual domain, the categories of snow, in our example above, have some relationship with ‘reality’ and are not totally arbitrary. This position, advocated by Wittgenstein, takes the middle ground between two philosophical viewpoints. One is labeled as *nominalism*, and holds that concepts conjured up by the human mind are just names, but do not correspond to an objective reality. The other, contrary view is labeled *realism* and holds that an objective reality exists, and that reality brings forward the concepts needed for human inquiry to understand reality. So from the middle ground position one can say that “Nature has something to say, but does not determine what we can say” [Hassard 1993, p. 83].

These views likewise hold for social entities like enterprise: “What is real in organizations ultimately depends on human beings that sustain realness” [Morgan 1990, p. 30]. Put another way, the enterprise whole and its elements determine each other mutually. It is this ‘codetermination’ that contributes to complexity and makes the machine metaphor untenable. In other words, no ‘neutral’ form of participating in enterprise activities is thus possible. The notion of ‘contextualism’ expresses “a sensitivity to the interdependence between how things appear and the environment which causes them to appear” [Wheatley 1994, p. 63]. Fully in line with the emphasized holistic enterprise perspective, Hosking and Morley stress that organizing implies simultaneous attention to complex interdependent processes and aspects of reciprocal influence, which cannot be reduced to addressing the supposedly independent contributors in isolation [1994].

The Enterprise and its Environment: Co-Creation

Paragraph 2.1.1 sketched that Western thought has created a fundamental dichotomy between the thinking subject and the world. The world is viewed as an objective, independent entity – the ‘world out there’ – of which human inquiries should reveal its facts (truths). This traditional viewpoint is similarly manifest in thinking about enterprises. The enterprise and its environment are seen as two independent entities: the enterprise delivers products and services to the environment and reacts to stimuli from that environment. These stimuli are considered to exist independent of the enterprise. However, an enterprise organizes the environment as part of itself: it chooses the environmental domain of interaction, whereby the nature and number of relationships with its environment co-evolve. Both the enterprise and its environment must be seen as a unity of mutual relationships. Enterprise evolution is thus always a pattern of co-creation between the enterprise and its environment: enterprises are able to influence the nature of their environment, whereas conversely, their environment shapes the nature of enterprises [Morgan 2006]. Morgan has coined the term 'egocentric organization' for an enterprise that sees itself as an 'autonomous' discrete entity that merely must survive changes in the environment. This egocentric view is not without danger. Viewing the enterprise and the environment as separate entities fails to recognize that the enterprise also defines the environment from its own position. That environment is thus not objectively given. Only through the co-creation perspective, an enterprise – say a producer of typewriters – can assess the adequacy of the relationships with its environment by noticing the end of life of typewriters, and change environmental conditions such that enterprise survival is safeguarded.

2.2.2 Complexity, Dynamics and Uncertainty

The Inevitability of Uncertainty

Under the labels 'chaos theory', 'complexity theory' or 'non-linear dynamics', new insights emerged that demonstrated limits to the reductionistic, deterministic approach to reality [Gleick 1988, Vinten 1992, Stacey 1992,1993,1996, Vliet 1994, Wheatley 1994]. Chaos theory argues that in various cases – associated with complexity – deterministic relationships are impossible to establish. Uncertainty is thus seen as an inherent characteristic connected to complexity. Generally, the breakdown of deterministic predictability is the result of (non-linear) interdependencies, with various forms of – often positive, reinforcing – feedback. Unforeseen patterns will thus emerge. The following example might serve as an illustration [Glass 1996].

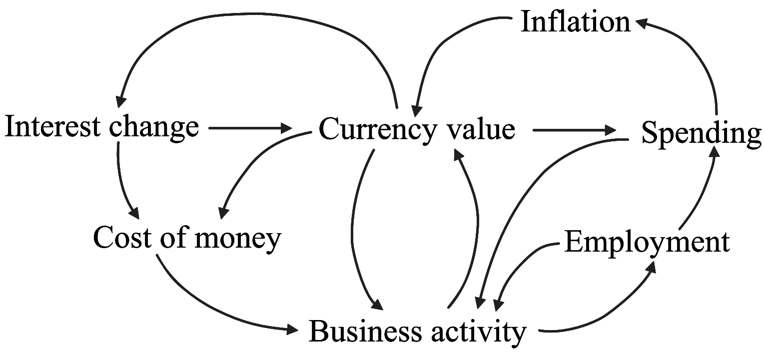


Fig. 2.2. Interrelated variables causing uncertainty

A simple linear cause-and-effect relationship can be assumed between an interest rise and the subsequent higher currency value. More complex non-linear relationships might actually exist however. Interest increases will lead to higher costs for borrowing money, which in turn could lead to business decline, unemployment and higher social costs. Unemployment might lead further to reduced overall spending. As such, the resulting inflation could lead to a decrease in the currency value, contrary to the simple assumption. The process might become unstable because of positive feedback due to additional interest increases that are needed to maintain the currency value, causing a repeat of the aforementioned cycle. Other intervening forces can influence the level and direction of feedback, such that causality is lost in complexity. Figure 2.2 shows the possible interdependencies in the example given.

Various other examples have been described showing that uncertainty and indeterminacy are connected inherently to complexity [Bignell and Fortune 1984, Gleick 1988, Senge 1990, Sterman 2000]. "Ambiguity arises because changes in the state of the system resulting from our own decisions are confounded with simultaneous changes in a host of other variables. The number of variables that might affect the system vastly overwhelms the data available to rule out alternative theories and competing interpretations" [Sterman 2000, p. 25].

Dynamics and complexity cause effects and consequences of actions and interventions to be distant in space and time, and often subtle and not obvious [Senge 1990]. So uncertainty, unpredictability and chaos are inherent in complex systems, which are non-linear, open and possessing a high degree of freedom [Vinten 1992]. Assumptions of a cause and effect nature between action and outcome prove invalid since these causal links disappear in the complexity of reality [Stacey 1992, 1993, 1996].

Complex systems have characteristics that form the basis for the 'law of incompatibility' stating that as complexity rises, "Precise statements lose meaning, and meaningful statements lose precision" [McNeill and Freiberger 1993, p. 43]. In other words, "As complexity of a system increases, our ability to make precise, yet significant statements about its behavior diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive" [ibid.]. Put another way, complex systems show 'emergent' overall behavior resulting from the interaction of many components. For a large part, the emergent behavior cannot be predicted or even envisioned from knowledge of what each component of a system does in isolation [Casti 1997].

Remarkably, complex systems can show forms of control that create order. Under certain conditions order can emerge via a creative role of self-organizing [Stacey 1992, 1993]. Control in these cases does not therefore follow from *a priori* defined forms which are based on assumed causality, but rather, control in this case is "emergent control" [Kelly 1994, p. 20]. Such self-organizing phenomena (without an apparent overarching goal) can for example be observed in flows of fluid and gas, dynamic mechanical systems or economics, but also in biology, such as a population's rate of growth [Gleick 1988]. As we will discuss in paragraph 2.4, emergent control through self-organizing is likewise possible in enterprises. In that case, an overarching goal (enterprise mission, as well as norms and values) aligns self-organizing activities.

The impact of the views presented by the chaos theory is considerable, even to the extent that this theory is considered "the end of the reductionistic program in science" [Gleick 1988, p. 304]. Appreciating this perspective implies recognition of the importance of a holistic approach instead of a purely reductionistic one [Vinten 1992]. Unlike the implications of the reductionistic view, higher-level complexities cannot be understood from the characteristics of lower-level entities [Kelly 1994].

Fuzziness

Contrary to the unambiguous 'either-or' logic mentioned in the previous section, the theory of 'fuzzy logic' was developed to address the fundamentally present ambiguity and uncertainty in reality [McNeill and Freiberger 1993]. Fuzzy logic has become a valuable tool in the field of engineering and technology, such as in the area of control theory, but has also proved itself very useful in other areas such as staff recruiting, stock market analysis, medical diagnosis and production planning. With reference to the discussion earlier, it is interesting to note that the predominant mode of Western thinking concurs with the observation that Western industries were initially falling behind Japan in applying the fuzzy, non-deterministic logic identified above.

To exemplify the strong Western bias further, as the story goes, the developer of the fuzzy logic theory experienced severe culturally-based opposition, manifest in the rejection of research funds, and the impossibility of publishing ideas in established scientific journals [McNeill and Freiberger 1993]. The existing mental map appeared to be so strong, that professors risked their careers when pursuing the fuzzy logic theory [op. cit.]. Being captive in an either-or pattern of thinking has been shown to have contributed strongly to the growth of hazardous failure conditions ultimately leading to a nuclear accident within the Three Mile Island nuclear power plant [Bignell and Fortune 1984]. With reference to the connection between complexity and uncertainty and ambiguity mentioned earlier, "No message style existed for saying that there was uncertainty", so "Shades of meaning could not be expressed" [op. cit., p. 19]. The whole socio-technical system "lacked the finesse necessary for transmitting 'unscientific' information on likelihoods, possibilities and vague probabilities" [ibid.].

Enterprises and Uncertainty

Essentially, as indicated above, uncertainty is associated with complexity. The introductory chapter positioned enterprises as organized complexities that can be seen as complex socio-economic and socio-technical systems of "organized connectedness" [Bignell and Fortune 1984, p. 155]. Many interdependencies between human actors mutually, between human actors and technical systems, and between these systems mutually, play a role. Multiple, dynamic interrelationships thus exist such that the inherent characteristic of an organic structure refers more to potentials and possibilities, than to predictability [Wheatley 1984]. As Mintzberg notes, "No organization can be so well run, so organized, that it has considered every contingency in advance" [1989, p. 20]. Katz and Kahn similarly observe that "It is impossible to prescribe role requirements precisely and completely or lay down rules with sufficient specificity to cover all contingencies arising in a single week of work of a complex organization" [1978, p. 266]. Enterprises and their context are exposed to, and influenced by, precipitating events, "But no organization – no matter how brilliant, rational, or imaginative – could possibly foresee the timing, severity, or even the nature of all such precipitating events" [Quinn 1999, p. 124]. Hence, enterprise reality cannot be captured completely in causal, cause and effect relationships. Uncertainty is increased further since actors within the enterprise reality (unpredictably) influence the context. As mentioned earlier, reality is socially constructed [Berger and Luckmann 1967, Hosking and Morley 1991]. However, the traditional view depicted the social reality of enterprises as an objective mechanistic reality, with deterministic relationships between various aspects which can be treated as sequential, discrete and independent. Yet as we have pointed out, enterprise reality should be described as an organic, dynamic, and ambiguous reality, where relationships appear to be "parallel, simultaneous, connected, multiple and interdependent" [Bennis 1989, p. 101]. As a result, numerous interactive and interlocked loops of interdependencies exist that bring about uncertainty and emergent behavior. Increase in uncertainty follows further from many sources of dynamics such as resulting from economics, customer behavior, technology progress, competition, suppliers, geopolitical conditions, governmental rules and regulations, environmental conditions, etc. Indeed, a survey among 500 top-managers taught that they qualified the dynamics in their domain of business as high to very high [Prahalad and Krishnan 2003].

Recognizing and accepting chaos, uncertainty and ambiguity offers new, fundamentally different and intriguing perspectives on the meaning of control [Stacey 1992, 1993]. Control in its classical deterministic form seems incommensurable and incongruous with the various patterns of "dynamic interconnectedness" mentioned in the above [Wheatley 1994, p. 23].

Our concluding thoughts are best described in the words of Richard Tarnas [1996, p. 357]:

"The deep interconnectedness of phenomena encouraged a new holistic thinking about the world, with many social, moral, and religious implications. Increasing numbers of scientists began to question modern science's pervasive, if often unconscious, assumption that the intellectual effort to reduce all reality to the smallest measurable components of the physical world would eventually reveal that which was most fundamental in the universe. The reductionist program, dominant since Descartes, now appeared to many to be myopically selective, and likely to miss that which was most significant in the nature of things". We feel this myopic perspective likewise holds for the view on enterprises governance and enterprise design.

2.3 The Myth of Traditional Control

Our previous reflections corroborated that the mechanistic mindset dominates enterprise reality, as evidenced by the classical, mechanistic approach to organizing, leading to a tendency to control the enterprise in almost every detail. Seeing the outcome of enterprise governance as the arrangement of activities, conditions and resources – the enterprise design – such that the enterprise becomes more efficient and effective in terms of realizing its goals, the question seems relevant as to whether the mechanistic approach is in fact to be the exclusive or preferred mode of control. The paragraphs below discuss traditional means of control showing the characteristics of mechanistic thought within enterprises, as outlined in paragraph 2.1.3, and argue that much of traditional control is a myth. Some writers have labeled it a "mega myth" [Bijlsma-Frankema and Koopman 2004]. Dee Hock, the founder and former CEO of the Visa credit card company has put it more graphically: "The desire to command and control is a death wish. Absolute control is the coffin" [1999, p. 24]. Other modes of control are thus required. After sketching the myth of traditional control, the alternative perspective on governance will be discussed.

2.3.1 Planning and Performance Targets

Various tools and techniques in the area of work analysis, budgeting and planning have been developed to support the traditional mechanistic way of organizing. Central to mechanistic thinking is the notion of control. Prominent among the methods to effectuate control is planning. Indeed, "Perhaps the clearest theme in the planning literature is its obsession with control" [Mintzberg 1994, p. 201]. Henry Fayol expressed the inherent rigid and mechanistic character of planning by noting "that the very purpose of planning is not to encourage flexibility, but to reduce it" [In: Mintzberg 1994, p. 173]. The predominance of planning is clearly manifest by noting that the majority ($\geq 80\%$) of enterprise change appears to be conducted from the planning perspective, however with little success [Boonstra 2004].

Typical examples of planning techniques are Management-by-Objectives, Program Evaluation and Review Technique (PERT), or the (US Government) Planning, Programming and Budgeting System. Various analytical tools have also been developed for planning optimization and decision making. All these techniques aim at "systematization, routinization and predictability" [Lawrence and Lorsch 1969, p. 161]. However, since complexity, uncertainty and unpredictability are essential aspects of the enterprise environment, as previously argued, experiences with these techniques show the 'limits to rationality'. As an illustration, examples of an exclusively single-minded application of operation research techniques to aid decision-making have been shown to lead to disastrous results [Mintzberg 1989, Pfeffer 1994, Hoos 2003]. Neither did the Program, Planning and Budgeting System combined with the PERT method introduced for the development of the Polaris Missile System, reflect the actual activities that occurred. Other sources reported that the Planning, Programming and Budgeting System "failed everywhere and at all times" [Wildavsky, In: Mintzberg 1994, p. 117]. Rather, these planning systems were of symbolic content to foster the myth of control, and secure future external support and funding [Bolman and Deal 1994], hence to secure faith in the "belief of a human destiny subject to intentional human control" [March 1994, p. 65]. Bolman and Deal argued similarly that much of enterprise reality, be it in the form of structures, planning processes, evaluation and review procedures, or management behavior, are largely of symbolic or ritual content to signal the message that things are under control [1994]. Rituals within the enterprise theatre suggest order and predictability, and serve to legitimate actions.

Associated with planning is the use of unit and individual performance targets: planning and targets are the two sides of the 'control coin'. This connection seems inevitable, since "Planning further influences organizational goals into quantifiable targets, which are necessary for the planning models, especially the setting of objectives at the front and budgeting at the back end" [Mintzberg 1994, p. 192]. Quantification evidently necessitates measuring the assumed objective reality. Measurement reliability is however inherently problematic: enterprise complexity with its massive interrelations and interdependencies make simple cause and effect relationships between unit or personal effort and outcome questionable. All too often targets and their associated measuring lead to undesired behavior: lack of collaboration and narrow-minded focus on satisfying targets. The result is 'goal replacement', whereby attention to the real enterprise purpose is diluted in favor of adherence to, and compliance with, unit and personal targets [Kerr 1989]. For example, attention to crime prevention is likely to fade if targets consider the actual number of crimes solved. Similarly, targets for an employment agency on the number of people mediated successfully will tend to shift attention to people that can be mediated easily, thereby drawing attention away from people that really need help. These examples illustrate the counterproductive and perverting effects that are often associated with unit and personal performance targets.

In a true mechanistic stance and instrumentalist view on employees, performance targets are linked frequently to employee monetary reward: performance-related pay as the supposedly causal mechanism for performance delivery. Here too the limits to traditional control are clearly manifest. Enterprise complexity with many interdependencies makes work increasingly less amenable to individual performance-related pay [Lawler 1990]. The effect of goal replacement can sometimes even take on serious forms. Effects of a pilot pay system – which withheld payment for non-completed flights as the result of diversions, returns or cancellations – were reported, whereby flight continuations occurred despite safety concerns [Phillips and McKenna 1996]. The ineffective and counterproductive results of performance-related pay has been argued by many writers [Pym 1973, Deming 1986, Bowles and Coates 1993, Kohn 1993, Evans et al. 1996].

Similar observations can be made from the overall (corporate) enterprise perspective: performance-related pay for executive management is used to secure and enhance enterprise performance. Within the corporate governance perspective, which will be discussed in Chapter 5, enterprise performance is defined in financial terms to safeguard the interest of shareholders. In a true deterministic stance, payment is believed to drive performance. Causal linkage is thus supposed to be "bolstered by performance measurement systems that accurately and consistently gauge shareholder value creation, and is then reinforced by compensation systems that provide decision-makers with the appropriate incentives to make value-increasing decisions" [Brickly et al. 2005, p. 103]. Here too the limits to mechanistic thinking were manifest since these incentive pay systems did not appear to work. Research did not show any positive correlation between board compensation and various forms of enterprise performance [MacAvoy and Millstein 2005]. For similar reasons to those previously mentioned, performance-related pay at board-level has also been criticized [Brennan 2005].

Goal replacement is clearly manifest: not the capabilities to deliver products and services in a customer-oriented manner – which forms the basis for enterprise economic performance – but an overall economic performance target is the primary and exclusive area of attention. Hence, "It places corporate priorities on financial, not operating, management" [Johnson and Kaplan 1987, p. 200]. The perverting effects of these approaches became clearly manifest through corporate scandals that led to (renewed) attention to corporate governance at the end of the last century. Rightly so, "A clear sense of direction and compelling principles about conduct in the pursuit of it are far more effective than long-term plans and detailed objectives" [Hock 1995, p. 202]. Indeed, "Money motivates neither the best people, nor the best in people. It can move the body and influence the mind, but it cannot touch the heart or move the spirit" [op. cit., p. 253].

2.3.2 Managing People Rather than Process Capabilities

Planning and targets are the mechanistic instruments that supposedly effectuate control. Since enterprise processes deliver products and services, the effectuation of control through unit and personal targets necessarily induces a focus on process output. But it seems intuitively clear that process performance necessitates a focus on the inherent process capabilities, rather than merely the process output. Focus on the latter amounts to saying that paying attention to a car's speedometer is sufficient for securing the ability to deliver speed, instead of paying attention to the car's inherent capabilities that deliver speed. The definition of relevant performance indicators about process quality (linked to process capabilities) is evidently important. But results and the capabilities to produce them are two fundamentally different aspects and should not be confused. Hence, as Deming emphasizes, "Focus on outcome is not an effective way to improve a process or activity" [1986, p. 76]. Numerous publications and empirical data have corroborated this fact [Oakland and Porter 1994, Zairi 1994, Eckes 2001, Seddon 2005].

Underlying the attention for individual performance targets is the uncritically adopted assumption that employees are the primary causes of good and poor performance, not the enterprise 'system' in which they work [Seddon 2005].

Contrary to this assumption, Deming demonstrates the opposite: 94% of poor performance is the inherent result of the enterprise 'system' (common causes), hence is due to the way enterprises operate (their design), whereas only 6% of poor performance is attributable to inadequate employee conduct (special causes) [1986, p. 315]. Nonetheless, people are virtually always held responsible for inadequate enterprise performance. As Sterman observes: "The tendency to blame the person rather than the system is so strong, psychologists call it the fundamental attribution error" [2000, p. 28].

Rather remarkably therefore, the mechanistic approach with the illustrated focus on control – budgets, performance targets, performance reporting, appraisal, etc. – entails management engaged in managing employees who are only marginally responsible for inadequate results. The large area of common causes remains unattended. Put differently, the area that matters most to customers is virtually outside the management scope, as figure 2.3 depicts schematically.

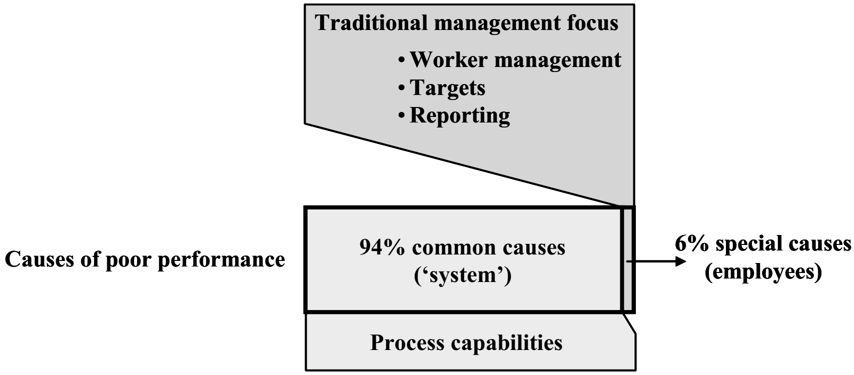


Fig. 2.3. Causes of poor performance

2.3.3. Management Accounting

Relevance Questioned

The system of managerial control – objectives, planning, unit and personal performance targets, performance reporting, budgets, etc. – rests on data that for a considerable part, if not exclusively, is provided through the management accounting 'system', acting as the primary source for management information and decision-making. Notably, since management accounting data does not relate directly to enterprise process capabilities, the use of such data fits the focus on process output perfectly, as criticized in the previous paragraph. As shown in paragraph 2.3.1, output-focused thinking is also manifest at the overall enterprise level, by giving exclusive attention to financial performance criteria.

Mechanistic thinking about enterprise and management accounting are closely interrelated. Not surprisingly, its principles were established at the same time as Taylor, Fayol and Weber formulated their views on organizing (cf. paragraph 2.1.3). Virtually all management accounting practices, such as concerning investments, cost allocations, labor, material, production measures, overhead and departmental performance measures, were developed at the beginning of the last century [Johnson and Kaplan 1987]. Innovation in this area happens to be marginal, since "Virtually no new ideas have affected the design and use of cost management systems" [op. cit., p. 176]. Progress in information system development therefore led merely to historic management accounting being automated.

In view of enhancing quality, productivity, (end-to-end) process capabilities, or shorter time-to-market, traditional management accounting gradually became ineffective and "unable to cope with competitive pressures of today's global business environment and sustain true continuous improvement and enhance performance" [Evans and Ashworth 1995]. The output focus mentioned previously meant that the horizon of managers "contracted to the short-term cycle of the profit and loss statement" [Johnson and Kaplan 1987, p. 25], and meant that "In most companies return on capital employed, shareholder value or return per employee, became the primary arbiters of top management performance" [Hamel and Prahalad 1994, p. 125]. Although adequate financial performance is ultimately a necessary condition for enterprise survival, the exclusive focus on said performance appears paradoxically not to be the proper way to secure adequate future financial performance [Buttery and Shadur 1991]. The collection of data over decades confirms this observation, since "There is little correlation between profit performance of a business at any given point in time, and what its performance is likely to be in the future" [Brancato 1995, p. 59]. It appears that non-financial performance indicators, such as those concerning product and service quality, process excellence and employee satisfaction, are better predictors for future (financial) performance: "There is a strong correlation between the underlying structure of business measured by non-financial performance measures, and its future performance" [ibid.]. In the chapter about corporate governance it will become similarly apparent that the focus on financial criteria – in view of shareholder interests – is in fact inadequate for safeguarding those interests.

Various authors have argued that traditional accounting is ill-suited to address enterprise complexity with its many dynamic interrelationships and interdependencies, as previously discussed [Brignall and Ballantine 1996, Evans et al. 1996]. Also within the corporate governance debate one refers to "the failure of accounting to count what counts and to provide a meaningful measure of value" [Baylor University 2005, p. 139].

Numerous cases have been documented showing that productivity and quality improvements – established through methods like total quality management, just-in-time, design for manufacturing and flexible manufacturing systems – were not being tracked by traditional accounting systems, nor did these systems support those quality and productivity methods [Belinger and Brinson 1988, Johnson and Kaplan 1987, Shank and Govindarajan 1988, Johnson 1990, Cooper 1990, Goldratt 1990, Koss and Lewis 1993, Barker 1995, Brancato 1995, Goldratt and Cox 2004].

As much as a three-fold difference in productivity among comparably-operating manufacturing plants was obscured by the financial measuring system used [Chew 1990]. Drucker observers that "Traditional cost accounting can hardly justify a product *improvement*, let alone a product or process *innovation*. Automation for instance shows up as a cost, but always never as a benefit" [1992a, p. 245]. Further, departmentalism, local sub-optimization, lack of end-to-end process focus and collaboration, as well as the use of questionable and cumbersome cost categories are the typical manifestations of traditional accounting. Erroneous decisions to outsource production were often taken [Johnson and Kaplan 1987]. Similarly in the area of information services, cases have been documented where activities were erroneously outsourced based on misleading accounting data [Lacity and Hirschheim 1993].

In summary, traditional accounting suffers from the following drawbacks: (1) results in local sub-optimization, (2) ignores interconnectivity of various processes and the resulting propagation of increased costs related to the end-product due to non-quality, (3) inadequately only partly measures financial aspects of complex systems, and ignores costs or lost income resulting from, for example, customer dissatisfaction or disloyalty, employee absenteeism and turnover, (4) values human capacities and inherent knowledge inadequately, (5) exerts a short-term outlook which is detrimental to long-term improvements, (6) is frequently irrelevant for direct operational control, and (7) does not support, or tends to impede, the establishment of espoused organizational values and objectives. Johnson and Kaplan reached the inevitable conclusion that most cost accounting and managerial control systems currently applied "are of little use for determining product costs, for enhancing cost control, or for encouraging the creation of long-term economic wealth" [1987, p. 221]. Similarly, Zairi states that traditional accounting systems produce "irrelevant and misleading information" and are "unable to map process performance" [1994, p. 9]. Not surprisingly therefore, traditional accounting might undermine strategic initiatives and distort the very picture about how effectively the initiatives are deployed. Interestingly, Japanese accounting systems are reported to focus on such measurements as "to help to create a competitive future, not quantify the performance of their organizations at this moment" [Hiromoto 1988].

Remedies?: Activity-Based Costing and the Balanced Score Card

Various attempts have been undertaken to remedy the drawbacks of traditional accounting. One such attempt is 'activity-based costing', a method aimed at better linking cost measurements to enterprise activities and processes [Cooper 1990, 1996]. It is argued that activity-based costing would lead to 'activity-based management' [Evans and Ashworth 1995]. Rather than focusing on process output, this would shift attention towards activities within processes, and as such would aid in enhancing performance and continuous improvements. One might argue however, that detailed insight into activities is required for making the approach useful. Hence a machine-like concept, where precise and reliable details about activities and their costs are known, appears to be assumed implicitly. Experiences do not portray an overly favorable picture [Anderson and Young 2001]. Again, complexity puts limits on this form of control. Precisely because of those limits, a revised approach has been suggested that departs from the detailed focus, and addresses costs on higher aggregated levels [Kaplan and Anderson 2007].

Another attempt to remedy the shortcomings of traditional management accounting is the 'balanced scorecard' approach [Kaplan and Norton 1996]. The idea is to provide more integrated business measurement through four areas of attention: (1) the customer, (2) organizational learning and growth, (3) internal business processes, and (4) financial performance [op. cit.]. There appears to be little empirical evidence that enterprises adopting the balanced scorecard approach have gained benefits [DeBusk and Crabtree 2006]. The inherent validity of the concept is also questioned [Azoff 2005]. Various causes play a role, notably the inability to define a meaningful, mutually-related coherent and consistent set of indicators representing the four areas. Formal relationships between the four areas of attention thus remain unclear. This is the inherent consequence of the output-focused approach mentioned earlier without attention to the organizational capabilities that determine output. Put another way, lack of attention to enterprise design makes the 'defined' output indicators decoupled from internal organizational capabilities and does not provide insight into the relationship between the four attention areas. Hence governance becomes illusive. Linking the whole approach with performance-related pay further entails the dysfunctional consequences mentioned in paragraph 2.3.1.

2.3.4 Strategy Evolvement

Learning Rather than Planning

Given the prominence of planning, it will come as no surprise that mechanistic thinking assumes that strategy development can also be executed as a planning process. Planning strategy implies seeing management engaged in structured activities leading to a set of strategic initiatives that can be decided upon, and operationalized through budgets, targets and the planning of projects. For the strategic planner life is simple: "The implementation of strategy comprises sub-activities that are primarily administrative. If purpose is determined, then the resources of a company can be mobilized to accomplish it" [Andrews 1999, p. 77]. So, "Corporate strategy is the pattern of decisions in a company that determines and reveals its objectives, purposes or goals, produces the principal policies and plans for achieving those goals, and defines the range of business a company is to pursue" [op. cit., p. 22]. Figure 2.4 depicts the strategic planning notion graphically.

All too often, the input for the structured activities comes predominantly from within the management accounting domain, since this domain supposedly contains data that defines the content of future strategic intent, as exemplified by financial forecasts, budgets and business cases with their financial qualifiers. Novelties will be scarce since "The whole numbers game usually amounts to an exercise in repeating what everyone already knows, geared to the generation of a set of targets

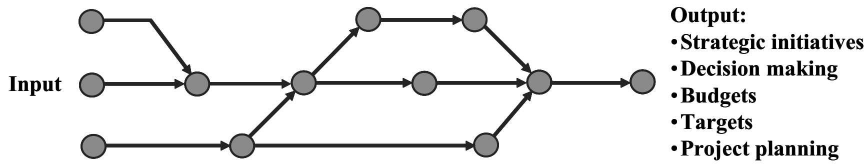


Fig. 2.4. The strategic planning view

and standards within the context of existing strategies (and ignoring what changes might take place in an emerging fashion)" [Mintzberg 1994, p. 86]. Hence, such planning processes rarely (if ever) lead to new directions: "The planning process overemphasizes financial analysis methodologies that foreclose meaningful strategic options, encourage short-term attitudes and behavior, drive out potential major innovations, misdirect resource allocations and actively undercut the enterprise's intended strategies" [Quinn, In: Mintzberg 1994, p. 109].

Strategic planning is a fiction: new ideas do not originate through a timetable of planned activities. We therefore concur with theorists who have rejected the notion of 'mechanistic' strategy development through planning. According to Stacey, the ambiguity inherent in the complex reality, "exposes much of the received wisdom of strategic management to be a management fantasy defense against anxiety" [1993].

Various writers have argued convincingly against portraying strategy development as a planned process [Mason and Mitroff 1981, Mintzberg 1994]. Planning "is a formalized procedure to produce an articulated result" [Mintzberg 1994, p. 12]. Put another way, planning is about realizing choices already made. Formal plans are merely a confirmation of strategic decisions already reached through other informal, bottom-up, intuitive or political processes which are outside the top-down planning process [Yukl 2002]. Clearly, planning refers to decomposition, while strategy development is about arriving at certain choices and rests on synthesis and integration, aspects that are difficult to conceive as the result of analytic planning processes. According to Mintzberg, a planning process is "formally reductionist in nature", with the underlying assumption "that *analysis will produce synthesis*: decomposition of the process of strategy-making into a series of articulated steps, each to be carried out as specified in sequence, will produce integrated strategies" [1994, p. 13]. The whole notion of strategic planning reflects causal thinking, whereby the enterprise future is subject to an analytic planning process. Despite uncertainties and indeterminacies abounding, the planning approach holds "that a phenomenon has been captured because it is written down, labeled and put in a box, ideally represented by numbers" [op. cit., p. 54]. It is to confuse real vision with the manipulation of numbers. In other words, "What are called strategic planning exercises often reduce to the generation of numbers not ideas – objectives and budgets but not strategies" [Mintzberg 1994, p. 85]. We will return to the issue of strategy development in paragraph 3.2 about enterprise development.

Strategic Transition Barriers

Apart from the notion that strategic choices cannot be the outcome of a planning process, the planning approach to strategy development assumes further that strategic choices can be implemented in a top-down, planned manner. Both the incapability of a planning process to provide strategic choices, and the unlikelihood of an unproblematic top-down implementation planning can be corroborated further in view of strategic transition barriers formulated by Weil and Broadbent in relation to IT strategic choices [1998, p. 42]. Three barriers are identified: (1) "expression barriers", that have to do with the inability to articulate clearly and explicitly the strategic direction and goals pertinent to various business, organizational, informational and technology developments, (2) "specification barriers" identifying the inability to specify what the enterprise strategy must specifically accomplish, and (3) "implementation barriers", which are caused by various (technological) restrictions following from the current enterprise environment, defined by aspects such as the existing rules and regulations, culture or technology.

We might also point to other barriers that the planning perspective ignores [Wit and Meyer 1999]: (4) given the dynamics, complexity and associated uncertainty, the issues facing an enterprise can hardly be captured completely and unambiguously and analyzed such that analysis provides the necessary and sufficient set of further actions, and (5) the planning perspective assumes that implementation of planned actions is context-independent. But plans and their implementation are interactive: they affect one another mutually since plans are not received in a neutral context. Similarly this observation holds for the introduction of rules and legislation, or technology. In view of the complexity of an enterprise, all these barriers are entirely understandable, and are also to be excepted [Ciborra 2001]. We contend that the mechanistic, top-down, planning-oriented approach cannot remove these barriers. As we will illustrate later, the governance competence is crucial for addressing these barriers.

Bounded Rationality

Associated with the planning view on strategy development is the belief in rational decision-making: the strategy is the pattern of rational decisions. Mechanistic thinking upholds the ability to know an objective reality. So issues facing an enterprise are clear, such that rational decision-making can take place. Herbert Simon argued that the simplicity of mechanistic thinking is deceptive, since it is "a simplicity that conceals fundamental ambiguities" [1976, p. 21]. Uncertainty is further amplified due to the limited information available, addressed and processed, leading to a situation identified by Herbert Simon as "bounded rationality" [1976]. According to Simon, enterprise reality is therefore characterized by "limits to rationality" [op. cit., p. 40, p. 108]. Rationality in this sense is "concerned with the selection of preferred behavior alternatives in terms of some system of values whereby consequences of behavior can be evaluated" [op. cit., p. 75]. However, due to the incompleteness of knowledge, the difficulty of anticipating consequences, the limited view of all possible alternatives, as well as the fact that valuations are often unclear and diffuse, rationality is limited. Nonetheless, despite the acknowledgement of bounded rationality, the notion of rationality is still upheld by Simon. Limited rationality is thus considered more to be a practical issue than a principle one. That might be questioned in many cases. Due to the reasons mentioned earlier, enterprise issues are seldom unambiguously clear, while often habits, intuition or other drivers (management's scoring urge, politics, or incompetence) preside over rational decision-making.

2.3.5 Emergence

Dynamics, complexity and the associated uncertainty necessitate "adaptability, intuition, paradox and entrepreneurial creativity in the face of an unpredictable, indeed inherently unknowable, future" [Vliet 1994]. Others have drawn attention similarly to the emergent rather than the analytical and planned character of strategy [Hendry et al. 1993, Hellgren and Melin 1993]. Formal planned strategy is considered to be naive in the face of uncertainty, indeterminacy and ambiguity. Rather, strategy emerges in a dynamic interplay with contextual conditions. This implies an incremental development, whereby strategy is constantly readjusted, since it is overtaken by developments outside management's ability to predict and control [Miller and Dess 1996]. The notion of 'strategic planning' is therefore considered an oxymoron. Uncertainty and ambiguity necessitate adopting to emerging, previously unknown environments. Changes as a result of adaptation occur "not because we are planning, but because we are learning" [Stacey 1993, p. 9]. Evidence shows that "learning and visionary approaches appear to be superior to planning for creating strategy" [Mintzberg 1994, p. 270]. As Mintzberg et al. observe, "Above all, learning, in the form of fits and starts, discoveries based on serendipitous events and the recognition of unexpected patterns, plays a key role, if not the key role, in the development of strategies that are novel" [1998, p. 73]. Comparably, enterprise changes that are conducted in a developmental, evolutionary fashion are considerably more successful than those conducted in a planned, top-down manner [Boonstra 2004].

Complexity provides the creative space where "New knowledge is born in the midst of ambiguity and redundancy" [Nonaka and Takeuchi 1995, p. 12]. New order may then emerge from chaos and uncertainty in an unpredictable way through a process of self-organizing, as indicated earlier [Stacey 1993, Wheatley 1994]. Dee Hock – as mentioned earlier, the founder and former CEO of the Visa credit card company – has coined the term 'chaordic' from combining the words 'chaos' and 'order' to identify "any self-organizing, self-governing, adaptive, nonlinear, complex organism, organization, or system, whether physical, biological, or social, the behavior of which harmoniously combines characteristics of both chaos and order" [1999, p. 30].

The self-organizing approach is based on the presence of uncertainty in economic and social systems, making change processes fundamentally undetermined.

With reference to their study about 'visionary companies', Collins and Porras shattered the myth that those companies outperformed their competitors as a result of "brilliant and complex strategic planning" [1994, p. 9]. On the contrary, emerging and nomadic characteristics such as experimentation, trial and error, together with opportunism, were connected to their success. However, for years organizational science has been focused on controlling uncertainty, since it is considered a nuisance instead of a creative space [Casti 1997]. Rather than acknowledging the inherent consequences of complexity, and positively utilizing its possibilities, planning remained a 'secular faith', despite compelling evidence to question that fate. One principal proponent of strategic planning even positioned such method for dealing with complexity: "Formal long-range planning seemed almost like a godsend to the top executives of organizations facing increased complexity" [In: Mintzberg 1994, p. 137].

Uncertainty in enterprises necessitates finding ways to recognize and address chaos and uncertainty [Pascale and Athos 1981, Peters 1989]. Complex socio-economic and socio-technical systems require approaches to governance that acknowledge emergent control. As we will argue in paragraph 2.4, employee involvement will enable emergent forms of self-management, and in so doing, will enable emergent control and the emergence of overall order. Comparably, proponents of the 'complex responsive processes theory' hold that self-organizing processes of local human interaction create continuity, change and renewal, thereby creating overall order [Stacey et al. 2000, Stacey 2003]. Similarly as mentioned in paragraph 2.2.1, through complex responsive processes human actors shape the enterprise, while at the same time being shaped by the enterprise [op. cit.]. Also from a top-management perspective, the practical validity of these views has been demonstrated in various cases, while acknowledging that top-management cannot control the overall cumulative effect of local initiatives [Groot 2007].

A single-minded mechanistic method is likely to be counter-productive due to the "pursuit of one-dimensional approaches to multi-dimensional problems" [Vinten 1992, p. 25]. The unwillingness to use an inclusive perspective on enterprises will further continue an either-or mode of thinking that leads to continually seeing them "as full of irreconcilable trade-offs" [Davis 1987, p. 85]. Freedom and order are recognized in the inclusive view as two essential aspects of all enterprises. However the either-or approach treats them as an irreconcilable dilemma. But freedom and order are not necessarily opposites. Given uncertainty and ambiguity, more freedom in self-organizing could address uncertainty to create emergent overall order [Wheatley 1994, p. 95]. An enterprise as a deterministic system is viewed as an oversimplification leading to overconfidence in formal control methods and an unjustified belief in the myth of controllability, together with the illusion of being in control [Senge 1990, p. 290]. This over-simplification is considered a management liability, since it confronts the "complex dynamic realities with a language designed for simple static problems" [op. cit., p. 226]. Indeed, the introductory chapter mentioned that the high-level complexity of enterprises was addressed with concepts only suitable for low-level complexities, such as machines.

Table 2.1 summarizes the most important differences between the mechanistic view and the non-mechanistic view, also based on the distinctions presented by Dent [1999].

Table 2.1. Key differences between the mechanistic and non-mechanistic view

Mechanistic view	Non-mechanistic view
Reductionism	Holism
Determinism	Uncertainty, indeterminacy
Linear causality	Many interdependencies
Objective reality	Perspective (perceived) reality
Observer and context separated	Observer and context mutually dependent
Focus on discrete entities	Focus on relationships
Either-or thinking	Polarity (inclusive) thinking
Logic	Paradox
Behavior specified from the top down	Behavior emerges bottom up
Planning	Learning
Focus on outcome	Focus on process

2.4 The Organismic Perspective

Opposite the reductionistic or mechanistic perspective is the perspective labeled as 'holistic' or 'organismic' [Capra 1996, p. 12]. The latter label indicates that a system is considered analogous to a living body. The aforementioned distinction has also been introduced in relation to enterprises under similar labels [Burns and Stalker 1961]. The label 'organic' was also used [Burns 1963]. Mechanistic enterprises show the rigid, machine-like characteristics previously discussed, whereas the organismic enterprises have opposite characteristics, and show flexibility and responsiveness, based on fundamentally different perspectives on control. These fundamentally different perspectives are necessary for providing an answer to the myth of traditional control previously sketched. Recalling our observations in paragraph 2.1.4, the organismic perspective is reminiscent of characteristics of Eastern thought, not only because of the (human-centered) organismic concept itself, but also in view of the avoidance of either-or thinking and the processual (adaptive, learning, emerging) notion of enterprise change. In this section we will argue the importance of the organismic perspective on enterprises, which forms the basis for arguing the organismic perspective on governance.

2.4.1 The Human-Centered Approach: Employee Involvement

Our previous discussion has shown the dominance of mechanistic thinking, and argued its limitations. In the following paragraphs we will illustrate further that, in view of a number of essential enterprise success areas, an exclusive mechanistic approach is dysfunctional since it undervalues human capacities, the very essence of the organismic approach to enterprises. Undervaluing human capacities entails that people should behave like machine parts carrying out predefined tasks. Work that requires only mechanical input stifles creativity and initiative. This absence of mentally-involved employees created in itself a justification for the existence and continuation of the mechanistic approach. The inherent undervaluation of human capacities and contributions within the mechanistic mindset essentially detaches employees from enterprise activities in an emotional sense, since these activities are not perceived as part of their responsibilities. Carrying out tasks 'set before them' amounts to no more than mechanical behavior, and is distant from participation and the expression of personal involvement with, and integration into, enterprise activities. Hence, at the employee level, the mechanistic approach to enterprises induces the attitude of not taking responsibility for what is happening. Employee involvement is thus extremely limited. Striking differences regarding the level of personal involvement ('ownership') appeared in a survey indicating that 93% of Japanese employees, but only 9% of American employees, thought that they themselves would benefit from enterprise improvements [Rehfeld 1994, p. 42].

Lack of employee involvement is detrimental to enterprise success as we will argue in the next paragraphs. The drive for further productivity and quality improvements, as well as a customer- and service-oriented operation, will be shown to rest on employee involvement to a crucial degree. Similarly this holds for the need for enterprise learning and innovation, and the moral and ethical aspects related to the responsibility of enterprises beyond shareholder profit maximization. Finally, the focus on employee involvement is also driven by the shift from manual-intensive to knowledge-intensive work. Tomorrow's ultimate raw material will be knowledge. According to Drucker, the enterprise is thus to be seen as "the integration of specialized knowledge into a common task" [1992b]. Rather than undervaluing human capacities in enterprises, the areas identified above require a human-centered approach to enterprises.

There is ample evidence that employee involvement is conditional for enterprise success. Different enterprises having virtually identical technology, and producing similar products, nonetheless show dramatically different results in various areas such as productivity, quality, customer and service orientation and innovation [Pascale and Athos 1981, Chew 1990, Pfeffer 1994, Rehfeld 1994]. Within the mechanistic mindset described previously, these differences cannot be explained nor resolved. These phenomena can only be understood by focusing on human behavior in enterprises. In this sense, Drucker advocates a change in the areas of management concern, since "Aspects of human behavior are the primary facts of management science" [1985, p. 510]. As such, "Social innovation is equal to and often more important than scientific innovation" [Drucker 1992b]. Various writers have emphasized this theme. For Katz and Kahn, "The great central area of human behavior in organizations and institutions has been ignored" [1978, p. 2]. Likewise Prahalad concludes that "The biggest under-leveraged skill in a large company is Human Resource" [1995]. So, "It is not cash that fuels the journey to the future, but the emotional and intellectual energy of every employee" [Hamel and Prahalad 1994]. Innovation according to Moss Kanter, should therefore not primarily concern new products, but should specifically concern the way enterprises are operating [1983]. Hence, they should concern social and organizational innovation [op. cit.]. One might thus contend that the necessity of focusing on employee involvement and behavior should be a strategic focus in itself. Indeed, apart from other strategic aspects, Miles et al. identified a clear "managerial philosophy that establishes continuous development of human assets" as a key element of success in corporate redesign [1995].

The observations above indicate that the source of competitive advantage has changed. A report from The Conference Board Europe confirms this view. Analyzing 166 companies with respect to human performance, the report concludes that "Historically, the response to competition has been to add technology, cut costs or seek favorable government regulation. None of these efforts had a lasting effect on productivity. The only sustainable resource for competitive advantage is people" [Csoka 1994, p. 7, p. 25]. We will illustrate the importance of employee involvement – hence the importance of the organismic perspective – relative to the following enterprise success areas: productivity, quality, service, and learning and innovation.

2.4.2 Productivity

Although in his book *The Wealth of Nations* published in 1776 Adam Smith advocated the principle of division of labor to increase productivity, systematic approaches to productivity improvement were probably initiated through the work of Taylor, Fayol and Weber mentioned in paragraph 2.1.3. Collectively, these thoughts can be seen as the structural and bureaucratic approach to thinking about enterprises: the "machine bureaucracy" [Mintzberg 1989, p. 47]. Underlying these approaches were the dominant principles of determinism and reductionism, as outlined previously. Productivity was assumed to be higher the more employees behaved according to predefined formal work patterns, rules and regulations. Production management and industrial engineering became important disciplines dealing with work planning, and time and motion studies [Mayer 1968, Niebel 1982]. Stability and control were pursued through high levels of formalization [Robbins 1990]. Essential in the mechanistic approach is a sharp distinction between management and non-management, or in other words, between thinking and doing. Management is considered the locus for knowledge and control [Barnard 1938, Taylor 1912]. These principles were established almost a century ago, when "the last great organizational transformation" took place [Bennis 1989, p. 177].

We might observe that the results of this approach to productivity improvement have been impressive. At the end of the last century Drucker estimated that a 45-fold productivity improvement has been realized since the beginning of the industrial revolution, contributing to the creation of wealth in industrialized countries [1991]. Roughly a 25-fold increase in real income was accomplished between 1920 and 1990 [op. cit.]. Further, the mechanistic approach was continually able to produce complex products with unskilled or semi-skilled employees [Drucker 1993]. This aspect seems especially important, since based on the general education level of employees at the onset of the industrial revolution, enterprise arrangements were needed that indeed allowed poorly-educated people to be productive in an organizational setting.

Although the traditional approach to productivity resulted in considerable gain, the question remains as to whether the mechanistic approach is able to sustain further productivity growth. Drucker argues that the production revolution identified above is over, and that the influx of technology in organizations will not by itself generate higher productivity [1991]. Productivity and competitive advantage can therefore only be improved through the involvement of people [Pfeffer 1994]. Productivity thus becomes an aspect of "social organization" [Ouchi 1981, p. 51]. Without changing the existing technology, employee involvement has been shown to lead to dramatic changes in organizational productivity [Denton 1991]. The case of the NUMMI car manufacturing transformation from a cynical, uninvolved, low-productivity workforce into a participative, highly productive one, is often mentioned [Adler 1993, Pfeffer 1994]. Comparable to the NUMMI transformation is that of Semco, a Brazilian producer of industrial equipment. An almost seven-fold improvement in productivity was reported as the result of employee involvement, deployed to an almost unprecedented degree [Semler 1993]. We have reported various other examples elsewhere [Hoogervorst 1998]. Employee involvement is critical, in view of the shift from manual-intensive to knowledge-intensive work mentioned previously. In light of this shift Drucker refers to the new productivity challenge for the "knowledge worker" [1991].

Employee involvement essentially implies a departure from the strict distinction between management and non-management, and thus implies a departure from the strict separation between planning and execution, or between thinking and doing. Productivity increases can only result from involvement and participation of responsible employees, showing constructive and cooperative behavior, willing to reflect on the efficiency and effectiveness of their own work activities, and showing responsiveness to the need to change them. Employee involvement to gain productivity implies that productivity depends on the possibility for social innovation, which, as stated earlier, is "equally and often more important than scientific innovation" [Drucker 1992b].

2.4.3 Quality

The concept of quality relates to an end-user of a product or service, and can be defined as “the degree to which the product in use will meet the expectations of the customer” [Feigenbaum 1961, p. 13]. Sometimes quality is simply defined as “conformance to requirements” [Crosby 1980, p. 15]. Initially, primary attention was devoted to (statistical) quality control in production processes [Feigenbaum 1961]. Subsequently, consideration was increasingly devoted to the importance of prevention, rather than merely detection of quality defects [Deming 1986]. Alongside Quality Control, Quality Assurance also became essential. This widened the scope of quality-related issues beyond the focus on core production processes. Under the influence of the organizational culture approach and numerous examples of failures to implement quality circles and quality teams, insights emerged that only a consistent company-wide approach could produce intended quality results [Townsend 1986, Brennan 1992, Erickson 1992, Chang et al. 1993, Zairi 1994]. The required corporate-wide focus is expressed by the concept of Total Quality Management for example. Ultimately the total quality philosophy rests on three principles: customer focus, continuous improvement and employee involvement [Dean and Bowen 1994].

Serious and consistent quality improvement programs have been shown to lead to a significant reduction in defect levels, response times and production costs in conjunction with considerable productivity improvements [Juran 1992]. The quality-focused approach thus has significant economic impact. Numerous examples have been given to document the positive effects of the TQM approach [Townsend 1986, Belohlav 1993, Cole et al. 1993, Gallo 1993, Kirby 1993, Zairi 1994, Oakland and Porter 1994, Voss and Blackmon 1995].

Interestingly, a mechanistic approach to quality is sometimes advocated, exemplified by the ISO 9000 approach, whereby the focus is on contracts and internal control through procedures, records and inspection. This entailed considerable bureaucracy, whereby quality became exchanged for conformity. Procedural efficiency and satisfying auditors took prevalence over what matters to customers [Seddon 2000]. Typically reflecting the mechanistic stance: ISO 9000 is considered a ‘*management* system’. The whole approach turned out to be far from conducive to quality, even to the stated likelihood “that ISO 9000 has inflicted damage to the competitive position of hundreds of thousands of organizations” [op. cit., p. 29]. As we will argue further in a later section, “the focus of an organization wanting to improve quality and competitive position should be on learning, not on compliance” [op. cit., p. 52].

Unlike the mechanistic approach to quality, the strong focus on employee involvement is an essential aspect of the total quality approach [Hoogervorst et al. 2005]. Employee knowledge and contributions are viewed as a prerequisite. Involvement and participation are mentioned by numerous writers on quality as concepts that are necessary for continuous improvement. According to Juran, enterprises that excelled in quality “used employee involvement to an unprecedented degree" [1991]. Similarly, the six-sigma quality concept is viewed as a high employee involvement concept [Eckes 2001].

The concept of 'kaizen' as a principle of continuous improvement is described as a people-oriented concept [Imai 1986].

Seeing employees as a source of meaningful contributions implies an approach fundamentally different from the traditional separation of thinking and doing. The TQM philosophy is therefore considered to be incompatible with the traditional mechanistic management theory and practice [Grant et al. 1994, Amsden and Ferratt 1996]. Continuation of this theory and practices were shown as root causes for failing quality initiatives: management was only interested in reducing the costs of non-quality, since that had a direct impact on the 'bottom-line' [Zuboff and Maxmin 2002].

2.4.4 Service

A service can be defined as an "intangible exchange of effort for money that occurs in an interpersonal relationship that can't be recaptured only repeated" [Bell and Zemke 1990]. Understandably, the delivery of a service rests on a proper structural-functionalistic foundation, as mentioned in paragraph 1.1.2. This is a necessary, but not sufficient condition. Foremost, service is seen in 'humanistic' terms: people are considered as the primary providers of service [Schlesinger and Heskett 1991]. Contenders of the humanistic model argue that an exclusive mechaistic view will inevitably lead to the start of the 'cycle of failure', seen as a self-destructing mechanism of service decline that is bound to start since the mechanistic approach cannot adopt readily to changing conditions [op. cit., p. 75]. Poor service is thus "designed into the system" [ibid.]. Thus, it is the result of the 'common causes' discussed in paragraph 2.3.2. Further, the mechanistic approach to service might lead to mere instrumental and often marginal behavior. Hence the mechanistic model with its focus on rules, regulations and output targets, is viewed as creating service employees who are uninterested in customer problems, or are unable to address the problems when interested (cf. paragraph 2.3.1, 2.3.2). The inadequacy of the mechanistic model of service is illustrated further by arguing that a service 'system' is routine-oriented and cannot deal adequately with the unexpected [Hart 1989]. Only employees with authority, empowered and who have behavioral guidance on a more aggregated level via the mission, values and goals, can deal effectively with service contingencies. For example, relaxing centralized control and stimulating local initiatives of empowered employees has been shown to lead to better train punctuality and passenger service [Groot 2007]. In this view employees are expected to show initiative and creativity in order to address service problems and act diligently. Investigations also show that personal attention and responsiveness are important aspects of service expectations [Zemke 1989]. Clearly, leverage in service is the freedom to act [Berry and Parasuraman 1992]. Empowerment and participation are considered crucial success factors relevant to service [Hart et al. 1990, Wills 1992, Bowen and Lawler 1995]. This authorization or empowerment approach to service rests on the participation model and the Theory Y vision on enterprises [Bowen and Lawler 1995, Wills 1992]. Contrary to the Theory X vision, the Theory Y vision holds that work is not seen as inherently distasteful to most people, such that strict control is required for adequate performance. Rather, it is argued that people want to be recognized as individuals and want to feel important and useful. These needs are considered more motivational than monetary rewards based on assumed forms of narrow self-interest [McGregor 1960].

Essentially, the human approach to service recognizes that "A service company can only be as good as its people" [Berry and Parasuraman 1992, p. 30]. Ultimately, as investigations show, the treatment of employees is reflected in the treatment of customers [Zemke 1989]. As Bowen and Lawler note, "Studies support the idea that how employees feel about their work spills over to customers, influencing their satisfaction with the service they receive" [1995, p. 76]. As with quality, the economic impact of providing good service is also considerable [Zemke 1989, Heskett et al. 1990].

2.4.5 Enterprise Learning and Innovation

Social groups – hence enterprises – are considered to develop a collective memory and collective knowledge that can only be attributed to the group as such, since groups may consist of different individuals over time, while groups preserve knowledge and mental maps which are transferred to new group members [Dixon 1992, Weick 1994]. Group knowledge is thus relatively stationary, while group members may be contingent. According to Kim, a group is a "collective individual with its own set of mental models that contribute to the organization's shared mental models and learning" [1993]. Argyris and Schön regard the enterprise as a cognitive phenomenon that learns and develops knowledge [1978].

Creating and sharing knowledge is therefore considered crucial for gaining and maintaining competitive advantage [Nonaka and Takeuchi 1995, Davenport and Prusak 1998]. As Drucker notes, "The real controlling resource and absolutely decisive factor of production is now neither capital, nor land, nor labor, it is knowledge" [1993, p. 6].

Shared knowledge will determine the enterprise 'mental map' that guides behavior and determines the enterprise reaction to various internal and external circumstances. The concept of the learning enterprise emphasizes the importance of the generation, distribution, integration and application of knowledge in enterprises in order to change behavior, as well as emphasizing the need to create conditions for adapting to new shared knowledge. This latter aspect manifests the capability of learning. Various definitions of a learning enterprise exist. Learning relates to the development of knowledge about interrelationships between the organization's actions and the environment [Kim 1993]. Argyris stresses the importance of also focusing on internal conditions by stating that "If learning is to persist, managers and employees must look inward [and] reflect critically on their own behavior, identify the ways they often inadvertently contribute to the organizations problems and then change how they act" [1991]. The latter aspect is important, so enterprise learning might be more broadly defined as "the process of improving action through better knowledge and understanding" [Easterby-Smith 1990]. Others view learning likewise "as the capacity or process within an enterprise to maintain or improve performance based on experience" [Nevis et al. 1995]. Enterprise learning thus refers to "increasing an organization's capacity to take effective action" [Kim 1993].

Taking action can have two different forms: addressing merely symptoms or the actual underlying causes. These two forms are related to two perspectives on learning: 'single-loop learning' and 'double-loop learning' [Argyris and Schön 1978]. For example, when quality problems are encountered, extra inspection might be arranged to remedy deficiencies. Or high employee turnover might be addressed through extra recruiting efforts, while increasing absenteeism might lead to intensified control. These are actions based on single-loop learning. No reflection takes place about underlying reasons that causes problems to occur. Double-loop learning is the label used to identify learning resulting from reflecting upon underlying relationships and patterns of interconnectedness that are the roots of problems. With reference to the previous single-loop examples, quality problems might not be the result of lack of inspection, but rather the result of the principle of inspection itself that leads to lack of employee commitment towards quality since deficiencies will be detected anyway. Quality problems might also be the result of a production-volume-oriented management reporting structure and value system. In addition, employee turnover and absenteeism can be interpreted as a sign of low commitment, owing to the structuring of work that eliminates opportunities for employee involvement.

Others have identified similar categories of learning. Bennis identified the two modes of learning as 'maintenance' and 'innovative' learning [1989, p. 75]. Maintenance learning resembles the concept of single-loop learning discussed above. Innovative learning is similar to double-loop learning, since this learning is reflective and dialogue-oriented and opens different perspectives on reality to aid change.

Argyris and Schön argue that learning only occurs if knowledge is translated into reproducible behavior [1978]. As Argyris notes, learning should be "in the service of action, not simply discovery or insight" [1993]. A learning enterprise is thus geared intentionally to the acquisition and distribution of knowledge in order to detect and remove errors, and to improve enterprise processes and actions. Evidently, the process of continuous improvement previously identified when discussing productivity, quality, and service, requires the ability to learn. Hence a learning enterprise is "an organization skilled at creating, acquiring and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" [Garvin 1993]. Learning is both a manifestation and a prerequisite for change. For Schein, enterprises that cannot learn cannot change [1993]. This position is also expressed relative to enterprise strategy where changes are considered to occur not because of planning (mechanistic view) but because of learning (organismic view) [Stacey 1993]. Strategy emerges because of learning about the dynamic relation between the organization and the environment, as argued in paragraph 2.3.4 [Mintzberg 1989, 1994]. Enterprise learning leads to adaptation and self-renewal. According to Drucker, organizations need to provide for their self-renewal by having structures designed for continuous learning [1985]. Many theorists and enterprise leaders stress the importance of enterprise learning which is considered a critical competency for enterprise continuity and growth [Senge 1990, Drucker 1991, Armstrong 1992, Drucker 1992, Dixon 1992]. Learning faster than competitors may be the only sustainable competitive advantage. According to Prahalad and Hamel, collective learning should therefore be an enterprise core competence [1990]. This competence depends ultimately on employee involvement, since enterprise learning starts with individual learning. It is impossible to conceive of a learning enterprise without individual learners on whose skills and commitment the learning enterprise depends [Mumford 1992]. Thus "Organizational learning takes place through individual actors whose actions are based on a set of shared models" [Kim 1993]. Put another way, renewal, innovation and improvements are thus considered to come largely from the 'human side' of enterprises.

Enterprise and environmental conditions that necessitate continuous adaptation are seldom clearly defined. In such situations of dynamics and complexity, ambiguity and uncertainty exist, as discussed earlier. Hence the process of learning is heuristic, whereby emerging knowledge guides future actions. The notion of 'emergence' discussed in paragraph 2.3.5 is thus associated strongly with the learning enterprise. The emerging nature of knowledge development requires that employees will display the involvement and behavior necessary for learning, and the development of the capacities to act, to take place. Empowerment is seen as a prerequisite for the deployment and use of learning opportunities [Mumford 1992]. The ability to learn requires a climate of trust and openness where people are committed, participate and are willing to explore new ways of working. Nevis et al. identified various facilitating factors that induce and support learning [1995].

We might observe that uncertainty in enterprises and heuristic, experienced-based, learning are mutually implied: without uncertainty, heuristic learning is impossible to practice, while without the willingness of employees to learn heuristically, uncertainty cannot be dealt with. In turn, through heuristic learning, uncertainty is acted upon, and in some sense contained and controlled. Without uncertainty no learning takes place and only mechanistic determinism would determine employee behavior. Uncertainty and unpredictability offer possibilities for self-regulation however and as such, offer possibilities for employee self-development and self-realization.

The aspects mentioned previously are similarly relevant with regard to innovation. Learning and innovation are thus complementary aspects. Innovation is considered a significant non-routine and discontinuous enterprise change to be distinguished from the mere extrapolation of current modes of operation relative to existing systems, structures and technology [Moss Kanter 1983, Mezias and Glynn 1993]. Briefly stated, innovation refers to "a process of bringing any new, problem-solving idea to use in an organization" [Moss Kanter 1983, p. 20]. Thus innovation also relates to management methods and the very ways that enterprises operate.

Appreciably, the mechanistic perspective on enterprises is not conducive to innovation. This concurs with the view of Moss-Kanter who observes that "The more jobs are formalized with duties finely specified and codified, the less innovation is produced in the organization", so conversely, "Low formalization is associated with more innovativeness" [Moss Kanter 1983, p. 144]. Reliance on formalization has as a dysfunctional consequence "the lack of innovative and spontaneous behavior necessary for effective organizational functioning" [Katz and Kahn 1978, p. 266].

Innovation is emergent: it cannot be planned. Innovation resembles the heuristic learning process mentioned earlier. A study of the world's most innovative large enterprises supports the idea of innovation as an emerging quality [Quinn 1985]. "All innovation has an improvisational aspect. Decades of research show that innovation combines the discipline of skilled actors with serendipity and change; and even strategy formulation can be discovery-based" [Moss Kanter 2001, p. 107]. As is the case with learning, the variability implied by dynamics, complexity and uncertainty offers possibilities for employee-initiated actions leading to innovation. Such actions will only occur however if this variability is explicitly recognized and appreciated by "relaxing managerial control, routines and less precise performance management" [Mezias and Glynn 1993]. As Moss Kanter argues "Innovative companies provide the freedom to act which arouses the desire to act" [1983, p. 142]. Hence, innovation is based on creating (designing) organizational conditions conducive to innovation [Moss Kanter et al. 1997]. Empirical data supports the importance of employee involvement for innovation: contrary to what the mechanistic, top-down approach would suggest, most ideas for innovation come from within the enterprise, not from the top [Christensen 1997, Moss Kanter et al. 1997]. As empirical data indicates, "The annual planning system itself was hardly (if ever) the initiating source of really new key issues or radical departures into new product/market realms" [Quinn 1999, p. 129].

2.4.6 Self-Organization: Addressing Complexity, Dynamics and Uncertainty

Life at the Edge of Chaos

As paragraph 2.1.3 showed, mechanistic thinking creates enterprises having machine-like characteristics. Essential properties of machines are: fixed functionality, time invariant behavior, stability and predictability. Self-initiated change is not to be expected, nor appreciated: the coffee machine should reliably produce coffee, nothing else. Arguably, the machine characteristics can be associated with the structural-functionalistic foundation mentioned previously.

As we have illustrated, operationally as well as strategically enterprises need to react to and anticipate unforeseen situations arising out of dynamics, complexity and the related uncertainty; they need to change and adapt. Precisely the capabilities that a machine cannot provide. Hence, next to the structural-functionalistic machine stability, there is a need for so much instability that change and adaptation is enabled. Total instability (chaos) is evidently unproductive since nothing of the structural-functionalistic foundation remains. Various theorists have argued that productive change occurs at the boundary between stability and chaos [Kauffman 1995, Capra 1996, Brown and Eisenhart 1998]. This draws on the biological metaphor: "Life exists at the edge of chaos" [Kauffman 1995, p. 26]. These opposing aspects point to the fundamental tension discussed below.

The Fundamental Tension: Stability and Instability

The fundamental tension enterprises are facing thus concerns the need for stability on the one hand in order to provide the necessary structural-functionalistic foundation, and on the other, the need for instability in order for adaptation, change and renewal to take place. Resolving this fundamental tension (paradox) is by no means trivial. In view of the preceding paragraphs, we submit that this tension can only be addressed and resolved through employee involvement. In the light of the enterprise success areas identified previously, employee participation and involvement will be crucial in a future that demands flexibility in production, shorter product development time, responsiveness and the ability to adapt and change direction, together with greater innovation, quality and service, and an overall need for continuous improvement. Incidentally, management appears not to be the source of knowledge for these improvements. One survey reported that only about 4% of the problems encountered by factory workers were known to management [Whiteley 1992].

As figure 2.5 shows, we have labeled the edge between stability and chaos the 'creative boundary'. It is here that employee involvement becomes manifest through creativity and initiatives directed towards safeguarding operational process excellence and improvements, product and service improvements, as well as directed at new strategic developments. Interestingly, modern information technology developments greatly facilitate (and induce) the establishment of the

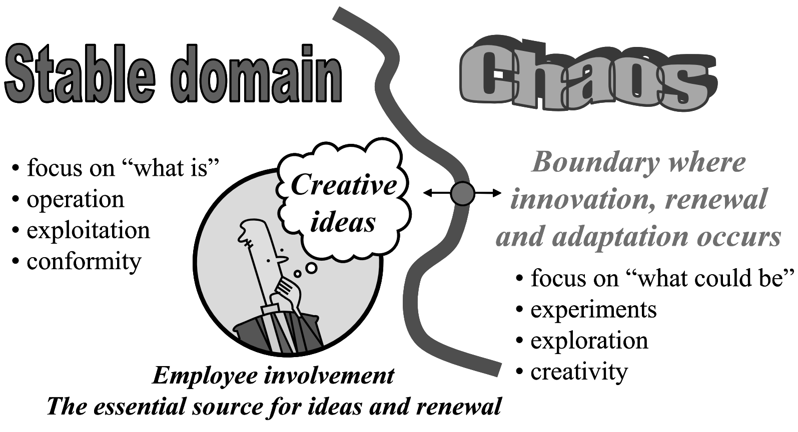


Fig. 2.5. The creative boundary

creative boundary. For example, modern web technology enables innovative end-users to create simple composite applications called 'mashups' [Mulholland et al. 2006]. Said creation of new business functionality is labeled as 'development on the edges': new functionality is emerging through creative end-users while maintaining the core business and IT operational integrity and security [op. cit.].

Unlike the mechanistic approach to enterprise design, these reflections necessitate the recognition that required forms of enterprise activities, and specifically employee behavior, cannot be totally determined in advance, since these activities and employee behavior have to respond to external and internal contingencies emerging through dynamics, complexity and the associated uncertainty. We recall the observation of Katz and Kahn given earlier that "it is impossible to prescribe role requirements precisely and completely or lay down rules with sufficient specificity to cover all contingencies arising in a single week of work of a complex organization" [1978, p. 266]. Success at the creative boundary depends on the participation of employees and their capacity for self-organizing and self-ordering [Chang 1993]. Evidently, local freedom is a necessity, as mentioned previously when discussing innovation. Freedom and order are thus not necessarily oppositional, as mentioned earlier. Rather, local freedom is required to create overall order, expressed in employee actions being aligned with the enterprise purpose and goals. Handling uncertainty assumes creativity and local initiative combined with such a commitment and participation that acting relative to various contingencies is considered necessary by employees and aligned with the enterprise purpose and goals. This requires controlling forces on higher aggregated levels, such as the organizational culture, as we have described elsewhere, and it will be resumed briefly in paragraph 3.3.2 [Hoogervorst 1998].

2.4.7 Human Resources Engagement

The Human-Centered Focus

The previous discussion about areas where enterprises need to be successful argued that an exclusively traditional mechanistic approach was inadequate. Success in all areas requires employee involvement and participation, such that employee input is used to improve enterprise performance relative to productivity, quality and service, as well as creating an overall order in an uncertain and unpredictable context, while enabling enterprise learning and innovation. This focus on employee involvement and participation necessitates viewing human resources itself as an area where the enterprise needs to be successful, hence viewing human resources as an area of strategic focus.

The traditional perspective on human capacities is congruent with the mechanistic management theory discussed previously. Within the traditional view, human resources are virtually a non-issue, since employees are merely fitted into the enterprise machine: the instrumental view on human resources. This approach to human resources confirmed the traditional management versus employee dichotomy, termed as the "dualist treatment of competence" [Hosking and Morley 1991, p. 44].

Contrary to the traditional Theory X model, the Theory Y model is based on a different set of assumptions, as indicated previously [McGregor 1960]. Unlike the traditional model, the human relations model expresses elements of the Theory Y anthropological vision and acknowledges the possibility of committed employees, and the importance of employee motivation. Others have voiced similar views under different labels, such as Type J [Pascale and Athos 1981], System Z [Ouchi 1981] and System IV [Likert 1965]. Participation and involvement of employees are viewed as important, and to be arranged via adequate enterprise design. This approach acknowledges the need for employee development which allows individuals to exercise responsibility and achieve their potential [Zuboff and Maxmin 2002]. As such, this approach also addresses the importance of the meaning of work in relation to creating meaning and purpose in human life. Motivation of employees becomes a problem when work loses its meaning [Kilcourse 1994]. Utilization of employee creativity and capacities, but even more, creating a climate for employee development, is seen as essential. Self-direction and self-control are viewed as important concepts. According to Fromm, employee self-realization is established through expressions of creativity and self-initiated behavior [1941]. Essentially, the human resources-focused perspective considers the ethical side of employment as an issue in its own right [Walton 1988, Sashkin 1989]. Hence it considers employees as more than a means of production. Notably, these behavioral aspects are exactly those required to be successful in the areas mentioned previously. Various writers nonetheless contend that in reality, most human resource functions in organizations do not reflect the human-focused perspective, and are merely instrumental, operating as a traditional personnel management function [Armstrong 1992, Thomason 1992]. As Hendry and Pettigrew state, the question boils down to whether emphasis is given to *human*, or to *resources management* [1990].

HR Enablement and the Unitarist View

Two different views can be identified with respect to human resources strategy. The first view can be labeled as 'HR alignment', whereby the HR strategy follows the enterprise strategy, hence is subordinated to the enterprise strategy. As such, human resources management tends to be instrumental, with central themes related to personnel selection, appraisal, compensation structures and training. This approach concurs with mechanistic thinking, whereby social aspects tend to be undervalued [Gaugler and Weber 1995]. Within the second view, labeled as 'HR enablement', employees are considered the most valuable asset. Consequently, the human resources strategy is considered in and of itself as an important strategic focus [Hoogervorst et al. 2002]. Development of the most valuable asset necessitates a proactive, rather than a reactive strategic intent. Figure 2.6 shows the different views.

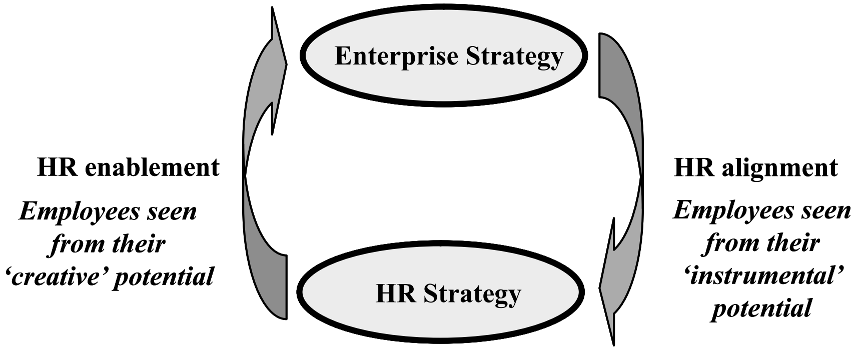


Fig. 2.6. HR alignment and HR enablement views on HR strategy

Clearly, principles for human resources engagement geared to employee involvement, participation and self-management are significantly different than those for the instrumental approach. The former principles will express a 'unitarist' view on human resource aspects [Cave 1992, p. 133]. Within this view, no necessary opposition, incompatibility or divergence has to be present between enterprise and employee interests. The enterprise is to act in such a manner that these interests coincide [Fitz-Enz 1990, Senge 1990]. Others have expressed such a condition as 'mutuality', which is defined as "integrating the needs of those who work in the organization with the needs of the organization" [Armstrong 1992, p. 22]. This forms the basis for psychological satisfaction, whereby necessary activities, seen from the enterprise perspective, are also desired activities as seen from the individual perspective [Fromm 1941]. Enterprise performance and people satisfaction are thus not considered as necessarily mutually exclusive, but can be mutually enforcing. The unitarist view states in essence that desired forms of human behavior based on enterprise performance, or based on human development, do not necessarily constitute a principal conflict of interest [Likert 1965]. This focus would make employees able to satisfy higher-order motivational needs. Such possibilities would allow employees to align personal goals or interests successfully with enterprise goals and interests, hence obtaining the state of 'mutuality' as identified previously.

In summary, the unitarist view on human resource management unites enterprise issues pertinent to people management from an operational perspective, with ethical aspects regarding the responsibility towards employees. Within this approach, people-oriented aspects are thus both ends and means. This position fits the change advocated by Drucker, that is a change from adapting the individual to the needs of the organization to adapting the organization to the needs, aspirations and potential of the individual [Drucker 1985]. Recalling conditions of uncertainty, ambiguity and unpredictability that are connected to enterprise reality, as we have stressed previously, these conditions not only require employee involvement and participation to give overall order, but at the same time offer opportunities to make employee involvement and participation meaningful.

As Handy notes, if participation is to mean anything, it has to be at the level of self-management or self-organization [1995]. Owing to uncertainty and unpredictability, there is a necessity for – and so there can be – employee self-management, and thus employee self-development. It is here that the demands of the individual employee for meaningful work can be met [Zuboff and Maxmin 2002]. According to Fromm, human self-development and self-realization are the ultimate goals of human freedom [1941]. Notably, the unitarist view on human resources engagement, expressing congruence between enterprise and personal goals, is possible due to the essential non-mechanistic character of enterprises. Employee behavior reflecting self-development and self-realization is based on self-control. Further, employee self-control rests on various forms of employee-initiated behavior. These behavior characteristics are a requirement for enterprises that aim to be value-driven and in pursuit of excellence, fostering performance orientation, encouraging high levels of commitment, competence, quality, innovation and customer service [Armstrong and Cooke 1992].

2.5 The Fundamental Choice

2.5.1 The Mechanistic and Organismic Perspectives Summarized

Two essentially different views on organizing have been outlined: the mechanistic and organismic perspective. The mechanistic perspective has a number of convictions that can be summarized as:

- Enterprise complexity can only be understood and managed through breakdown into, and knowledge about, fundamental parts. The more detail, the more knowledge and the higher the ability to control the complexity. This conviction is exemplified further by the minute and fixed division of labor, detailed task and job descriptions and the managerial control hierarchy, including the associated measurements. The fixed task patterns define the fixed, machine-like enterprise operational structure.
- The objective, deterministic enterprise reality is inherently measurable. Enterprise reality can (thus) be captured objectively and unambiguously through measurement. In turn, measurements define reality. Said reality exists independently of management which merely controls the enterprise as an object. Through measurement, developments can be controlled and guided into the desired direction.
- Events have identifiable causes that necessarily determine the current state of affairs, which state in turn determines the future state of affairs. Clear cause and effect relationships can be established. Enterprises can thus be controlled through a management structure of top-down cause and effect relationships that secures the contribution of individual workers. Control proceeds top-down, whereby higher levels control lower levels. Unit and

personal targets, as well as performance-related pay are seen as incentives (causes) that drive performance (effect).

- In view of these convictions, complex tasks or goals can be broken down into elementary units of activity that can be planned and controlled, thereby securing the accomplishment of the complex tasks or goals. Hence, a sequence of actions (linear cause/effect relationships) can be determined that will produce a predefined result.
- Since there are identifiable deterministic cause/effect relationships, the effects of initiatives (causes) are inherently predictable. The enterprise future is thus under intentional human control: courses of action can be planned and controlled, while risks can be identified and managed. Thus, through planning, strategy can be defined and executed, whereby the enterprise future is determined and secured.
- Employees are instruments: elements of the enterprise machine. The more they behave according to predefined task descriptions, the better the enterprise performance.

In summary, the mechanistic view treats the enterprise as a machine leading to a high level of enterprise rigidity and inertia. The mechanistic approach is deterministic with an unquestioned belief in the predictability of enterprise developments, and a denial of the ever-present internal and external dynamics and complexity with its inherently associated uncertainty. The organismic perspective on organizing refutes these convictions and holds that:

- Enterprise complexity shows overall, aggregated behavior that cannot be inferred from knowledge about the constituent parts.
- Enterprise reality is socially constructed. Communication plays an essential role. Employees interpret reality through concepts and language established and agreed through social interaction. People are both products of the enterprise context in which they operate, while also being participants in shaping that context.
- Cause and effect relationships vanish in enterprise complexity, dynamics and the associated uncertainty. Measurements are therefore often symbolic in nature, with no identifiable link to enterprise performance, and often lead to unproductive goal replacement.
- Detailed task and job descriptions – based on the assumed predictability of task execution – are unproductive when predictability vanishes.
- Detailed task and job descriptions imbues enterprises with rigid, machine-like characteristics, with the inherent inability to adapt and change.
- Enterprises are cognitive systems that learn and develop knowledge. Enterprise learning is crucial for the capacity to adapt and change.
- Enterprise change is not the result of planning but of learning. The learning process is emergent: results become manifest in evolutionary, unplanned and unpredictable ways.
- Self-control and self-organization are essential for enterprise performance and the ability to innovate, change and renew.

- Unlike the instrumental, machine-like view, the capacity for self-organizing is essential for enterprise adaptation and change.
- Employee involvement is essential for:
  - enhancing productivity, quality and service
  - resolving the fundamental tension between enterprise stability on the one hand, and the ability to change and adapt, on the other
  - addressing the non-mechanistic character of enterprises
  - dealing with complexity, dynamics and the associated uncertainty
  - addressing strategic transition barriers
  - constituting the foundation for enterprise learning and emergent enterprise developments.
- Employee involvement and local freedom are essential for constituting the self-organizing capacity.

In view of these fundamental perspectives, a basic and fundamental choice has to be made as to the core beliefs underlying the way of organizing and governance. Our position will be outlined below.

2.5.2 From Mechanistic to Organismic Ways of Organizing

Two fundamentally different perspectives on enterprises have been discussed: the mechanistic and organismic perspective. These different perspectives define the way enterprises are organized, and thus define the characteristics of governance, strategy development, design and operation of enterprises. In view of the limits of mechanistic thinking in dealing with dynamics, complexity and the associated uncertainty, the importance of the organismic perspective was emphasized. All too often, unforeseen developments, opportunities and threads, complex and hardly discernable mutual dependencies and relationships between actors and internal and external forces, as well as various forms of nonlinear feedback, make predictability and control an illusion. It is this illusion on which the mechanistic way of organizing is based.

When discussing the different governance themes in later chapters, additional arguments against the mechanistic viewpoint will be given. As emphasized, complexity, dynamics and the associated uncertainty necessitate the ability for adaptation and change, and the creativity for bringing that about, typical aspects that the enterprise as a 'machine' essentially cannot offer. Increased dynamics necessitate enterprise response time to be greatly reduced, in order to make responses meaningful and relevant. Enterprise flexibility is thus crucial. This forms the basis for strategic change. As made plausible, and argued further in paragraph 3.2.2, strategy development is an emergent, incremental process, based on enterprise learning in dynamic interaction with various enterprise contextual conditions. Unlike the mechanistic way of organizing, the organismic way of organizing is directed to adaptation, flexibility and the ability to change in light of unforeseen requirements.

As we have argued, new order emerges out of uncertainty in an unpredictable way through the process of self-organization (creative boundary). This holds for the operational domain, such as rectifying unforeseen problems in production and service processes, but also for the strategic domain, the domain of learning about future enterprise choices. The section about employee involvement showed that the ability for self-organization rests on the ability for employee self-initiated behavior. Contrary to detailed task descriptions, rules, regulations and targets, there is employee freedom, hence, there is room for employee-initiated behavior and creativity. Shared goals, norms and values offer important behavioral guidance. We have seen that employee involvement is essential for productivity, quality, service, and enterprise learning and innovation.

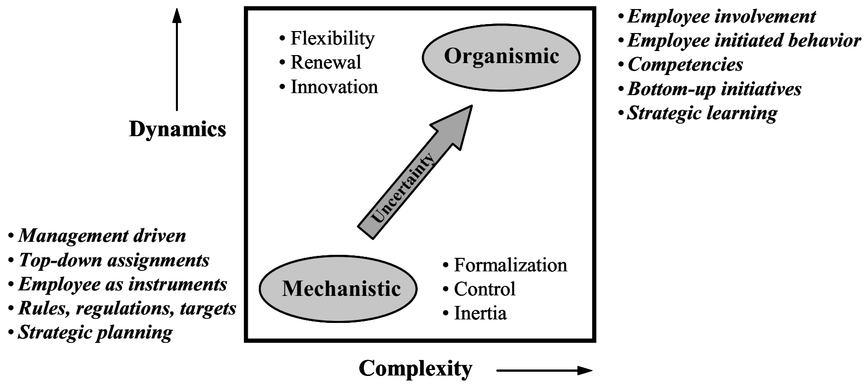


Fig. 2.7. The necessary shift from the mechanistic towards the organismic way of organizing

More than in the past, enterprises face considerable complexity and dynamics caused by technological, social, economic, political, commercial, environmental or competitive developments. Globalization and deregulation, and the emergence of new business models (e-business, network economy, networked enterprises) likewise play an important role. We recall the survey mentioned earlier among 500 top managers who qualified the dynamics in their domain of business as high to very high [Prahalad and Krishnan 2002]. In line with our observations in the section about limits to mechanistic thinking, the inevitable conclusion has to be that increasing complexity and dynamics necessitate a shift (transformation) from the mechanistic towards the organismic way of organizing. Hence a shift from top-down control to bottom-up empowerment [Johnson 1992]. As Daft observes: "As environmental uncertainty increases, organizations tend to become more organic, which means decentralizing authority and responsibility to lower levels, encouraging employees to take care of problems by working directly with one another, encouraging teamwork, and taking an informal approach to assigning tasks and responsibility" [2001, p. 144]. Figure 2.7 depicts the necessary shift schematically.

2.5.3 Our Own Position

As illustrated, mechanistic thinking is a dominant mental map for interpreting reality. Within enterprises, it is often the only approach used. Admittedly, the mechanistic approach presents a highly mutually-consistent theoretical body of knowledge. It can be seen as the traditional cognitive or mental map by which enterprises are designed, enterprise issues are interpreted and enterprise members – specifically management – are shaped. Although various theorists have argued different views, the traditional mechanistic and reductionistic approach appears to remain the prevalent mode of thinking, as argued in paragraph 2.1.3.

Most would agree with the observation that the mechanistic approach to reality works very well to a great extent. Complex technical systems on which society daily depends, show perfectly the utility of this type of thinking. In case of a system breakdown, rational and deterministic cause and effect relationships are assumed to be in force, and rightly so. As mentioned in paragraph 2.1.4, scientific progress is also driven by mechanistic thinking to a considerable degree. Our earlier reflections should thus not be interpreted as a plea to disregard principles of rationalism, reductionism or determinism all together, nor to devalue logical-deductive thinking for the development of knowledge. Our own thinking is based on these principles to a greater or lesser degree. In addition, various activities in enterprise reality benefit from rational planning and the application of analytic tools, including adequate measurements. Paragraph 2.4.2 also mentioned that the mechanistic approach has created considerable growth in productivity, employment and wealth. We have frequently stressed further the importance of the structural-functionalistic enterprise foundation. The structural-functionalistic foundation is a prerequisite for the opportunity to address aspects of human development and the utilization of human capacities in enterprises fully, in our opinion. For instance, adequate processes and technology allow decentralization and self-management while ensuring synchronized enterprise activities towards common goals. So a proper structural-functionalistic foundation is an essential condition for sustaining a human-centered focus. Lack of attention to the performance of that foundation can easily lead to rapid enterprise decline [Parker and Lorenzini 1993]. Rightly so, customers are not satisfied when insufficient enterprise performance is justified by referring to dynamics, complexity and the associated uncertainty that is connected to enterprises! They expect quality and service. As we have argued, both the structural-functionalistic foundation and employee involvement are crucial.

In addition and more importantly, an adequate structural-functionalistic foundation can significantly raise the level of competence of employees, as is the case in the area of information distribution and the generation of knowledge to support local decision-making and autonomy. Technology, especially information technology, might resolve the paradox between the requirements for adequate process control, and the requirements to establish involved and committed employees. Technology can be extremely supportive in the form of information and decision support systems, which improve quality of knowledge and enhance employee involvement by allowing local decision-making and the use of cognitive capacities of employees [Zuboff and Maxmin 2002].

As we have illustrated, mechanistic thinking has practically become the *exclusive* way of thinking however. Mechanistic approaches are often virtually unquestioned, and irregularities are not considered as evidence for the importance of different views, but rather seen as an anomaly that can be attributed to improper insight into the deterministic relationships or are attributed to poorly established initial conditions. Erroneous results thus create a practical problem, not one of principle. Hence our critique lies in the *exclusive* and *isolated* use of mechanistic thinking which even precludes awareness about its dominant use, thereby contributing to the continuation of problems that cannot be solved within this domain of thinking. Said thinking by its very nature precludes viewing the enterprise as an integrated whole, with a multitude of interrelated, mutually influencing aspects, wherein employees play a crucial role. Case studies presented by Maznevski et al. about enterprise decline, showed the traditional mindset as obscuring the insight that the quality of employees is a contributing factor to the success of the organization [1993].

Strategist Prahalad considered the prevalence of the mechanistic mindset as *the* fundamental problem, which he identified as “the tyranny of the dominant logic” [1995]. Often therefore, the issue is not only about learning new things, but managing the “forgetting curve as well” [op. cit.]. As Prahalad argues, “We need to understand the ‘cognitive maps’ of people inside the organization, the processes by which these maps evolve, and the process of collective learning and socialization” [op. cit.]. All too often according to Senge, “There is a fundamental mismatch between the nature of reality in complex systems and our predominant ways of thinking about that reality” [1990, p. 63]. Unawareness of the dominant mindset might lead to Miller’s Icarus paradox: past successes support the existing mindset further, eventually leading to decline, because “The very causes of success, when extended may become the causes of failure” [Miller 1992]. Faltering enterprise capabilities are then attributed to “a managerial mindset that had become inappropriate for the contemporary realities” [Doz and Thanheiser 1993, p. 295]. Likewise, when analyzing failures in corporate redesign among various firms, Miles et al. identified as a probable cause “a lack of clarity concerning the logic of both their existing designs and those they were attempting to create” [1995]. The necessary shift to the organismic way of organizing requires a different ‘mental map’. Hence it requires ‘rethinking’, which addresses the mental map, since it “is an attempt to probe beneath organizational structures (restructuring) and processes (reengineering) in order to understand the link between the way managers think and the way they design organizations” [Keidel 1994]. “Rethinking seeks to identify the logic that connects cognitive patterns and organizational patterns” [op. cit.]. Similarly, fundamental approaches to reengineering also imply rethinking the basic mental map that governs enterprise operations. Hammer and Champy note that “At the heart of business reengineering lies the notion of *discontinuous thinking* – identifying and abandoning the outdated rules and fundamental assumptions that underlie current business operations” [1993, p. 3].

Within our approach to governance we reject the mechanistic view on governance, as will be outlined in subsequent chapters, and view governance – within the organismic perspective – as an enterprise *competence* that rests on employee competencies in the sense described above. Nonetheless, some facets of the mechanistic perspective will be taken into account insofar as they have to do with creating the necessary structural-functionalistic foundation of the enterprise. This foundation must be designed. However as we have emphasized in paragraph 1.1.2, various other conditions must likewise be designed, such that the organismic way of organizing becomes possible. As will become increasingly understandable throughout this book, the ability to address these design aspects is an important aspect of the enterprise governance competence.

3 Enterprise Essentials

Since enterprises (companies, organizations, institutions) are the central focus of corporate, IT and enterprise governance, this chapter will discuss some core aspects of enterprises. This concerns the essential notion about enterprises, when they initially emerged, and the important (design) characteristics of enterprises. Some non-trivial problems facing every enterprise will be identified. In doing so, the question addressed is if, and to what extent universally-applicable – not culture-bounded – theories about enterprises are possible. Various facts of enterprise development are subsequently reviewed. Important changes concern the context in which modern enterprises operate. Such a context appears to be highly dynamic and complex, which implies significantly different views on enterprises and their development, and provides further grounds for the employee-centric, competence-based governance approach. Two principal perspectives on strategic choices will be reviewed, including the conditions for implementing strategic choices successfully. These conditions necessitate positioning governance as a central organizational capacity, which raises the issue of central governance versus local freedom. Under the labels 'enterprise alignment' and 'enterprise enablement', different views on the relationship between enterprise strategy and design are introduced, which are associated with the mechanistic and organismic perspective on governance respectively. In view of the employee-centric organismic governance perspective, core aspects of employee behavior and the behavioral context are outlined. Finally, important paradigm shifts concerning the views on enterprises are resumed.

3.1 Core Aspects of an Enterprise

3.1.1 What is an Enterprise?

Companies, organizations and institutions have been generally identified earlier as 'enterprises'. This chapter will identify some core aspects of enterprises. These core aspects are presented in literature labeled as 'organizational theory'. The term 'organization' will thus be used sometimes to follow the terminology of the organizational literature.

Individuals in a modern society are virtually continuously confronted and affected by enterprises. As a customer, employee, patient, student, vacationer or civilian, the (necessary) influence of enterprises is present everywhere. Almost without exaggeration one might submit that society has become a society of, and dominated by, enterprises. The central position of enterprises begs the question about how the term 'enterprise' must be precisely understood.

The literature provides many definitions for an enterprise. An enterprise is considered as a "consciously coordinated social entity, with a relatively identifiable boundary, that functions on a relatively continuous basis to achieve a common goal or a set of goals" for example [Robbins 1990, p. 4]. Another definition reads: "Organizations are social units (or human groupings) deliberately constructed and reconstructed to seek specific goals" [Etzioni, In: Lammers 1987, p. 24]. Despite some differences, all definitions point to a number of specific characteristics. First, an enterprise is a social entity. This means that – despite technological resources of support – human beings are ultimately responsible for realizing enterprise goals. Communication is evidently vital for employees to coordinate their collaborative activities. Chapter 7 will therefore show that basic communication patterns form an essential aspect of the enterprise engineering theory and methodology. Goal orientation is the second important characteristic. One might also refer to the *function* of the enterprise. As a consequence of the goal orientation of the social entity, certain *interaction patterns* necessarily exist between human beings (actors) within the enterprise, dealing with coordination, cooperation and collaboration in view of the enterprise goal. Those interaction patterns and their supporting technology do not develop spontaneously (at least not for a considerable part). This notion points to a third important characteristic: enterprises are consciously and intentionally created or *designed*, as we have stressed in the introductory chapter. The latter characteristic is crucial, and begs the question as to how the enterprise must be designed. Appreciably, this characteristic (being intentionally created), as well as the subsequent design question and its answer, refer to the central theme of this book. In the next chapter we will return to the crucial issue of the design question, since its answer determines the methodology for enterprise design. The enterprise goal clarifies the purpose and the direction of the interaction patterns, and provides the reference for verifying the adequacy of enterprise design. Finally, as a last characteristic, the more or less identifiable enterprise boundary can be mentioned, that distinguishes the enterprise from its environment. Such a distinction is relevant since on the one hand the enterprise delivers its function to entities in the environment, and on the other, it takes energy, resources and information from the environment. The abovementioned characteristics are summarized in the following definition: "Organizations are (1) social entities that (2) are goal directed (3) are designed as deliberately structured and coordinated activity systems, and (4) are linked to the external environment" [Daft 2001, p. 12].

As we have seen in the previous chapter, enterprise design can lead to fundamentally different arrangements: the mechanistic and organismic way of organizing. These arrangements refer to two 'images of organizations': the organization as a 'machine' or 'organism' [Morgan 2006]. Morgan has described various other images eloquently, such as organizations as political systems or even psychic prisons. Indeed, organizations might be experienced as such. However, we will adhere to the previous definition since the goal-direction and/or the design ultimately determine whether or not enterprises manifest a certain image.

3.1.2 *The Industrial Revolution: The Birth of Enterprises*

In view of the essential characteristics of enterprises given above, enterprises have most likely existed from the beginning of mankind. The military and governmental governance functions of the Roman Empire can be seen as well-known early organizational forms. They are viewed as an intentionally designed "system of imperial power enforcement" [Gibbon 2003, p. 55]. Next to governmental organizational forms, an increase in (worldwide) trade and transport activities gave rise to various civil and commercial enterprises. The Dutch East India Company (1602–1798) is an example.

Various parallels can be noticed between the development of the industrial revolution and the development of enterprises as we know them today. This concurrence has been influential for thinking about enterprises and the associated structural-functionalistic concepts as outlined in Chapter 2. The industrial revolution turned out to be an enormous technological, socio-economical and cultural transformation. Since various developments contributed to the industrial revolution, its period of development is difficult to define precisely. Often the period from 1760 through 1830 is mentioned is the era of the industrial revolution, whereby (initially the British and European) civilization changed from an agricultural into an industrial society [Ashton 1969]. Increasingly, manual labor was replaced by machines.

It is important to emphasize that the industrial revolution must be characterized first and foremost as an evolutionary, emergent development. Not one single development or innovation can be considered as the prime driving force behind the industrial revolution. The advancement of machine tooling that enabled the development of machines for producing goods appeared important however. The innovation of the steam-driven machine by Thomas Newcomen (1663–1729) was followed later by the rotating steam engine of James Watt (1736–1819), which made the powering of many production machines in factories possible. Thereby, large scale, factory-oriented production of goods was stimulated. Many enterprises emerged in areas such as textiles, gas, mining, oil refinery or transport (train and ship) for example, followed later by communication (telegraph). Construction of roads and canals made concentrated factory-production of goods possible at locations distant from those where products were eventually used, or where the basic production materials were available. Associated with the appearance of industrial enterprises and the rising need for capital, was the emergence of financial markets. At the end of the 18th and beginning of the 19th century, the first signs appeared that enterprises gained access to capital via the emission of shares [Solomon and Solomon 2004]. The development of financial enterprises like stock exchanges followed subsequently as a necessary function within the financial markets. The New York stock exchange for example, was established in 1792 [Root 1998].

Employment offered by factories and mines led to migration of people from rural areas to rapidly developing cities. Urbanization also led to the creation of new social classes and changing social and cultural circumstances. Generally, increased productivity, welfare, and health can be associated with the industrial revolution.

Many parallel technological, demographic, sociological, geographical, and economic – mutually supporting and reinforcing – developments thus contributed to the considerable transformation of the (initial European) society. This transformation is not so much the result of scientific progress, but is due for a substantial part to competent technicians that were able to translate their insights into practical applications, like the machine tooling previously mentioned, with which production machines could be made. After roughly 1830, one refers to the second industrial revolution, propelled by transport capabilities offered by the railways. Sometimes there is mention of a third industrial revolution that started roughly in the mid-1970s, mainly due to revolutionary developments in information technology. This revolution will be sketched briefly in the chapter about IT governance.

The industrial revolution can be viewed as the transformation that also led to organizational forms that are currently primarily manifest. Core aspects of enterprises – and their theory development – find their origin here. For a long time, factory-oriented production was directed towards delivering standard products and services. This type of production was associated with mass demand, whereby customers – also because of prevailing economic conditions – appeared to be satisfied with supplier-defined products or services. Markets were relatively static, so mass demand could be answered through mass production and its associated ways of organizing. As we have outlined in Chapter 2, these ways of organizing were 'mechanistic' in nature: the enterprise as a machine. Attention went primarily to economically optimal ways of production whereby the end-user of the products or services received virtually no attention Understandably, enterprises therefore tended to be inward-looking.

An increase in wealth led to increased demand for more product variety. As a result, the market became less static since larger product variety implied more demand dynamics. Technological progress, specifically concerning IT, enabled customizing products to individual requirements of customers, as will be illustrated in the section about business dynamics below. Gradually, a shift from standard, mass production towards individualized (customized) production, and from a static towards a dynamic market, became manifest, as depicted schematically in figure 3.1.

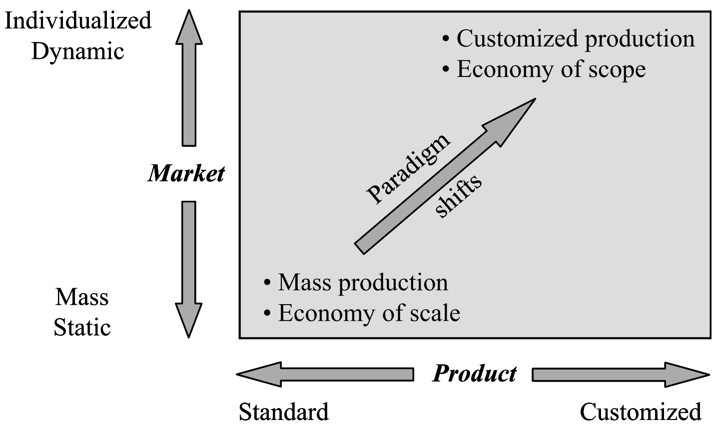


Fig. 3.1. Shifts in market and production character

With the shift shown in figure 3.1, a great number of fundamental changes are associated concerning the manner of business conduct and the way enterprises are organized. Increasingly, ways of organizing focused on mass production can be considered as an anachronism. Changes are fundamental since they imply essentially different perspectives on enterprises, their customers, employees and suppliers. The changes, that we will resume in a later paragraph, can thus be identified as paradigm shifts.

3.1.3 Functionalization and Coordination; Differentiation and Integration

Core Concepts

As we saw, enterprises are intentionally-created (designed) social entities directed towards a certain goal, or put another way, directed towards the realization of a certain function. Inherently associated with the goal or function orientation is the fact that enterprises are driven by "rationality endeavor" [Lammers 1987, p. 25]. Enterprises thus strive for rational behavior in view of realizing the goal set. This rationality endeavor implies that increased organizational complexity will be mastered through functional specialization: a person or group of persons carry out specific tasks or task complexes. Evidently, this *functionalization* necessitates *coordination*, since the various functional specializations must synchronize and harmonize their activities mutually in view of the enterprise goal. This refers to the interaction patterns mentioned earlier. Three characteristics – in view of our later discussion, *design* characteristics – are therefore inherent in enterprises [Lammers 1987, p. 27]:

- *Functionalization*: the creation of specific tasks or task complexes
- *Coordination*: the realization of unity in task execution
- *Rational finalization*: the totality of interaction patterns must be directed towards the ultimate goal.

As we will outline later, the rationality endeavor has led to essentially different approaches for the arrangement (the design) of enterprises.

Comparable distinctions have been given by Lawrence and Lorsch through the concepts of *differentiation* and *integration* [1967]. These concepts are introduced from the viewpoint that the organization of enterprises must match with the environment – and the associated dynamics and uncertainty – to which the enterprise is directed. As such, this leads to certain functional *differentiation* of organizational units, like sales, marketing, production or research. Differentiation thus has to do with specific functions, comparable with the functionalization mentioned earlier. Those different functional organizational units must realize the enterprise goal jointly. For that, *integration* is required: collaboration between functional units such that unity and coherence is established among organizational activities [op. cit.].

The perspectives provided above are in fact expressions of the *contingency theory* stating that the internal enterprise arrangements (its design) are contingent to a certain degree upon the environment to which the enterprise is directing its attention, and contingent upon the enterprise operational conditions. Within this viewpoint, the internal enterprise design will be different in case of a relatively stable market with reasonable certainty about customers, than in case of a highly dynamic market with much uncertainty. Differences might concern the level of external customer and market focus for example, or the speed of decision-making. Comparable remarks can be made concerning the type of enterprise. A bank will display other organizational functions than an advertising agency. Likewise, an enterprise directed towards the delivery of innovative products and services will manifest a different organizational set-up than an enterprise supplying less change-sensitive products and services [Lammers 1987].

Some Non-trivial Problems

The concepts of functionalization and differentiation on the one hand, and coordination and integration on the other, point to the fundamental, non-trivial problem of enterprise fragmentation due to necessary functionalization, and the necessity of having the enterprise operating as an integrated whole. Hence the problem of unifying differentiation and integration. Evidently, this problem can only be addressed effectively from a design perspective: its solution is not likely to happen spontaneously. In Chapter 1 we identified an enterprise as an organized complexity that manifests order through its design. In solving the non-trivial problem, order must be addressed at a deeper level: not merely order, but coherent and consistent order, such that the various aspects of the enterprise operate as an integrated whole. It seems that traditional organizational sciences do not offer a theory and associated methodology for addressing this problem. In the chapter about enterprise governance we will present the enterprise engineering theory and methodology as a promising answer. Anticipating that discussion, in the next chapter we will argue the system perspective as a necessary starting point.

Although functionalization and differentiation seem inevitable, the danger obviously lies in the (gradual) creation of the mechanistic, machine-like characteristics, as previously discussed. In an enterprise designed as a machine, the problem of functionalization and differentiation on the one hand and the need for integration on the other, is solved in a fixed, stable manner. However paragraph 2.4.6 identified another non-trivial problem: providing stability for delivering products and services reliably, while at the same time allowing so much instability for adaptation, change, innovation, and renewal to take place. For that, the organismic perspective – viewing the enterprise as an organism with cognitive capabilities – must be taken. Figure 3.2 below shows that the two non-trivial problems of unifying (1) stability and instability, and (2) differentiation and integration, can only be addressed simultaneously from the organismic perspective.

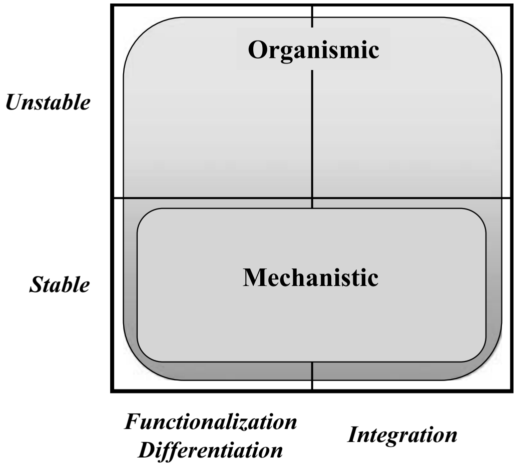


Fig. 3.2. Addressing two non-trivial enterprise problems

Based on our discussion in Chapter 2, employees are seen as the crucial enablers for the organismic way of organizing. As previously indicated, a fundamentally different design underlies the mechanistic or organismic way of organizing respectively.

3.1.4 Are General Theories Possible about Enterprises?

Enterprises operate in a certain economic, cultural, political and demographic context, on which the enterprise has hardly any, or only limited, influence. Different countries show different contexts. Based on five cultural dimensions, Hofstede has identified essential differences in value patterns in various countries [1986, 1991]. These dimensions are: (1) *power distance*, describing accessibility of management and their distance from subordinates, (2) *collectivism* versus *individualism*, referring to an orientation towards relationships and group aspects versus personal aspects, (3) *femininity* versus *masculinity*, a dimension measuring a focus on either the quality of life, feelings, social aspects of work, cooperation, versus material success, recognition, challenge and advancement, (4) *uncertainty avoidance*, referring to the level of formal rules and regulations, the structuring of activities and establishment of authority to secure predictable behavior, and (5) *long* versus *short term orientation*, characterizing aspects of time horizons and visions used. Various behavior examples are given that can be attributed to the basic assumptions given above [Hofstede 1986, 1991; Schein 2004]. Comparable cultural differences have been identified by Hampden-Turner and Trompenaars, such as the *tasks* versus *relationships* orientation and the *individualism* versus *group* orientation [1994]. The *linear* versus *cyclic* notion of time is also mentioned as a fundamental cultural difference [Hampden-Turner and Trompenaars 1994, Schein 2004].

These differences compare with those mentioned in paragraph 2.1.4 regarding the differences between Eastern and Western thought.

Understandably, society influences value patterns and attitudes of people working within an enterprise. This might concern the attitude towards authority, trust in others, self-esteem, or trust in the future [Mirvis and Kanter 1991]. Possibly therefore, the external contextual influence on desired employee value patterns and attitudes could be larger than the internal influence of the enterprise. Enterprise management is thus not totally independent of the local culture and society [Drucker 1985]. Differences between Western and Eastern value patterns also shape the form of management, as we have addressed in paragraph 2.1.4.

The foregoing reflection might suggest that a general, universally applicable theory about management and organizing is not really possible, since the enterprise arrangements and its management would be contingent upon the local context to a considerable degree [Hofstede 1993]. Various studies nonetheless indicate that this contingency is not necessarily the case for all types of enterprise arrangements. A five-country study showed that, despite large differences in societal structures, similar hierarchical structures and their associated characteristics were found within enterprises [Tannenbaum et al. 1974]. Likewise, a study comparing enterprises in seven countries confirmed the utilization of similar organizational principles, such as pertinent to team building and the arrangement of work [Head and Sorenson 1993]. Many techniques showed a widespread use, whereby their effectiveness appeared not to be related to a specific local culture. Put another way, similar organizational techniques used in different countries led to similar developments. This conclusion is supported by an international comparison of the effectiveness of self-managing teams. Positive results were reported in various enterprises located worldwide in different social contexts [Salem and Banner 1992]. Comparable results were found in a worldwide production enterprise: demographic factors appeared to have no moderating effect on work attitudes and the value patterns of the enterprise [Posner 1992]. Other examples concern the success of Japanese enterprises outside their traditional context [Rehfeld 1990, 1994, Jones 1991, Lynn 1992, Sassen 1992]. Analogously, American- and European-led enterprises in India and South America performed better than their local counterparts [Lammers 1987]. Finally, a worldwide operating multinational showed a similar company culture in different operating units, despite local differences in the societal culture [Hofstede 1991].

It might be concluded that enterprises are not totally independent of the local cultural context, but a core of culture-free propositions exists concerning the arrangement of enterprises, such that general theories about organizing are possible [Lammers, 1987, p. 217]. According to the *convergence thesis*, modern enterprises follow a certain inherent logic of industrialization to some degree [op. cit., p. 216]. Put another way, gradual differences can be noticed concerning the application of certain organizational concepts and techniques, but no principal differences pertinent to the set of concepts and techniques used. That is not to say that there can be no principal differences between sets of concepts and techniques, such as those following from the mechanistic or organismic way of organizing. However a chosen set is not necessarily culture-bound in all aspects. Enterprises are thus autonomous for a large part when it comes to the preferred way of organizing and the establishment of desired employee behavior. The latter means that also generally, universally applicable theories about human behavior play a role, such as pertinent to motivation.

Various theories about the arrangement of enterprises are presented in the literature. A principal distinction between the mechanistic and organismic way of organizing has been discussed in the previous chapter. Differences between theories are thus also based on deep-seated convictions about how enterprises should operate and thus be designed accordingly. As outlined in Chapter 2, an organizational theory that sees employee creativity and initiative as the crucial core for enterprise success will differ essentially from a theory that considers the condition whereby employees are following predefined rules and detailed task descriptions as the basis for enterprise success. The previous reflections indicate that none of the various theories has a limited domain of application *a priori*, in the sense that the theory works well in certain societies, and not in others. Rather than referring to the convergence thesis, one might preferably – in view of multiple theories – refer to *universalization thesis*: theories are universally applicable in principle. Nonetheless this does not imply theoretical relativism. As we have argued in Chapter 2, and will argue further in other chapters, some theories are much to be preferred over others. The universalization thesis submits that those theories are also universally utilizable. So despite the Western propensity towards the mechanistic way of organizing, we submit that the organismic way of organizing – hence the organismic perspective on governance – can be applied successfully within the Western context. The examples given in paragraph 2.4 corroborate this viewpoint.

3.2 Enterprise Development

Numerous factors make the process of enterprise development far from linear and planned. In addition to the considerations given in Chapter 2, various other aspects are identified in this paragraph underscoring the importance of the competence-based view on enterprise development.

3.2.1 The Modern Enterprise Context

Technology

The influence of technology on society is considerable, and often of primary significance for the manner in which society is arranged and can be characterized [Achterhuis 1992]. An example is the revolutionary influence of information technology that will be sketched briefly in Chapter 6. From a historic perspective, the rate of technology adoption in society seems to increase. Put another way, the time it takes for technology to reach broad utilization among people reduces. Based on data from the American Census Bureau, figure 3.3 shows the time it took for different technologies to reach at least 25% of the American population [Cox and Alm 1996, DiVanna 1997]. The telephone took 35 years, while for the personal computer (PC) only 15 years elapsed to reach that level. For the Internet, the period is five years. Within a few years, the Internet has reached a utilization density for which the telephone network needed 100 years.

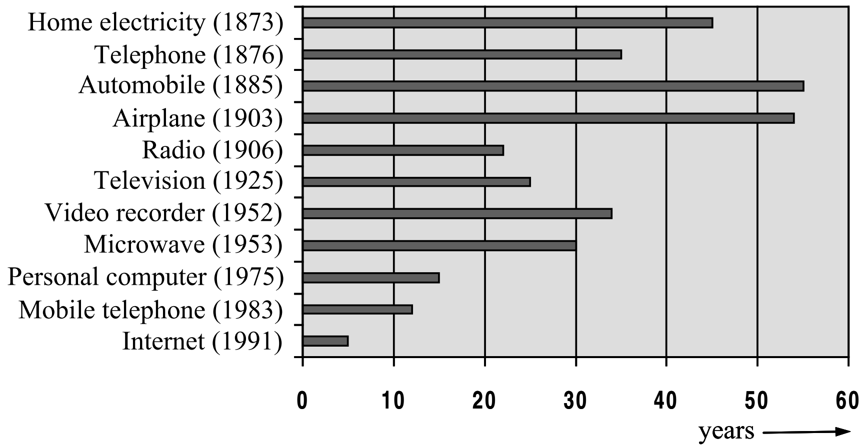


Fig. 3.3. Reduced technology distribution time

Technology-driven dynamics can be appreciated not only based on the time it takes for widespread utilization, but can also appreciated from the relative unpredictability of technology developments and their impact. Uncertainty plays a key role. Generally, uncertainty is the consequence of lack of knowledge, or the inevitable effect of the inherent character of the developments themselves [Wilde 2000]. The latter aspects plays an all-determining role as far as technology progress is concerned. As the story goes, at the beginning of the last century, the director of the American Patent Office proposed closing the office, since everything that could be invented, was already invented. The proposal appeared premature: more than half of all American patents were issued after 1960 [Cox and Alm 1996]. Predicting or assessing technology advancements with reasonable accuracy is virtually impossible. As an illustration, we will mention some examples from the chapter on IT governance. After the invention of the telegraph, the Boston Post wrote in 1865 that “Well-informed people know it is impossible to transmit voice over wires. Even if it were, it would be of no practical use” [In: Bekkers and Smits 1997, p. 5]. In 1943, the president of IBM estimated a worldwide market for about five computers. Not much later (1949) Popular Mechanics magazine stated that future computers probably would not weigh more than 1.5 tons, which in itself would be a considerable improvement compared to the ENIAC computer operating at that time and weighing about 27 tons. Notably, in 1971 the complete computational power of the ENIAC computer was realized on one integrated circuit (IC) with negligible weight [Moore 1997]. One might rightly refer to a digital revolution [Negroponte 1996]. This revolution, further sketched in Chapter 6, has meanwhile led to a wide variety of fixed and mobile devices giving access to various networks. Ever-increasing mobile communication capacity and the convergence of a variety of media has created an 'always on', or 'real-time' society. Miniaturization of microchips enables the incorporation of 'intelligence' in virtually anything. As an illustration: packages can identify their location and washing machines can download their programs from the Internet. One refers to ubiquitous computing, that creates 'ambient intelligence' with the Internet as the all-embracing communication medium: between people, between people and devices, and between devices mutually.

The inability to foresee these developments even approximately also holds remarkably for those closely involved with these developments. Still, at the end of 1970s the then-president of Digital Equipment saw no reason why people would want a computer in their home. Some years later the president and founder of Microsoft considered a storage capacity of 640 Kb sufficient for those desiring such a device in their home anyway [Aarts 2005]. Predictions about the impact of technology on society were no better. In 1929, NBC radio's president predicted that radio would turn out to be the ideal means for establishing the "ideal democracy" [Wilde 2000, p. 69]. Electricity was also viewed as wielding broad influence. According Marshall McLuhan, electricity would "liberate us from city noise, war and violence, and enable us to regain contact with nature" [op. cit., p. 52]. As one of the founders of the Intel microprocessor corporation observes, "As has always been the case with new technology, the most important and revolutionary uses are the ones we can't yet foresee" [Moore 1997]. The inability to predict the impact of technological developments with any practical accuracy has to do with the following factors [Wilde 2000, pp. 73–75]:

- Every technology, alongside its designers' defined intentional use, also has a potential use that is very hard to foresee *a priori*
- A successful technology will be followed by barely predictable new functionalities
- Innovative success depends on complementary innovations that enable the utilization of the initial innovation
- A technology's success depends on many other conditions, such as economic, social, political and demographic factors
- The existing conceptual reference framework implies that the impact of technology innovations and their subsequent systems cannot be understood and fully comprehended
- It is unclear whether, and to what extent, new technologies and their associated new ways of working will replace existing technologies and ways of working.

The uncertainty sketched above is one of the reasons why Chapter 2 argued the organismic way of organizing.

Business

We will use the term ‘business’ to denote the enterprise function: delivery of products and services to customers. Globalization, deregulation, and the removal of trade barriers have changed the character of doing business dramatically. Open markets and increased competition on a worldwide scale (in principle) have increased business dynamics significantly. Technological developments play a dominant role in business domain changes. Information technology is an evident example, for which the underlying driving forces will be sketched in Chapter 6. New forms of business conduct and ways of organizing have been introduced under the ‘e-label’, such as ‘e-business’ or ‘e-government’. Networks of interacting and collaborating customers, employees, business partners and suppliers – with new communication, interaction and distribution channels – are manifestations of this new enterprise context. The ‘business ecosystem’ label has been coined to identify “an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world” [Moore 1996, p. 26].

In this new enterprise context, the traditional distinction between customer and producer, or between product and service becomes less prominent. Through interactive dialog with the supplier, a customer can determine the type of product and service. Other than mass production for anonymous customers, the product or service is delivered for a specific customer. As such, the logic of production is reversed: the customer does not come into play at the end of the production process, but determines the execution of the production process right from the start [Negroponte 1995]. Hence, as depicted earlier in figure 3.1, the situation typical of the industrial revolution is reversed: mass production, based on mass demand, will shift increasingly towards individual production based on individual demand.

In a similar vein, the distinction between physical products and services vanishes. Technology enables complementing physical products with associated services. Well-known are various services that are offered in conjunction with using a car. The enterprise might thereby shift its focus from producing cars towards delivering mobility services.

Economic analysis shows that globalization, deregulation and the removal of trade barriers have stimulated enterprises to develop new products and services. The number of new products has tripled since 1980 [Cox and Alm 1996]. The shorter life-cycle of products and services can also be mentioned. Renewal thus occurs more frequently. For example, at the end of the 1970s the life-cycle of electronic consumer products lay between three to six years. Ten years later this had already been reduced to one year [Haaf et al. 2002]. More variations of the same product also reached the market. Roughly over the same period, it was not only the product life-cycle which reduced significantly, but the number of electronic product variations increased tenfold [op. cit.]. Enormous product variations of essentially the same product resulted from more enterprises offering that type of product, but also arose from enterprises offering more product variations. Such enormous variation can be noticed in virtually all areas: from electronic equipment and cars to toothpaste [Cox and Alm 1996].

Technological developments will lead increasingly to the diffusion of business boundaries. A freight carrier might, for example, grow into a producer of logistic services who controls the total end-to-end chain. Within any business domain, the use of loyalty cards for customers can lead to offering financial services associated with the loyalty card. Diffusion of business boundaries is fueled further since information technology, as mentioned previously, makes it relatively easy to add complementary services to the primary product. So the sales of airline tickets can be combined (possibly through business partnerships) with services pertinent to finance, insurance, car rental or hotel reservations. One might even consider home security or animal care while owners are absent. As Moore observes: "A business ecosystem does not respect traditional industry boundaries" [1996, p. 28].

The foregoing sketch suggests significantly increased business dynamics. Experiences of enterprises themselves confirm this picture. Research among 500 top executives showed that they identified the dynamics in their business domain as high to very high [Prahalad and Krishnan 2002]. The speed of change also seems to increase. Longer periods of stability are becoming an illusion. As Zuboff and Maxmin state "Flexibility and agility have replaced long-term planning" [2002, p. 119].

Next to increased dynamics, the increased 'extendedness' is also a typical characteristic of the modern business context. Globalization, the networks of business partners and suppliers, and the offering of complementary services (with the associated diffusion of business boundaries); all these aspects point to a significantly increased extendedness of end-to-end customer and operational processes. Evidently, this 'whole' must operate in a unified and integrated manner. Local disturbances are not contained locally, but affect the whole chain and network.

Informatization

Progress in the area of information technology (in which we will include communication technology) has created massive amounts of data associated with customer and operational processes. Work is no longer merely automated but 'informated' [Zuboff 1989]. Increasingly, work becomes synonymous with 'knowledge work' [Drucker 1992b, 1993]. The management of physical assets – a typical characteristic of the era of the industrial revolution – shifts towards the management of 'intellectual assets'. As Drucker states: "The function of the organization is to make knowledge productive" [Drucker 1993, p. 49].

It seems superfluous to emphasize that knowledge (information) must not be fragmented, but unified and integrated. The IT-enabled networks of collaborating enterprises and employees, and with these networks associated collaborating customers and suppliers, create vast amounts of interconnected and interdependent tasks and functions requiring that information is shared and integrated. The productivity of knowledge thus depends on unity and integration: the enterprise must be directed to "the integration of knowledge into a common task" [Drucker 1992b]. Creating and sharing knowledge is viewed as crucial for gaining competitive advantage [Nonaka and Takeuchi 1995].

As we have seen in paragraph 2.4.5, one can also refer to knowledge at the level of the enterprise itself. According to Argyris and Schön, enterprises can be viewed as cognitive entities that learn and develop knowledge [1978]. Shared knowledge defines the enterprise 'mental map' that determines enterprise behavior as a reaction to, and anticipation of, environmental changes. So, recalling our discussion in paragraph 2.4.5, enterprise learning concerns the increased capacity to address those environmental changes effectively [Kim 1993]. Enterprise learning must be a core competence [Prahalad and Hamel 1990], and is both a manifestation as well as a prerequisite for change. Rightly, enterprises that cannot learn, cannot change [Schein 1993]. This is precisely the reason why Chapter 2 emphasized strategy development as a learning process. It seems obvious that the widespread informatization aids significantly in enterprise learning.

The informatization of enterprises also manifests noteworthy developments concerning the relationships of enterprises with customers (or citizens). Traditionally, these relationships were merely transaction-oriented: the exchange of products or services for some monetary reward. However, as indicated above, informatization has resulted in enormous amounts of data about customers. Effectively exploiting this data enables extending the relationship with customers beyond that of a singular transaction. Rather than a short-term transaction orientation, attention can shift towards a long-term relational orientation. It is argued that the information-intensive enterprise and society enables a shift from the "transaction economy" towards the "support economy", with its focus on supporting customers, civilians, patients, etc., based on the relationships that support-giving enterprises have built [Zuboff and Maxmin 2002].

Organization

The business domain discussed previously has to do with the interface of the enterprise with its environment: delivering products and services to customers. Having defined 'the business', hence *what* is being delivered, nothing has been said yet about *how* the products and services are actually brought about. That has to do with the internal arrangements of the enterprise: its organization. Here the term 'organization' is used broadly, including informational and technology aspects. In later chapters we will distinguish between these categories more formally.

Understandably, business domain changes have an impact on the enterprise organization. E-business services are a case in point. Offering (customizable) products and services to customers through a web portal requires that the internal (back-office) processes have been adjusted (redesigned) such that integrated process execution is safeguarded. Further, collaboration with business partners and suppliers likewise requires extensive processual and informational integration, and entails significant implications for the enterprise organization. Collaborative, computer-supported activities and structures aid the processual and informational integration. Chapter 2 emphasized the necessary shift from a mechanistic towards an organismic way of organizing. Other than the traditional mechanistic task division, the collaborative approach is directed towards the integration of distributed tasks, whereby coordination, distributed decision-making and knowledge sharing are facilitated [Bannon 1998].

Cooperative work structures, supported by information systems, can help considerably in avoiding rigidity and inertia associated with traditional, formal and hierarchical structures. Centralized data and knowledge can be used within decentralized authorities and responsibilities. Centralization and decentralization are thus not necessarily mutually exclusive: local operational units have the freedom to act within the boundaries of centrally defined directions, norms and values. Appreciably, the traditional organizational structure seems of lower importance: hierarchies and conventional central management become less relevant for networks of teams and individuals connected virtually, and directed towards the cooperative execution of an end-to-end process. In view of this, we have discussed elsewhere the necessity of adopting other human resource strategies due to the influence of information technology on the business and organizational context [Hoogervorst et al. 2002]. Additionally, as extensively argued in Chapter 2, other organizational forms are required due to increased dynamics and complexity facing enterprises. These organizational forms must aid in enhancing enterprise flexibility: the ability to change and adapt. We will return to this issue when discussing enterprise governance. The concept of (enterprise) architecture will turn out to be a crucial concept for a unified and integrated organization, with flexibility as an important area of concern.

The enterprise environment previously sketched in brief can be characterized as:

- Significantly increased environmental dynamics and the importance of enterprise flexibility to respond adequately to the dynamics experienced or anticipated
- Many actors in a business 'ecology': customers, employees, business partners and suppliers
- Multiple access channels and interfaces used by the actors
- A high degree of mutual collaboration, hence a high degree of interdependencies
- Wide-ranging enterprise 'extendedness': collaboration and interdependencies are not confined to traditional enterprise boundaries ('extended enterprise') since processes extend to the domains of customers, employees, business partners and suppliers
- The necessity for extensive processual integration
- Massive amounts of process-related data that alter the informational relationships between actors within the enterprise context fundamentally
- The necessity to realize transparency, coherence and consistency for immense amounts of data, enterprise-wide
- Legislation that requires transparency, coherence and consistency concerning (financial) data, such that responsibilities concerning the enterprise's financial state of affairs can be effectuated (compliance).

In and of themselves, the characteristics of the aforementioned developments emphasize the importance of unity and integration. A lack thereof leads to more severe consequences, since influences are manifest over a far more extended area.

3.2.2 Strategy Development

As we have mentioned earlier, enterprises are intentionally created, goal-oriented, social entities. On an overall level, the intentionality and goal orientation can be expressed by the enterprise *mission*. This can be seen as a relatively timeless general expression of the enterprise purpose, its reason for existence: the 'why' and 'whereto' of the enterprise. Within the general expression about the enterprise purpose, more specific, partly time-dependent, goals are relevant. These goals might relate to, or be determined by for example: (1) customers and the sales and interaction channels to be used, (2) the type of products and services, their quality, and the effectiveness and efficiency of their internal production, (3) the resources required, and (4) the environmental conditions of the enterprise, such as the market, competitors, as well as general economic developments. Certain conditions and convictions (norms and values) play a role, and determine under which principles the enterprise will carry out its mission and realize its goals. Two fundamentally different approaches in this respect have been outlined in Chapter 2. Clearly, an enterprise that also aims to offer meaningful work and aims to contribute to society, will most likely formulate associated goals, and will bring its internal arrangements (its design) into correspondence with these objectives. Choices the enterprise makes have to do with its goals and the conditions (among which the internal arrangements) under which these goals are to be achieved. We will define *strategy* as *the totality of choices (or intentions) that provide an overall orientation for the future development of the enterprise*. That is not to say that these choices are necessarily totally free. Emerging developments and the interdependence of an enterprise and its context (cf. paragraph 2.2.2) are likely to induce, or limit, strategic choices.

As the definition expresses, a strategy offers an orientation for future developments rather than a blueprint. Clearly, after having defined strategic choices it still remains unclear how the strategic choices are actually operationalized. Strategy must thus be distinguished from the plan(s) to make it happen. This distinction is sometimes ignored: "Strategy is a plan" [Daft 2001, p. 57]. Or comparably, strategy is "top management's plan to attain outcomes consistent with the organization's mission and goals" [Wright et al. 1992, p. 3]. Nonetheless, the question as to *how* to operationalize the strategic choices is important, and all too often is not addressed, or only inadequately. Paragraph 3.2.4 will show that the design perspective is required for addressing the question properly as to how strategic choices must be realized.

Many views exist about the way an enterprise strategy is developed. In their book 'Strategic Safari' Mintzberg et al. discuss ten different schools of thought [1998]. An important dividing line between these schools of thought is formed on the one hand by people advocating that strategy development is a *planning* process, and on the other by supporters of the view that strategy development is first and foremost a *learning* process. Respectively, these two distinctions closely resemble the *rational* thinking and *generative* thinking perspective on strategy development [Wit and Meyer 1999]. Despite the 'bounded rationality' mentioned in paragraph 2.3.4, the rational thinking perspective holds that issues facing the enterprise are sufficiently clear, and that analysis of relevant data will reveal the strategic direction that needs to be chosen. The process is linear: from analyzing data and formulating strategic objectives, to planning the relevant implementation projects. Proponents of the planning view see strategy development as having the following characteristics:

- A managed, formal process, divided into clearly discernible steps
- Suitable for rational decision-making
- Guided from the management top of the enterprise
- The process output is considered specific enough to implement the strategy directly (goals, budgets, targets, plans).

Notably, these characteristics clearly reflect the governance approaches mentioned briefly in Chapter 1, and reflect the mechanistic governance viewpoint outlined in Chapter 2.

In addition to our discussion in paragraph 2.3.4, we reiterate that planning is a formal procedure to realize a predefined specific result. This formal procedure requires *analysis* of the desired result, such that tasks and their time sequence can be defined, as well as resources. Planning is thus essentially reductionistic: the decomposition in (preferably quantitative) categories. Moreover, planning leads to *programming* the enterprise: the assignment of tasks, targets, responsibilities, budgets and other resources for achieving goals and objectives, including the necessary means of control [Wit and Meyer 1999].

To the contrary, the generative thinking perspective acknowledges that enterprise issues only become clear through interactive actions. Interpretative, intuitive and synthetic reasoning underlies the iterative actions. Generative thinking points to an incremental process: "Making strategy involves sense-making, reflecting, learning, envisioning, experimenting and changing the organization, which cannot be neatly organized and programmed" [Wit and Meyer 1999, p. 100].

Evidently, the value of planning is unquestioned in various cases, like building an aircraft, or arranging a wedding ceremony. However, developing a strategy, or trying to obtain the married status are not among those cases. These are emerging phenomena. We feel planning should not be associated with a strategic perspective, but with a tactical one: it concerns the deployment of the totality of means such that the specifically articulated result is achieved. In short, planning has to do with realizing already-made choices. Strategy development on the other hand has to do with establishing those choices. Successful implementation of strategic choices is not likely to be expected when choices are conflicting, hence when they are not mutually consistent and coherent. Evidently, the set of choices must form a unified and integrated whole. Strategy development is therefore all about *synthesis*, as the generative thinking perspective emphasizes. Unlike planning, the perspective is not reductionistic, but *holistic*. As Chapter 2 has illustrated, the planning approach is deeply rooted in management thinking: "To many writers planning is the only way to manage the future" [Mintzberg 1994, p. 15]. Noteworthy are the words 'only' and 'manage'. Within the planning vision, as the only possible vision, the future is thus fully contained within the domain of human control.

Many factors play a role when establishing strategic choices, among them commercial, economic, societal, political and technological developments. It seems no exaggeration to submit that these factors result in a very complex and dynamic enterprise context, as indicated previously in Chapter 2 and paragraph 3.2.1. We have seen that such context, understandably, is associated with a high level of uncertainty and unpredictability. Predicting important developments, let alone controlling them, lie outside management capabilities to a considerable degree. In itself, this constitutes an important reason why it is not fruitful to consider strategy development as a planning process. In the chapter about IT governance, the untenability of the planning vision on IT strategy development will be argued comparably. This holds, *mutatis mutandis* for the enterprise as a whole.

The dynamic complexity sketched earlier necessitates adaptations and incremental developments, whereby the strategy is adjusted continuously in view of the uncertain, and inherently unpredictable future. Developments in the era of the industrial revolution, as paragraph 3.1.2 briefly indicated, were evolutionary and emergent, hence, hardly predictable. Chapter 2 emphasized that changes in products and services do not occur because we are *planning*, but because we are *learning* [Stacey 1993]. Also in an operational sense, quality improvements concerning products and services, and their production, are the result of learning processes. The Japanese attention devoted to quality improvements is therefore associated with emergent, rather than with planned developments. The notion of kaizen points to the process of gradual, incremental improvements [Imai 1986, Rehfeld 1994]. Therefore, the strategy that is ultimately realized rests for a large part on emergent developments [Mintzberg 1994]. That is why the concept of enterprise learning has been stressed in paragraph 2.4.5, seen as an employee-centric concept. Indeed, and contrary to the management oriented, top-down perspective, various cases illustrate that most innovative ideas come from within the enterprise and not from the top [Christensen 1997, Moss Kanter et al. 1997]. Others have reported about innovative product and service developments defined by communities of customers and expert groups [Bloem and Doorn 2006].

The importance of incremental, more emergent strategy development is supported by research by Collins and Porras into highly excellently-performing enterprises [1994]. Twelve myths were debunked, among them the myth that their success was based on brilliant strategic planning. On the contrary: experimenting, trial and error, opportunism and coincidences lay at the core of success. Recalling our observations in paragraph 2.3.5, successful enterprises thus show an adaptive, opportunistic development of strategy [Key 1993]. Apart from the internal organizational context that enables such an approach, it seems clear that those characteristics hardly compare with the structural, mechanistic, top-down vision portrayed in Chapter 2.

In view of the dynamic enterprise complexity sketched earlier, the notion of long-term planning seems of little relevance. As Zuboff and Maxmin state: "Flexibility and agility have replaced long-term planning" [2003, p. 119]. Evidently, many conditions have to be satisfied for making strategy development possible as a learning process. An organizational culture that supports and stimulates learning is crucial. The way strategy development takes place thus bears heavily on the arrangement (the design) of the enterprise itself. Strategic learning is thus an important area of concern. As will become clear later, enterprise architecture is a key concept for addressing this concern through enterprise design.

The perspective on strategy development presented above constitutes an important reason for the competence-based view on governance that will be discussed further in paragraph 3.2.5.

Given the Western propensity towards the mechanistic way of organizing, as outlined in Chapter 2, an interesting question is whether there is indeed a Western bias towards the rational/planning perspective on strategy development, while Eastern countries would tend to favor the generative thinking/learning perspective. In addition to our observations in paragraph 2.1.4, a considerable weight of evidence indeed seems to indicate the aforementioned preferences [Ohmae 1982, Rehfeld 1994, Locke 1996]. Within the United States and other English-speaking countries (e.g. Britain, Canada, Australia) enterprises appear to favor the rational/planning perspective, whereas Japanese firms generally distrust corporate strategic planning [Wit and Meyer 1999]. As indicated previously, the generative/learning perspective is associated with incremental, continuous improvement-focused, emerging strategy development, which appears to be characteristic for South-East Asia [op. cit.]. Traditionally, European enterprises showed a somewhat midway picture, but are influenced increasingly by Anglo-Saxon dominated management thinking and its associated rational/planning perspective.

3.2.3 Important Strategic Choices: Position and Perspective

Strategic choices can be divided into two main categories, identified as '*position*' and '*perspective*' [Mintzberg 1994]. The 'position' category concerns the choices about products and services that the enterprise intends to deliver to customers, as well as concerning the choices about the type of customers aimed to be served. This category also has to do with choices about the market and the relative position against competitors that is to be gained or maintained. Under the 'perspective' category is understood the basic notions about the manner by which the products and services are produced. Hence it concerns the way of working. Norms and values are part of the 'perspective' since they determine the mode of working to a considerable extent.

Anticipating the discussion in the next chapter about the enterprise viewed as a system, the 'position' category can be associated with the enterprise *function*.

As mentioned earlier, it concerns the enterprise business: *what* is delivered to customers. The 'perspective' category (norms, values way of working) can be associated with the *construction* (the arrangement) of the enterprise. Figure 3.4 depicts both categories schematically.

Other than the continuation of the current position and perspective, strategic choices can imply changes in position or perspective, or both. All changes necessitate a new enterprise design. Changes that only alter position are relatively uncomplicated, since the way of working – the perspective – remains essentially similar (in theory). This is not the case for changes in perspective, whereby changes in norms and values and the way of working are on order. Those changes are seldom simple. The term 'transformation' rightly applies so often. In theory it is possible that a new position can be obtained within the same perspective. However, frequently a new position will require a new perspective. The development of a new position in relation to an e-business strategy is an example.

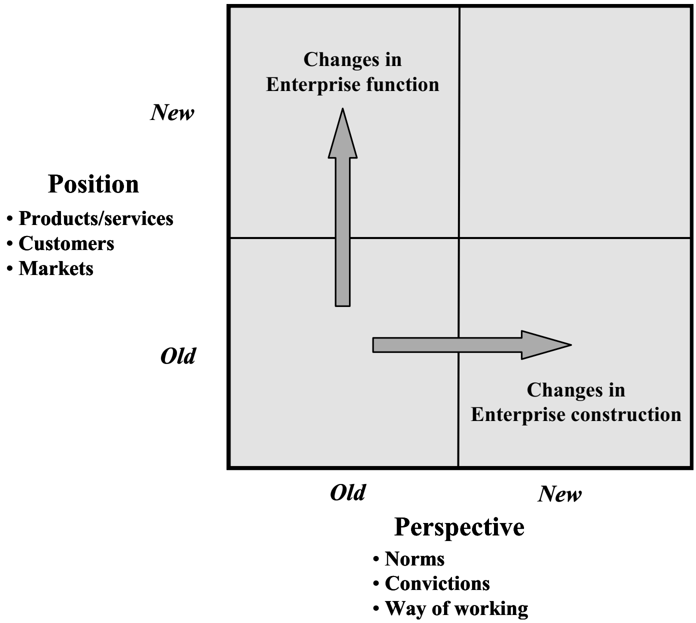


Fig. 3.4. Strategic choices: position and perspective

3.2.4 Conditions for Implementing Strategic Choices Successfully

The track record of implementing strategic choices successfully is rather poor. Some publications speak of a success rate less than 10% [Mintzberg 1994, p. 25]. This rather low figure compares with other sources. According to Kaplan and

Norton, many studies prove that between 70% and 90% of strategic initiatives fail, meaning that the expected result is not achieved [2004]. Studies concerning a specific strategic domain also portray a similar picture. Those studies deal with total quality management for example [Oakland and Porter 1994], business process reengineering, business process management, [Burlton, 2001, Smith and Fingar 2003], six sigma [Eckes 2001], e-business [Kalakota and Robinson 1999], customer relationship management [Kirby 2001], and mergers and acquisitions [Woolridge and Hayden 2002]. Remarkably enough, the high failure rate hardly receives any attention. All too often, failure is attributed conveniently to unforeseen or uncontrollable external events, precisely the aspects the mechanistic approach ignores.

The importance of unity and integration has been mentioned a number of times previously. Networks of collaborating enterprises and employees, and with those networks interacting customers and suppliers, create an abundance of interconnectivities and interdependencies of functions and tasks, and associated information. This requires unity and integration at the processual and informational levels. A plethora of research exists that indeed shows that failing (strategic) enterprise initiatives are primarily the consequence of a lack of unity and integration [Miles and Snow 1984, Beer et al. 1990, Kaufman 1992, Kotter 1995, Hoogervorst 1998, Galliers and Baets 1998, Pettigrew 1998]. Of utmost importance is the strong relationship between unity and integration on the one hand, and enterprise performance on the other [Lawrence and Lorsch 1967, Powell 1992]. According to the *congruence theorem*, enterprises will operate more effectively, and perform better, the higher the degree of unity and integration – the coherence and consistency of various enterprise aspects [Nadler and Tushman 1997]. Figure 3.5 depicts the congruence theorem graphically. As Collis and Montgomery observe: “In a great corporate strategy all elements (resources, business, organization) are aligned with one another” [In: Kaplan and Norton 2001, p. 162].

Through various labels, the notion of unity and integration has been emphasized, such as ‘internal structural fit’ [Lawrence and Lorsch 1967], ‘organizational

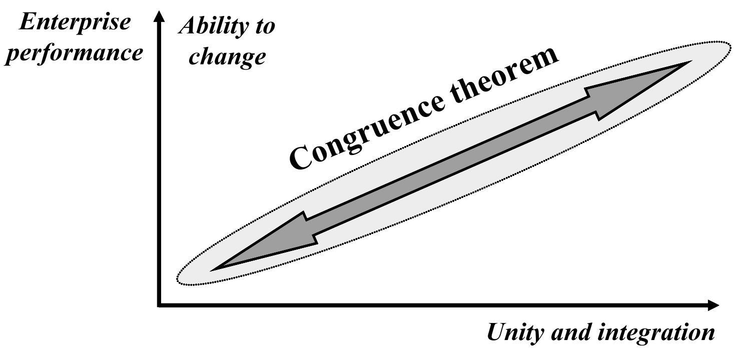


Fig. 3.5. The importance of unity and integration

alignment' [Powell 1992], or conversely of 'structural conflict' [Fritz 1996] in case unity and integration is absent. Unity and integration have also been emphasized with reference to the success of enterprise change: "Research has clearly linked segmentation and incoherence to organizational inertia, and integration and coherence to change capability" [Pettigrew, 1998, p. 287]. Failing information technology introductions have also, as will be discussed further in Chapter 6, to do with a lack of unity and integration of IT with its enterprise context.

Frameworks can be found in the literature asking that attention be paid to unity and integration and that its importance be stressed. A framework can be seen as a set of related areas of attention that need to be addressed concurrently in order to establish the unity and integration emphasized. An example of such a framework is the '7S framework' of McKinsey depicted in figure 3.6 [In: Peters and Waterman 1982]. It is argued that for an enterprise to be successful, the seven areas of attention must be dealt with in synchronization. Comparable areas of attention are given in the MIT framework [Scott Morton 1991]. In a similar vein, also from within the total quality movement, a framework with areas of attention is presented [EFQM 2003].

However although the notion of unity and integration stressed by those frameworks is evidently important, it remains unclear whether the areas of attention given are comprehensive (necessary and sufficient), while it also remains unclear *how* unity and integration is established. We will address unity and integration formally from the concept of the enterprise as a system, with enterprise architecture as the normative guidance for integrated design.

The seriousness of the inability to realize unity and integration – coherent and consistent design – becomes increasingly detrimental. Indeed, the developments discussed earlier, with labels like network economy, e-business, supply chain management, extended enterprise etc., require extensive business, organizational, informational and technological integration [Kalakota and Robinson 1999, Moss

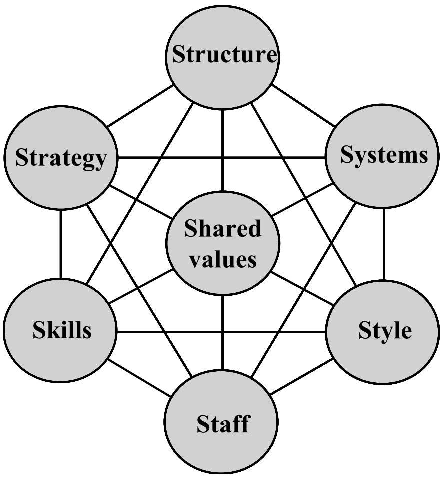


Fig. 3.6. 7S Framework

Kanter 2001, Stanton and Hammer 1999, Vervest and Dunn 2000]. It is not surprising therefore, that research among more than 500 CEOs identified the transformation towards a new business model, and the successful integration of new technology into the organization as the top-two challenges [Pohlmann 2001]. Such integration again points to coherent and consistent design, since technology in and of itself cannot establish integration [Turner 1998]. Notably, a study about strategy implementations reported that the ability to actually implement strategic choices coherently and consistently turned out to be more important that the quality of the strategy choices itself [Kaplan and Norton 2001]. Once again, in addition to the remarks made earlier, this provides further confirmation that the organizational competence for establishing integrated enterprise design is crucial. For this competence, the theory and methodology discussed in this book are considered indispensable.

3.2.5 Central Governance and Local Freedom

The Central Governance Role

We have illustrated that enterprises are exposed to considerable dynamics created by external forces that have to do with the market for example, or customer behavior, governmental activities, the economy, technology developments or the geopolitical situation. Moreover the enterprise creates its own dynamics, such as through reorganization, business cooperation, a merger, acquisition or new product and service development. Thus dynamics are created by changes in strategic position and/or perspective, as mentioned in paragraph 3.2.3. As we saw in paragraph 3.2.2, these changes emerge in an evolutionary, learning process. In the context of these dynamics and their associated uncertainty, strategic choices have to be made and operationalized. Most likely strategic choices will also be made with respect to certain areas of concern that the enterprise considers important, such as flexibility and time to market in order to respond adequately to enterprise dynamics, the quality of products and services, customer satisfaction, process excellence, safety, costs, or compliance with rules and legislation. Evidently, the strategic choices and concerns can only be addressed through the arrangement (the design) of the enterprise itself: its organization. Various aspects determine the character of the enterprise organization. Anticipating our later discussion, we might consider obvious aspects like processes and technology (e.g. IT), but also the culture (norms and values), human resources management, and employee behavior are important aspects of the enterprise organization. Hence an important question is, how to guide and operationalize these developments and concerns into a unified and integrated enterprise design. The governance competence is essential for that.

The topics just discussed are shown at the left-hand side of figure 3.7. Considerable uncertainty is associated with all three domains. Indeed, how can it be simply known what kind of specific strategic choices are to be made? How should areas of concern be addressed? And how should all that be operationalized in a coherent and consistent organizational arrangement, such that plans can be defined precisely and executed in a top-down strategic planning fashion? Chapter 2 has portrayed the mechanistic, top-down, and planning-oriented perspective as hopelessly naive. The vision on strategy development presented in paragraph 3.2.2 constitutes an important ground for the competence-based governance approach. Other than the rigid characteristics of the formal, management-oriented, planning-oriented governance perspective, it is this governance competence that interprets the environmental dynamics which are partly technology-driven; that operationalizes – works out and details – vague, generally formulated management-defined strategic intentions into possible enterprise developments, whereby strategic transition barriers are addressed. It is this governance competence that aids, sustains and enables the enterprise-wide emerging strategic learning process with its inherent uncertainties and interdependencies, and is an active stimulating participant in this process. It is this competence that can synthesize learning into a coherent and consistent set of choices; and can subsequently operationalize the choices into a coherent and consistent enterprise design. Next to these developments, it is this competence that – other than the linear, top-down, planning view suggests – initiates enterprise developments bottom-up, which anticipates possible business developments and their associated dynamics. It is this competence that constitutes and shapes the strategic dialog through the (in)formal social interaction and participation of stakeholders. Finally it is this competence that ensures a unified and integrated design and its implementation. This competence, and the core competencies within, are the topic of later discussion.

The central role of governance competence is likewise shown in figure 3.7. In accordance with our earlier remarks, enterprise engineering is shown as the theory and associated methodology for establishing a unified and integrated enterprise design. The typical non-mechanistic characteristics of the governance process, which we will illustrate in the chapter about IT and enterprise governance, are also indicated in figure 3.7.

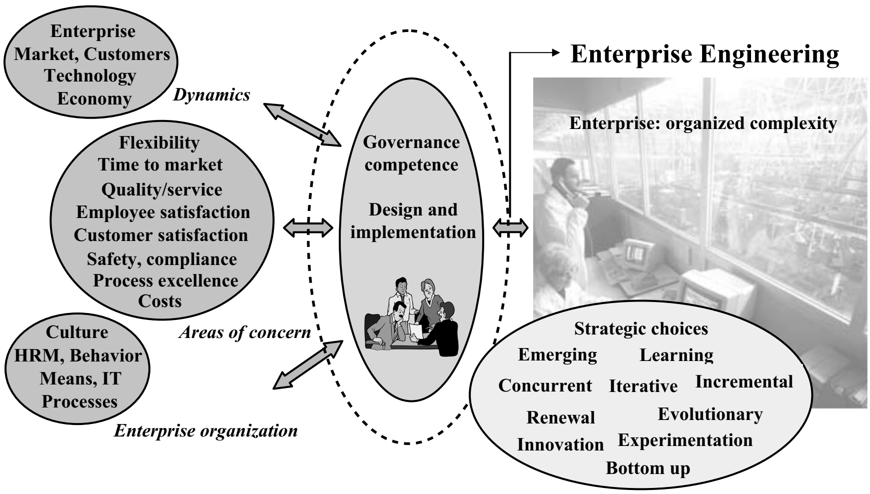


Fig. 3.7. The central role of the governance competence

Local Freedom and Self-Organizing Versus Central Governance

In view of enterprise performance and the ability to change, paragraph 3.2.4 argued the importance of unity and integration. Ensuring unity and integration (through design) is a central purpose of governance. In order to fulfill this purpose adequately, governance must obviously be exercised at the same level as that for which unity and integration is required. So, for example, one can hardly expect unity and integration for certain governmental endeavors at the overall country level if governance is only exercised at lower regional or city levels. The creation of autonomous police regions without any central governance is thus unlikely to yield a unified and integrated overall country police capability. Overall strategic initiatives will thus most likely fail.

One might observe that the obvious truth about the level where governance must be exercised is not always recognized: the governance competence is often absent at the level where unity and integration is factually required. Nonetheless, the very purpose of governance in an enterprise necessitates positioning governance centrally at the corporate level: affecting the enterprise as a whole.

For a considerable part, the organismic way of organizing rests on employee self-organization and self-initiated behavior, as discussed in Chapter 2. Hence, the question might be raised whether the central governance role does not conflict with the organismic perspective. Before answering this question, we might notice that this issue is yet another of the fundamental tensions with which enterprises have to cope. Next to addressing both stability and instability, as well as differentiation and integration, there is the additional issue of having both central governance and local freedom.

In answering the aforementioned question we submit that central governance and local freedom are not necessarily mutually exclusive. From a general societal standpoint it is argued that unbounded freedom leads ultimately to loss of individual freedom. Some economic, political and civic arrangements are required for the actualization of individual freedom [Fromm 1941]. Total anarchy is thus limiting freedom, rather than making it possible. Exploiting individual freedom assumes at least so much governance that individual freedom is enabled. So, for example, traffic rules enable the freedom to drive. For enterprises, conditions for the organismic way of organizing must be designed, as stated previously. So paradoxically, the ability for local freedom and self-organization depends on some central governance that ensures that conditions for local freedom and self-organization exist. In addition, adequate governance can assist greatly in making local initiatives viable and fruitful. Worldwide standards for music CDs have enabled the worldwide music industry to flourish based on local self-organizing initiatives. Within enterprises, employee-developed initiatives pertinent to offering new customer services would benefit greatly from governance-defined principles concerning customer data. Not seldom, central governance rules are accused of stifling creativity. The previous examples might argue to the contrary. To give a final example, writing occurs by using certain rules and a limited set of letters and characters. Has there been anybody complaining that this limited set stifles creative writing?

Finally, central governance can assist not only in making local initiatives viable and fruitful, but is also essential for assessing and coordinating local initiatives such that unity and integration is safeguarded at the enterprise level despite the fact that various units performing in the end-to-end process have creative ideas concerning their part of the process, as figure 3.8 shows schematically. Not seldom, local initiatives concerning the development of information systems jeopardize the seamless execution of an end-to-end process. So local units have the freedom to act within the boundaries of centrally defined principles. Adding to the remarks made earlier, centralized governance is not about monopolizing thinking and initiatives (like central planning), but is to aid, nourish and enable emerging local initiatives and guide them such that unified and integrated enterprise operation is established and maintained.

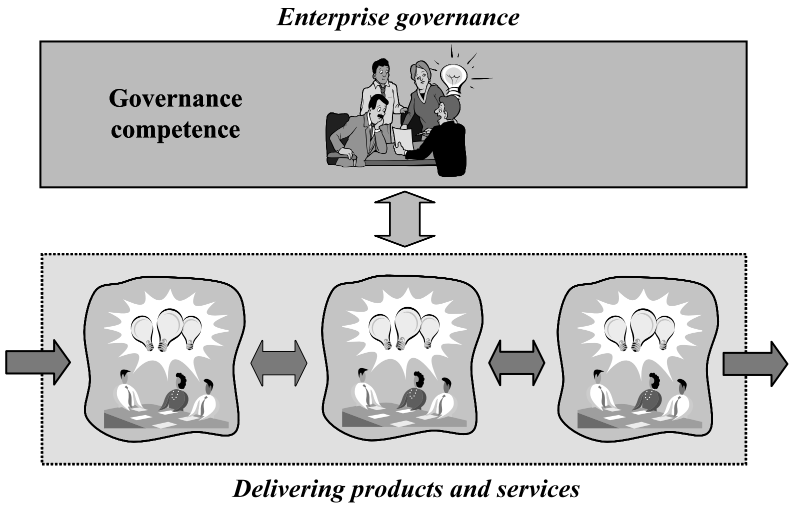


Fig. 3.8. Central governance for enabling local initiatives

3.2.6 Enterprise Alignment and Enterprise Enablement

The three governance themes outlined briefly in the introductory chapter were shown to be heavily dominated by mechanistic thinking. Governance is structurally oriented and associated with top-management, whereby in a top-down, planned fashion strategic directions are supposedly operationalized in enterprise arrangements. This perspective can be labeled as 'enterprise alignment': enterprise arrangements (its design) follows the enterprise strategy and should be congruent with the strategy. The alignment perspective concurs with Chandler's well-known maxim 'Structure follows strategy' [1962].

A fundamentally different perspective is obtained by taking the opposite position. The focus is thereby on enterprise arrangements that make new enterprise strategies possible. This alternative perspective is identified as 'enterprise enablement', whereby the design of the enterprise enables the emergence of new strategic directions. Both perspectives are shown schematically in figure 3.9.

We might observe that the notions of 'HR alignment' and 'HR enablement' discussed in paragraph 2.4.7 are specific instances of the themes introduced above. In the chapter about IT governance, the notions of 'IT alignment' and 'IT enablement' are introduced with a similar connotation. All enablement perspectives convey the same central message: the design of the enterprise – such as concerning the employment of employees or the use of IT – enables the emergence of new (strategic) enterprise developments.

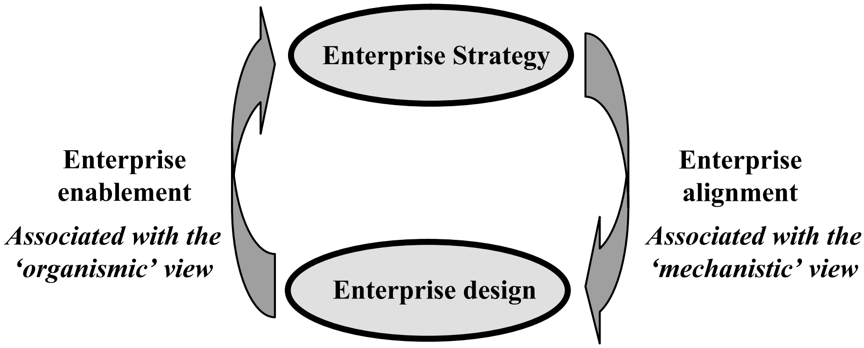


Fig. 3.9. Enterprise alignment and enablement

Obviously, the enablement perspective does not fit inherently within the mechanistic governance approach. The latter approach seems to be more associated with the notion of enterprise alignment, although – as we will argue in the case of business and IT alignment in Chapter 6 – the mechanistic approach is ineffective in operationalizing the notion of alignment. Given the characteristics of the organismic way of organizing, outlined in Chapter 2, this way of organizing is essential for the enterprise enablement perspective to be possible and effective. Further, enterprise enablement rests on adequate enterprise design, for which the organismic way of organizing is an essential aspect. In line with our observation in the introductory chapter, enterprise design must thus be a central area of attention within governance activities.

3.3 Employee Behavior and the Behavioral Context

3.3.1 Characteristics of Employee Behavior

The key distinctions between mechanistic and organismic ways of organizing have been outlined in Chapter 2. Within the mechanistic approach the emphasis lies on formal, predefined task structures, task content, rules and procedures.

The characteristic is *formalization*. Workers were seen as parts of the organizational 'machine'. Within this vision, enterprise performance will be higher, the more workers comply with predefined task content, rules and procedures. Emphasis lies on routinizing, control, planning, and (assumed) predictability. Within the mechanistic view the characteristics of employee behavior amount to no more than instrumental behavior: complying with the predefined way of task execution.

Contrary to the mechanistic view, the organismic perspective considers self-organizing capabilities as essential, resting on possibilities for employee self-initiated behavior (cf. paragraph 2.4.6 and 2.4.7). Contrary to detailed task descriptions, rules and procedures, that regulate employee behavior in a pre-defined manner, there is room for employee-initiated behavior, whereby shared goals, as well as norms and values, provide an important guiding behavioral context. Chapter 2 argued the importance of employee involvement for productivity, service, quality and enterprise learning, as well as for the capacity to change. As Drucker states: "Aspects of human behavior are the primary facts of management science" [1985, p. 510]. Not the operational, but the 'social system' determines the health of an enterprise [op. cit.].

Employee-initiated behavior is thus an important overall behavioral characteristic within the organismic perspective, and has to do with the ability to undertake action. More specific examples of behavioral characteristics, or dimensions, can be identified briefly as follows [Hoogervorst 1998]. Self-initiated behavior is evidently relevant with respect to continuous improvement in the areas of productivity, quality, and service. Continuous improvement requires behavior directed towards removing errors and increasing performance. The *achievement* dimension characterizes behavior directed at reaching goals. Hence the dimension expresses a desire to achieve [Moss Kanter 1983], and a drive to accomplish [Crosby 1980]. Others refer similarly to being performance-driven or showing an "intrapreneurial attitude" [Leonard-Barton 1992]. Improvement rests for a large part on employee creativity and the generation of new ideas, as expressed by the *creativity* dimension. This dimension characterizes behavior of employees concerning ideas and solutions to solve work-related problems or improve processes. Hence the dimension expresses the ability to think, and reflects the spirit of innovation [Argyris 1993]. Creativity is required further to address organizational contingencies, thus to deal with uncertainty and unpredictability [Easterby-Smith 1990]. Self-renewal and self-organizing have been identified as crucial for organizational continuity. An enterprise learning process was shown to aid the process of self-renewal and self-organizing. In this respect, the *openmindedness* dimension expresses employee behavior reflecting an openness to change [Armstrong 1992]. Others speak of responsiveness to the need for change [Drucker 1985], or employee flexibility [Kharbanda and Stallworthy 1991]. As illustrated, productivity, quality and service improvements, as well as enterprise learning, require employee involvement and participation as an essential underlying principle. Numerous authors have addressed the issue of participation from both the organizational performance perspective [Deming 1986, Heskett et al. 1990, Juran 1991, Schneider and Bowen 1993, Dean and Bowen 1994], and from the human resource perspective [McGregor 1960, Likert 1965, Sashkin 1989]. Participation is conditional for dedication and loyalty, as well as for self-development. Hence, the *participation* dimension expresses behavior that shows involvement with, and integration into, the organization. Finally, productivity, quality, and service require an end-result and goals-related behavioral focus. Contrary to departmentalism [Moss Kanter 1983], behavior should thus reflect a clear sense of the enterprise purpose and mission [Juran 1992]. As the fifth and final characteristic therefore, the *mission-attitude* dimension expresses behavior directed towards the enterprise end-product, and aligned with the enterprise purpose and mission.

In line with our earlier remarks, the required behavioral characteristics do not develop spontaneously and incidentally. Put another way, the conditions that are conducive to desired behavior must be created intentionally, hence must be designed. These conditions are called the 'behavioral context'. As Ghoshal and Bartlett observe, "Rather than focusing on changing individual behaviors, the more important challenge is to change that internal environment – what we call the behavioral context – that in turn influences people's behavior" [1997, p. 142]. Aspects of the behavioral context will be discussed below.

3.3.2 Behavioral Context

Internal organizational arrangements create the behavioral context in which employees operate. We will argue that three predominant, mutually related aspects, largely determine the behavioral context, and are thus determinants of employee behavior: (1) enterprise culture, (2) the management practices and (3) the various organizational structures and systems [Hoogervorst 1998]. This behavioral context can be seen as a source of implicit (intentional or unintentional) communication to employees, thereby affecting behavior, since the context signals to employees what is (apparently) expected and valued [Hoogervorst et al. 2004]. Rather than the espoused practices and values, the behavioral context manifests the practices and values in use [Argyris 1976, Weick 1995]. Because of their determining influence on employee behavior, the three aspects of the behavioral context are key success factors with respect to the organismic way of organizing. We will discuss these three important behavioral determinants briefly in order to illustrate their influence on employee behavior. We will subsequently argue their mutual relationship to support the position that behavioral change can only be sustained under consistency and coherence concerning the variables determining behavior. This further supports the arguments presented in paragraph 3.2.4 about conditions for strategic success. Behavioral determinants constitute the behavioral context. The argued focus on this context concurs with the observation of Ghoshal and Bartlett stating that "The power of the behavior context lies in its impact on the behavior of individual organizational members" [1997, p. 173]. Figure 3.10 shows the points made schematically.

Notably, in paragraph 2.2.1 we argued that people and their contexts are not independent entities, but are in a relationship of mutual creation: "People are both products of their context and participants in the shaping of those contexts"

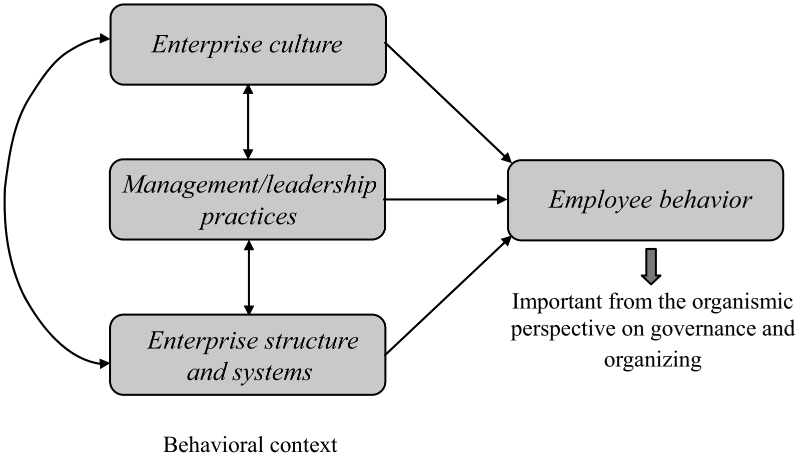


Fig. 3.10. Employee behavioral context

[Hosking and Morley 1991, p. 7]. One might thus argue that a second order effect plays a role in the behavioral context because employees themselves influence behavior. This second order effect is not depicted in figure 3.10, but when discussing organization design domains in Chapter 7, we will address this issue by introducing 'employees' as a formal design domain.

Enterprise Culture

Broad attention for organizational culture was driven by a crisis that was felt about enterprise performance in the 1980s [Dahler-Larsen 1994]. Many studies argued a relationship between cultural aspects and enterprise performance [Denison 1990, Kotter and Heskett 1992, Gordon and DiTomaso 1992]. Two views on culture can be mentioned. The first is based on a *descriptive* approach to culture, showing more attention for manifestations of culture, and addressing culture on the level of *form* [Trice and Beyer 1984]. Culture is thus seen as something the organization *is* [Meyerson and Martin 1994, Morgan 2006]. Within the second view the *normative* aspect of culture is emphasized [Hofstede 1991, Schein 2004]. Culture is then viewed as something the organization *has*. From this perspective, culture refers to basic values and beliefs that serve as guidance for behavior. As such, culture is seen as the product of group members' experiences and is considered a group characteristic [Rousseau 1990]. Hofstede speaks of the "collective programming of the mind" which is learned and derived from one's social environment [1991]. Further, culture is considered a relatively stable phenomenon that is preserved even if group members change. Therefore, as mentioned in paragraph 2.4.5 about enterprise learning, enterprises have a 'cognitive' system and memory, since as Weick observes, "Individuals may come and go, but organizations preserve knowledge, behaviors, mental maps, norms and values over time" [1994, p. 72]. Culture operates as a "social control system" providing behavioral guidance

[O'Reilly 1989]. In other words, culture communicates how things ought to be, and defines the "unwritten rules of the game" [Scott-Morgan 1994]. Enterprise culture can thus either support or frustrate enterprise goals.

Various authors indicate that next to the learning process through social interaction, (top) management activities also offer important impulses for initiating culture change [Deal and Kennedy 1982, Peters and Waterman 1982]. This points to the symbolic aspect of management that influences the beliefs and values of employees [Bolman and Deal 1994]. Schein considers the creation and management of culture the only thing of real importance to leaders [2004]. Seeing culture as behavioral guidance, cultural characteristics should be, or become such, that desired behavior is developed and maintained. Fundamentally, culture can act as an aggregated form of behavioral regulation, and can replace some of the traditional mechanistic structures of control [Koopman 1991].

Behavior regulation is thus an important aspect of culture. This importance is of considerable significance in view of the continuously present unpredictability and uncertainty that is connected to dynamics and complexity. As indicated previously, much of the enterprise context and reality is unpredictable, ambiguous and chaotic. Referring to paragraph 2.2.2, complex systems might have a principle or condition that allows them to develop an orderly pattern over time. Hence, "Fluctuations, randomness, and unpredictability at a local level, in the presence of guiding or self-referential principles cohere over time into definite and predictable form" [Wheatley 1994, p. 133]. Within enterprises, these principles or conditions giving order can be identified as the normative and value pattern of culture. Despite the complex ranges of roles, tasks and contextual variance, when observed over time, "There is consistency and predictability to the quality of behavior" [op. cit., p. 132]. How one should act in a specific service encounter for example is uncertain and unpredictable. However, the value pattern about quality guides the required behavior into an orderly and predictable fashion. In this sense, culture communicates implicitly what is considered important, and acts as a source for uncertainty reduction [Deal and Kennedy 1982].

In view of the argued importance of the organismic way of organizing and the associated employee self-initiating activities, enterprise culture can also be an important source for enabling self-organizing through appropriate value patterns. This requires trust in employees, as well as trust in the guiding power of values, knowing that they are strong enough influences to guide employee behavior into the desired direction [Wheatley 1994]. Referring to the notion of 'emergence' discussed in paragraph 2.3.5, culture enables the advancement of emergent behavior to create desired overall outcomes and exemplifies the paradox of control: being in control (of overall outcomes) and not in control (of detailed local behavior) at the same time [Stratfield 2001]. Weick provides a comparable observation pertinent to ensuring reliability in enterprise operations [1994]. Centralization (the establishment of desired norms and values) and decentralization (local self-organizing behavior of employees) takes place simultaneously: "This is precisely what culture does" [op. cit., p. 159].

Table 3.1 below summarizes the differences between the traditional, more structure-oriented approach to organizing, and the more culturally-oriented approach.

Table 3.1. Differences between the structural and cultural vision

	Structural vision	**Cultural vision**
Enterprise perspective	Reductionistic	Holistic
Control	Formalistic, rule oriented	(also) Value oriented
Value pattern	Irrelevant	Behavioral guidance, giving meaning
Management	Control focused	Culture (values) focused

Management or Leadership Practices

Traditionally, management is concerned with (personnel) planning, budgeting, and the creation of formal structures that define the machine-like rules of the organizational 'system' [Kotter 1988, Mintzberg 1989]. Appreciably, the traditional view on management is thus associated closely with the mechanistic perspective on organizing discussed in Chapter 2. Fundamentally different views on the role and activities of management are obtained when management is analyzed from the viewpoint of leadership. We will argue that the employee-centered approach to organizing entails management practices based on leadership.

Two important types of relationship can be identified between a person in charge and employees: *transactional* and *transformational* [Burns 1979]. In the case of a transactional relationship, the interaction between the person in charge – the manager – and employees is based on the exchange of valued things, as described by the economic transaction theory. No shared goal is required, while the mutual stimulation is limited, simple and restricted by the elements of transaction, such as monetary reward in exchange for labor. In many cases, the relation between management and employees is purely transactional: a contract that stipulates mutual obligations. The transactional relationship between management and employees neatly fits the mechanistic way of organizing outlined in Chapter 2.

The term leadership has a broader denotation than the organizational domain and has meaning for a wide range of societal aspects. Although the term leadership is sometimes used in the transactional sense, we will reserve this label for a person in charge having a transformational relationship with employees, in an organizational context. One might say that management is about subordinates, but leadership is about followers. In this case, a more complex, deeper and mutually stimulating relationship exists, which is directed to common goals [Burns 1979]. Unlike the top-down perspective, whereby the enterprise is managed as an 'object', leader and followers are co-creating emergent outcomes. The relationship between leader and followers concerns and affects the motivation of followers, based on mutual needs, expectations and values. An important element of leadership therefore concerns moral aspects that shape and give meaning to the relationship with followers, since the relationship is based on more than merely transactional elements. Leadership is about the behavior of followers resulting from the mutually stimulating relationship. As Hock observes: “Compelled behavior is the essence of tyranny, induced behavior is the essence of leadership” [1999, p. 68]. Leadership is to provide meaning, fulfillment and purpose. Max DePree, at that time Chairman and CEO of Herman Miller Inc., the Fortune 500 furniture-making company that was ranked among the ten best managed and innovative companies, has put it eloquently: “To lose sight of the beauty of ideas and of hope and opportunity, and to frustrate the right to be needed, is to be at the dying edge” [1989, p. 21]. Recalling the necessity of employee self-organizing, equally important is stimulating the self-confidence and self-efficacy of followers, which in turn leads to self-actualization. This stimulation rests on trust and integrity. As Bennis notes “Leadership without mutual trust is a contradiction” [1989, p. 140]. Appreciably, trust is important under the continuous presence of uncertainty and unpredictability, which are typical characteristics in the enterprise context. According to Zaleznik, the crucial difference between leaders and managers has to do with the conceptions they have about order and chaos [1992]. Leaders tolerate and can deal with the absence of structure and the presence of uncertainty and unpredictability [Bennis 1989, Zaleznik, 1992]. Empathy, seen as the capacity to identify oneself with the situation, feelings and motives of others, is considered essential for the possibility to create trust, and the ability to motivate people even under uncertain conditions [Burns 1979, Bennis 1989, Zaleznik 1992]. According to Yukl, empathy has been shown consistently to be important for managerial effectiveness [2002]. Ultimately, “Leadership is much more an art, a belief, a condition of the heart, than a set of things to do” [DePree 1989, p. 148]. Table 3.2 below resumes some differences between leadership and management.

Table 3.2. Differences between management and leadership

	Management	**Leadership**
Assumed context	Stable, orderly	Dynamic, chaotic, uncertain
Primary focus	Control, routinizing	Vision, direction, values
Relation with employees	Transactional	Transformational
Primary element in relation	Money	Shared values, goals, trust
Communication	Top-down	Two-way
Style	Authoritative	Coach, guiding

Leadership at all Levels

Leadership in the sense expressed above is not only relevant for upper hierarchical functions, but also relevant for every level in the enterprise. Indeed, every level requires a stimulating relationship with employees, and a translation of enterprise goals into local goals and aspirations. It is precisely these aspects which are often lacking at all enterprise levels [Tichy and Ulrich 1989]. As Kotter observes, leadership at middle and lower levels might be less formidable, but is certainly not less important or fundamentally different [1988]. This leadership with a 'small L' is therefore of 'incredible importance'. Doz and Thanheiser have commented similarly, and stress the importance of transformational leadership at every level in the enterprise [1993].

Since leadership entails a fundamentally different relationship with followers than management with subordinates, the concept of leadership appears to be meaningless within the instrumental and mechanistic perspective, which principally excludes the possibility of leadership. Further, although the employee-centered approach manifests itself differently in different situations, the approach itself is not considered situationally dependent, but rather based on the philosophy that considers employees as the crucial core for enterprise success. It is emphasized that this choice implies a shift from management towards leadership, since employee involvement, participation and commitment requires more than just a transactional relationship, but a relationship based on shared goals, values and aspirations. Clearly, this relationship enables the development of 'mutuality', whereby personal and organizational goals coincide, as mentioned in paragraph 2.4.7. Additionally this shift towards leadership implies a direction and focus towards the social aspects of organizing [Drucker 1985, Tsoukas 1994a]. Rather than referring to management practices, we should be referring to leadership practices.

Enterprise Structures and Systems

Enterprise structures and systems are the core elements of traditional thinking about organizations. Various structures and systems can be identified, such as a communication structure, an appraisal and reward system, a hierarchical structure, the work and task structure, an accounting system or a management information system, to name but a few. In the true mechanistic sense, structures and systems are regulating mechanisms. They form the formal system of control that embodies knowledge and principles for enterprise regulation, and represent the embedded system of management in an enterprise. Structures and systems should therefore match with the enterprise mission, vision, values and goals. In that case, structures and systems become, in the words of Selznick, the "institutional embodiment of purpose" [In: Burns 1979, p. 378]. As a consequence, various structures and systems should be mutually consistent, legible and coherent [Hosking and Morley 1991].

Coherence and Consistency of the Behavioral Context

The requirement for internal coherence and consistency – as expressed by the congruence theorem – has been argued in paragraph 3.2.4. Reality shows that this requirement is often violated with unfortunate consequences. For example, individual structures and systems are developed independently, leading to mismatches with the intentions of other structures or systems, or even with the intentions of the enterprise as a whole. All too often, mismatches will become manifest in the future or in another part of the enterprise [Senge 1990]. For example, specific performance-related rewards might lead to a strong narrow task or departmental focus, whereby the quality of the end-to-end process is degraded. In the chapters about corporate and IT governance we will encounter dysfunctional behavioral consequences resulting from departmentally-focused performance and accounting structures. The acquisition of unworkable orders because payment is contingent upon sales volume, is a well-known example. Deming labeled these reward structures as a "deadly disease" [1986, p. 97]. Similarly, cross-functional process improvements might fail due to departmentally-oriented accounting and management information structures, while reward structures focused on individuals might frustrate teamwork. Likewise, achieving quality improvements seems difficult if only productivity is measured. Finally, the needed long-term horizon for quality initiatives might be untenable due to the short-term financial reporting structures. Various authors have mentioned this mismatch as an impedance to building necessary competencies in enterprises [Deming 1986, Prahalad and Hamel 1990]. In all these examples, structures and systems manifest an inconsistent and incoherent part of the behavioral context.

Evidently, the requirement for coherence and consistency holds similarly for enterprise culture, management practices, and structures and systems mutually. They should be mutually supportive, in order not to impede change [Hoogervorst 1998]. The necessity for being mutually supportive arises from the fact that the three determinants of behavior affect one another mutually, as shown schematically in figure 3.10. Bureaucratic management practices will create bureaucratic structures and systems and a culture reflecting bureaucratic characteristics, and vice-versa. Changing an enterprise culture is thus something other than the approach taken by the CEO who supposedly said: "What this company needs is another culture, and my secretary is now typing it out".

Inconsistencies within the behavioral context might easily lead to low commitment or even cynicism about enterprise intentions. Multiple examples can be given. For example, it is not to be expected that quality improvements will be successful if the existing culture suppresses an open discussion about failures, or when management frustrates improvement suggestions because of their perceived prerogative of decision-making. Similarly, an information system for sharing knowledge seems of little value in a culture reflecting an individualistic and competitive working environment. Again, ensuring coherence and consistency of the behavioral context points to a unified and integrated enterprise design.

3.4 Paradigm Shifts

In his analysis about scientific progress, Thomas Kuhn introduced the notion of 'paradigm shift' [1962]. A paradigm is viewed as a conceptual model: a way of observing, investigating and explaining phenomena. The inability to address phenomena adequately within an existing paradigm might lead eventually to a paradigm shift: the adoption of a new model of thinking with essentially different concepts that are able to address the subject of investigation better. Hence, in case of enterprises, a "radical reconceptualization about the nature of business and the nature of the organization" [Laudon and Laudon 1998, p. 393]. Others speak of "creative destruction", seen as "the process of adopting new ideas and abandoning the corresponding older ones" [Nolan and Croson 1995, p. 17]. Multiple paradigm shifts play a role, having to do with (1) the organismic perspective on organizing and the employee-centric focus, (2) the recognition of enterprises as organized complexities, having a complexity that far exceeds the possibility to view the enterprise as a machine, (3) the recognition of complexity, dynamics and the associated uncertainty, and (4) the notion of emergent enterprise development. Important characteristics of these paradigm shifts are shown below.

	Old		**New**
• customers	anonymous	→	individually known
	mass marketing	→	one-to-one marketing
	product focus	→	relationship focus
• competitors	same domain	→	different domains
• business relationships	transaction-based	→	relationship-based, support
• partners	same domain	→	different domains
• business boundaries	clear and fixed	→	diffuse and dynamic
• enterprise boundaries	fixed, local	→	dynamic, extended
• products and services	distinct	→	complementary
• employees	costs	→	asset
	labor	→	knowledge
	management dependent	→	empowered
• employee employment	transaction focus	→	commitment focus
• management	formal control	→	support, values
• work	place-, time depended	→	anywhere, anytime
• work	automated	→	informated
• assets	financial, physical	→	intellectual
• market	mass, static, regulated	→	individual, dynamic, open
• way of organizing	mechanistic	→	organismic
• enterprise perspective	reductionistic	→	holistic
• enterprise context	stable, orderly	→	dynamic, uncertain
• enterprise development	planned	→	emerging

In view of the 'position' and 'perspective' strategic perspectives sketched in paragraph 3.2.3, the paradigm shifts have to do primarily with fundamental changes in 'perspective': norms, values, convictions and ways of working. The argued transformation from the mechanistic towards the organismic way of organizing is based on two important principles: employee involvement and local freedom and support for employee self-management. Hence, employee empowerment "demands a radical re-alignment of our beliefs about control systems and the levels at which decisions are made" [Block 1991, p. xiv]. A fundamentally new enterprise design, involving many areas, is thus associated with the paradigm shifts, as figure 3.11 indicates. When discussing enterprise governance, enterprise design areas will be introduced formally.

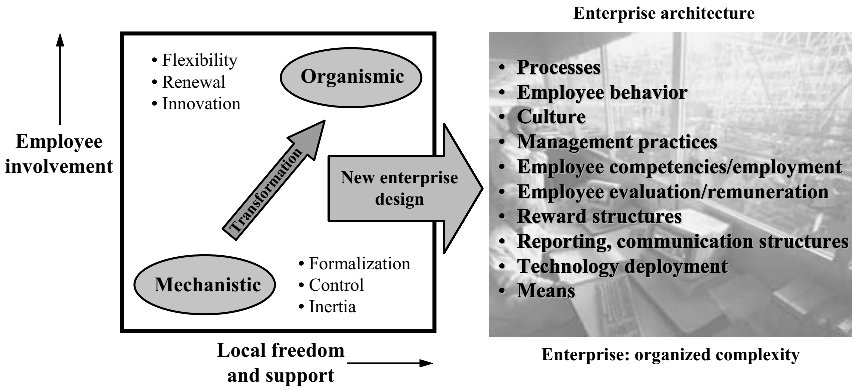


Fig. 3.11. Organismic enterprise design: transformation in many areas

4 System Thinking

The importance of unity and integration – the consistency and coherence between various enterprise aspects – has been argued in previous chapters. This appeared to be a crucial condition for implementing strategic choices successfully. Such a condition necessitates viewing the enterprise as a system. Comparable considerations hold for unity and the integration of IT systems individually, and for these systems in the context of the enterprise as a whole. Therefore the approaches outlined in the chapters about IT and enterprise governance rest for a substantial part on system thinking. For that reason, this chapter will outline some essential aspects of system thinking, whereby unity and integration will be emphasized as important system characteristics. References to enterprise system aspects will be given as illustrations. In order to safeguard unity and integration during system design, architecture is shown to be an essential concept. We will outline what architecture essentially is, and the difference between architecturing and designing. The reference context for architecturing is also discussed and we will devote attention to the formulation of architecture principles and to the meaning and significance of an architecture framework. Since we have emphasized the emerging nature of various enterprise developments, finally we will address the issue of whether such developments are consistent with the systemic perspective on enterprises.

4.1 Core Aspects of System Thinking

4.1.1 Organized Complexity Recalled

In the introductory chapter, three problem categories were identified based on the distinctions given by Weinberg [2001]. These problem categories relate to the level of organization (or its reverse, the level of randomness) and the level of complexity that has to be dealt with. Using these distinctions, the three problem categories can be depicted as areas shown in figure 4.1, which is an adapted version from the representation given by Weinberg. In accordance with the nomenclature introduced in Chapter 1, area I is that of "organized simplicity" [op. cit.]. As the picture illustrates, when complexity rises, the ability to use analytical methods declines rapidly. Low levels of organization (high levels of randomness) can be addressed trough statistical means, as area III of "unorganized complexity" indicates. This is particularly true when the number of interdependencies (complexity) with such random nature, increases. Population growth or the propagation of contagious diseases are examples of unorganized complexities that can be addressed statistically. The large area II is that of "organized complexity" in

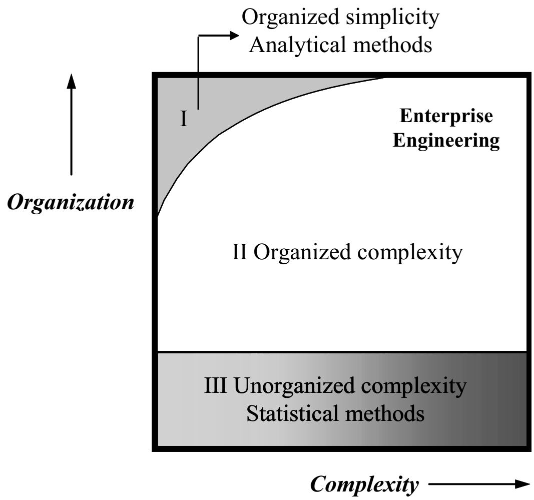


Fig. 4.1. Categories of complexity [Adapted from Weinberg 2001]

which enterprises are positioned. As stated in Chapter 1: an area too complex for analytical methods and too organized for statistical methods. The apparent lack of a theory for addressing the problem of organized complexity was mentioned previously as a core problem confronting modern science [Weaver 1967, Bertalanffy 1969].

The enormity of the problem with organized complexity is that many mutually related aspects, that form an organic whole, have to be taken into account. As stated in the introductory chapter, many authors argue that the system approach is the only way to address the aforementioned core problem effectively, and hence to study and develop enterprises [Bertalanffy 1969, Bunge 1979, Gharajedaghi 1999, Rechtin 2000]. Ackoff therefore argues that the high rate of failing strategic initiatives mentioned in the previous chapter, is the consequence of the initiatives being fundamentally anti-systemic [1999]. As mentioned earlier, the new, emerging discipline of enterprise engineering that will be discussed in Chapter 7, aims to contribute to the solution of aforementioned core problem. Central to this discipline is system thinking.

4.1.2 What is a System?

In essence, a system concerns a set of mutually related entities that perform a certain function jointly. It seems intuitively clear that a random set of things without relationships does not constitute a system, but merely a collection. Various system definitions exist. Jackson sees a system as "a complex whole the functioning of which depends on its parts and the interaction between these parts" [2003, p. 3]. Maier and Rechtin define a system as "a set of different elements so connected or related as to perform a unique function not performable by the elements alone" [2002]. Von Bertalanffy speaks of "a set of elements standing in interrelation among themselves and with the environment" [1969, p. 252]. Essentially, given the system function, a system encompasses a unified set of elements having a mutual relationship among themselves and with certain elements of the environment. It is important to make the intended system function relative to the system environment part of the system definition. This provides the following characteristics of a system [Dietz 2006]:

C = the system *composition*: the set of system elements
E = the system *environment*: the elements outside the system with which the system interacts
P = the system *production*: the products or services that C delivers to E
S = the system *structure*: the interaction relationships between the elements of C mutually, and between the elements of C and the elements of E.

Many system types can be identified, for example biological, chemical, technical or social systems. If all system elements are of the same category, one refers to a *homogeneous* system. In the other case, it is a *heterogeneous* system.

Essentially, a system is a unified whole of elements that operate in an integrated manner pertinent to a certain goal. Unity and integration are core concepts within the system approach. Conversely, it is argued that the system approach is required for achieving unity and integration adequately [Gharajedaghi 1999]. Herein lies the importance of viewing the enterprise as a system. System thinking is *holistic* rather than *reductionistic* [Jackson 2003]. Recalling our discussion in Chapter 2, within reductionistic thinking the elements gain primary and often exclusive attention, under the assumption that understanding the elements leads to understanding the whole. The reductionistic vision is by nature incapable of addressing and understanding the behavior of the whole. As the systems definitions indicate, a system shows behavior that cannot be attributed to any of the system elements, but only to the system as a whole. System behavior is determined completely by the system elements and their mutual relationships. Contrary to the reductionistic vision, the holistic vision holds that the whole gives meaning (purpose) to the parts. Put another way, parts can only be understood with reference to the whole.

An important general class of systems is that of man-made, constructed, systems: artifacts. With reference to the definition of an enterprise given in Chapter 3, and the system definitions given above, it seems evident that an enterprise is a system. All knowledge from the general system theory, thus also holds *mutatis mutandis* for enterprises.

4.1.3 Structural-functionalistic and Interpretative System Views

Structural-functionalistic System View

The inherent complexity of a system determines whether system behavior can be described in a formal (analytical) manner. Should the relationships between the system elements be described mathematically, the relationship between the system input and output is (generally) defined unequivocally. Technical systems are examples of systems that can be analyzed and understood that way. Certain aspects of socio-technical systems can also be addressed in an analytical manner, such as finding the optimal routing in a logistic delivery system by using operations research techniques. Often, the many possible relationships require such a model-focused simplification that (mathematical) analysis becomes possible, without sacrificing essential insight into system behavior. Models are thus used to grasp essential system properties, enabling system analysis and comprehending system behavior. This is typical of the engineering approach to systems. An objectively knowable system reality is presupposed. This type of system approach is identified as the *structuralistic* approach [Jackson 2003]. Sometimes the term *functionalistic* is used, in view of the focus on the functioning of the system and the relationships between the system elements. Associated thinking is labeled as *structural-functionalism* [Hassard 1993]. This thinking is based on the assumption that complex issues need the structural-functionalistic approach in order to effectively address those issues.

The structural-functionalistic system perspective comes under various labels. A comprehensive perspective is provided by the General Systems Theory that explores the correspondences, isomorphisms, laws and principles common to all systems [Bertalanffy 1969, Weinberg 2001]. Some important general system aspects are discussed in this chapter and will be applied to enterprises later. Next, the theory of Cybernetics can be mentioned, which grew out of developments in computer science, information theory and control theory. The focus is on the overall system, its subsystems and the (feedback) control mechanisms that regulate subsystems and overall system behavior. The theory has been applied to enterprises under the label 'Organizational Cybernetics' [Jackson 2003]. A third form of system thinking worth mentioning is Complexity Theory, which deals with chaotic and orderly behavior of systems. Hence, the theory focuses on system stability and instability. Some topics that have been discussed in the previous chapters reflect complexity theory thinking, and were shown to be relevant within the enterprise context. Finally, the theory of system dynamics discussed below is also viewed as structural-functionalistic system thinking.

As we outlined in Chapter 2, in the case of enterprises structural-functionalistic thinking is often associated with the mechanistic way of organizing and the formal, top-down, management-oriented governance approaches outlined briefly in Chapter 1. Within an exclusive structural-functionalistic view people are merely seen instrumentally as components within the mechanistic system (the enterprise a machine), not as actors whose commitment, ideas and creativity are crucial for enterprise success. Nonetheless, as we stressed in Chapter 2, for certain enterprise aspects the structural-functionalistic approach can be applied fruitfully. Rightly, as we have previously sketched, adequate enterprise operation rests on the structural-functionalistic foundation as a precondition. Part of the enterprise engineering theory and methodology discussed in Chapter 7, is based on modeling the enterprise in a structural-functionalistic manner.

Interpretative System View

In complex systems, many different variables, and myriads of interactions and interdependencies often play a role. This makes utilization of the structural-functionalistic system approach, at least partly, impossible or impractical. Many enterprise aspects cannot be addressed (fully) through analytical methods. Indeed, that was the very reason why enterprises were positioned in category II of 'organized complexity' (cf. figure 4.1). Moreover, the structural-functionalistic approach assumes an objective system reality. However, as we have mentioned in paragraph 2.2.1, the reality of enterprises is socially constructed. People and their context are not independent entities, but are in a relationship of mutual creation: they are affected by reality as well as shape reality. Put another way, people within enterprises *interpret* reality and manifest that interpretation in various ways (behavior, norms, values), which in turn defines reality and enterprise system behavior.

Further, enterprises are intentionally designed, goal-oriented social systems. Social actors (humans) are engaged in goal-oriented activities. Hence, these activities (must) have purpose and meaning. Meaningfulness and sense-making thus play an essential role. Consequently, enterprises are also characterized by convictions, values and norms (culture) and certain traits of individual employee involvement.

These considerations fall within the *interpretative* system view [Jackson 2003]. Within this view, the issue concerns not so much the structural-functionalistic aspects of an enterprise, but the *cognitive* aspects: the way enterprise facets are interpreted by human actors and shared meaning, values and beliefs are established. As we have discussed in the previous chapter, these cognitive aspects form a strong force for behavioral guidance, since they shape the enterprise culture, which in turn co-defines the behavioral context, and thereby determines employee behavior [Weick 1995]. Since employees are the social actors engaged in enterprise activities, employee behavior largely determines the effectiveness of the structural-functionalistic foundation of the enterprise. Evidently, the cognitive aspects of an enterprise are the inherent facets of enterprises being social systems. Appreciably, the notion of enterprise learning discussed in paragraph 2.5.4 only has meaning within the interpretative approach. It seems obvious that the mechanistic perspective on governance and organizing almost completely ignores the interpretative facet of enterprises. Meaninglessness is not seldom a characteristic of machine bureaucracies: "The only meaning of the job is the paycheck, not anything connected with work or the product" [Fromm 1955, p. 181]. With reference to the views presented in Chapter 2, the interpretative, cognitive facet of enterprises can only be addressed properly from the organismic perspective on governance and organizing.

We submit that a fruitful and motivating approach to understanding and designing enterprises lies in avoiding the either-or scheme by combining the structural-functionalistic perspective with the interpretative perspective, for example by considering norms and values as explicit enterprise design aspects. For that, the enterprise engineering theory and methodology discussed in Chapter 7 is considered a fruitful basis.

4.1.4 System Dynamics

Under the label 'system dynamics' a perspective and associated methodology is identified for analyzing complex social systems [Sterman 2000, Jackson 2003]. Within this perspective – initially developed by MIT's Jay Forrester in the early 1960s – the 'system' concept is somewhat broadly and less precisely used. A system is viewed as the whole (the structure) of actions, (supposed) causal chains and feedback relationships within socio-technical, socio-economical and socio-political domains. Actions can, for example, be seen as measures or initiatives that governments or enterprises take. Social, economic or technological occurrences can also result in a structure of subsequent actions, causal chains and feedback relationships. The domain of system dynamics is thus inherently large, varying from analyzing the effect of new legislation or interest rate changes, to analyzing the effect of introducing the lease concept on car sales [Sterman 2000]. Social systems are complex, multi-loop, nonlinear feedback systems that show counter-intuitive behavior, whereby lack of understanding leads to unexpected, ineffective or detrimental results [Forrester 2003]. Not seldom, measures and initiatives lead to the opposite of what was intended. Rather than solving problems, measures or initiatives fail, make problems more severe, or create new problems. Many influences and relationships play a role, whereby cause and effect are dispersed in time and place [Senge 1990]. These are the characteristics of dynamics and complexity, and their associated uncertainty, as discussed in Chapter 2. Figure 2.2 illustrated an example of the type of dynamic relationships that the system dynamics approach aims to address. As an additional example, consider a large project where many employees are involved. When a project delay occurs, several variables and their relationships play a role regarding the ability to reduce the delay. Figure 4.2 shows the 'system' of variables and their relationships having either a positive (+), increasing, or negative (–), decreasing, effect. So, for example, an increase in training is expected to lead to an increase in quality, and a reduction in rework. Taking the occurrence of project delay as a starting point, various dynamic relationships ultimately determine whether delay increases or decreases. In this example, errors might be manifest immediately, leading to extra rework and project delay, but errors might also be latent, leading to degrading quality (increased failure rate), which entails additional rework in a later stage. Other aspects might possibly play a role, such as eroding recruitment standards to fill vacancies, which would further increase skill dilution.

The advantage of such modeling is the explicit identification of, and dialog about, variables and their relationships that might affect the object of concern. Supporters of the system dynamics approach argue that due to an often limited and fragmented vision on issues, the multitude of relationships and interactions

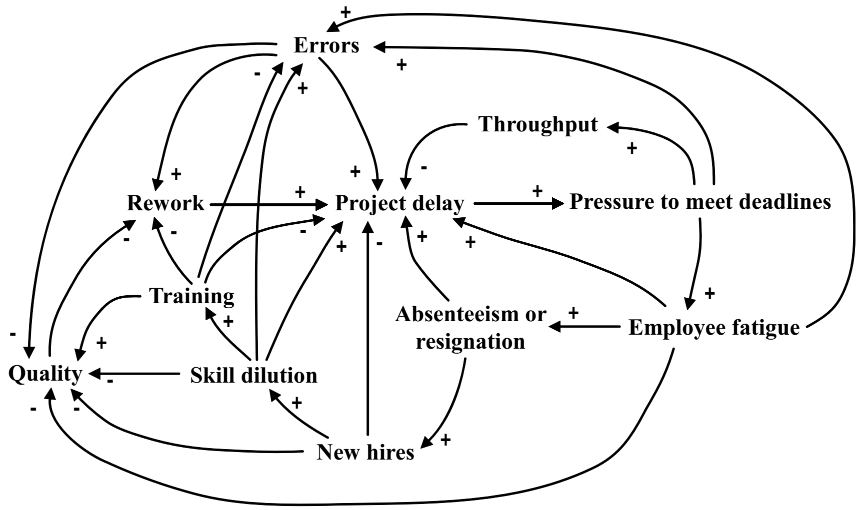


Fig. 4.2. Dynamic relationships determining project delay

is not recognized and addressed. From a holistic stance, the system dynamics approach aims nonetheless to capture the totality of possible interactions, causal chains and feedback relationships (positive and negative), in order to predict the effects of certain initiatives. Simulation often plays a key role, whereby empirical data are used to tune and validate the model. An actual case has been described (which triggered the use of the example given above) where the usefulness of extensive modeling has been demonstrated in controlling project delay proactively [Sterman 2000]. A number of archetypical feedback mechanisms have been developed within the system dynamics discipline [Senge 1990, Sterman 2000]. System dynamics is viewed as a method to stimulate learning about complex systems.

As mentioned, within the system dynamics approach, a system is viewed as the whole – the model – of interaction patterns that are the result of certain occurrences. Meaningful analysis thus presupposes that the model of interaction patterns can be established with sufficient accuracy and completeness. This might be inherently difficult for the type of systems that the system dynamics approach aims to analyze: uncertainty associated with dynamics and complexity makes it naturally hard to foresee interaction patterns and subsequently model them. Specifically with socio-economical, socio-technical and socio-political systems, interaction patterns emerge in unforeseen ways, since human actors interpret occurrences and react to them unexpectedly. Nonetheless, cases of successful system dynamic modeling have been reported [Sterman 2000].

Once various interaction patterns have been modeled, the system of relationships becomes deterministic. Recalling the distinction between the structural-functionalistic and the interpretative perspective, the system dynamics approach is therefore viewed as a representative of the former perspective [Jackson 2003].

Nonetheless, the concepts of the system dynamics approach allow the incorporation of interpretative aspects of actors within the interaction patterns. Rightly so, since the interpretative aspects determine for example the nature of feedback mechanisms in which human actors play a role. Rather than draw seemingly obvious conclusions, the system dynamics approach can identify underlying patterns of interaction, that warrant other conclusions. Such insights can thus enhance the quality of decision making in enterprises significantly.

Many interaction patterns play a role within and between enterprises, not merely from a structural-functionalistic perspective, but also from an interpretative perspective. The competence-based governance approach emphasized is not only relevant in view of addressing these interaction patterns – for which the system dynamics approach might be used in some instances – but also in view of the fact that corporate, IT and enterprise governance itself is constituted through interaction patterns. Examples will be given in later chapters.

4.1.5 Closed, Open and Adaptive Systems

Talking about the function of a system implicitly presupposes a relationship of the system with its environment. In fact, it is understood that we deal with an *open* system, whereby energy, information, and/or matter is exchanged between the system and its environment. This is evidently the case with an enterprise. The opposite of an open system is a *closed* one, where no interaction takes place with the outside world. The system purpose is thus defined with reference to the internal domain of the system itself. Notably, the traditional view on governance, management and organizing shows a strong focus on internal control, rules and procedures. Customers play virtually no role. This points to the mechanistic way of governance and organizing outlined in Chapter 2. This perspective thus comes close to the closed system perspective. When customers play a central role, and when attention is given to the environment or the society at large, the enterprise can truly be seen as an open system.

As Chapter 2 showed, the mechanistic viewpoint on governance and organizing is associated with static, time-invariant system characteristics. Indeed, a machine is designed to manifest its intended behavior continuously (its function) over time. It is thus not expected that the machine changes its inherent operation (its design) autonomously: it should do the things for which it is designed without showing its own creativity. For enterprises this condition is not fruitful. When discussing the *organismic* perspective on governance and organizing in Chapter 2, creativity, self-organizing and the ability to change were particularly emphasized for enabling the enterprise to adapt to changing contextual conditions. In system theory terms: the enterprise must be an *adaptive* system. Since enterprise elements are not all of the same type, the enterprise is also a *heterogeneous* system. In view of the above, an enterprise can be defined as a complex, open, heterogeneous and adaptive socio-technical system. The open system notion implies *input* from, and *output* to, the environment. Both the input and output can take on many forms:

energy, material information, knowledge etc. From an overall perspective, the enterprise transforms input into output. Hence, there is *throughput*.

4.1.6 Unity and Integration: Coherence and Consistency

Paragraph 3.2.4 mentioned that the majority of strategic enterprise initiatives fail. We argued that an important, if not the most important, reason for failure lies in lack of unity and integration among the various aspects that make up an enterprise. This has been brought to light amply in the literature.

Obviously, unity and integration matters not only at the operational and executional levels, but likewise – and at least as importantly – at the conceptual (strategic) level. One cannot expect that the implementation of a conceptually incoherent whole will yield an operationally coherent whole. Take for example an enterprise that directs its commercial strategy towards marketing innovative products and services, while its financial strategy is geared to maximizing shareholder value. In view of the latter, it is most likely that a strong short-term focus will result, leaving little room for the necessary long-term orientation required for developing innovative products and services. In terms of our discussion in paragraph 3.2.4, there is no coherence and consistency. As emphasized earlier, the system approach aims to safeguard coherence and consistency, from a holistic perspective, by addressing the various system aspects in view of the operation of the whole. Since enterprises are complex systems, safeguarding coherence and consistency is inherently difficult. Enterprise architecture will prove to be an essential and effective concept in this respect. Prior to addressing this topic thoroughly in Chapter 7, the essential aspects of architecture and architecturing have to be outlined, which we will do in the next paragraph.

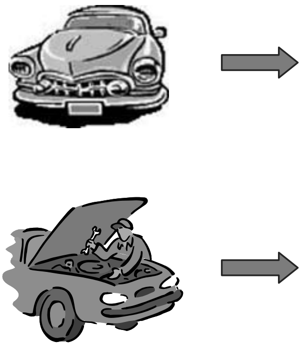
4.2 Architecture and Architecturing

4.2.1 Fundamental System Perspectives: Function and Construction

In order to sketch the relationship between system thinking and architecture, we will confine ourselves to man-made systems. The systems of our observation are *artifacts*: intentionally created, goal-oriented entities with a certain purpose. As we saw in paragraph 3.1.1, this is the case for enterprises.

When realizing systems, two fundamental perspectives play a role: the teleological and ontological perspective [Dietz 2006]. The word ‘teleological’ stems from the Greek word ‘teleos’, referring to the ultimate goal or purpose. Hence, the teleological perspective concerns the *goal* or purpose of the system, can thus be related to the *function* of the system . As indicated earlier, the system function pertains to *what* the system is supposed to deliver.

Concerning the second perspective, the word 'ontological' has its roots in the Greek word 'óntos' which refers to the essence (nature) of things: their 'being'. Within the ontological system perspective attention is given to what the system *is*, hence concerns the (essential) characteristics of its existence. The ontological system perspective can therefore be associated with the *construction* of the system, so deals with *how* the system function is brought to life. In addition, the teleological or functional perspective is called the 'black-box' perspective, since knowledge about the construction and operation of the system is not addressed. The ontological or constructional perspective is labeled as the 'white-box' perspective. Knowledge about the construction and operation of the system is thereby evidently essential [op. cit.]. Figure 4.3 illustrates the two basis perspectives.



Functional, teleological
perspective:
- Closed, "black-box" view
- Management, control oriented
- Design knowledge not required

Constructional, ontological
perspective:
- Open, "white-box view
- Design, change oriented
- Design knowledge essential

Fig. 4.3. Two fundamental system perspectives

Next to the primary system goal (its function), attention must often be devoted to secondary goals or objectives. So the primary goal for a car has to do with providing a personal mode of transport. However, secondary goals that have to do with, for example, safety or the psychology of the owner, play an important role. Similarly, and unlike the argued financial focus within the corporate governance perspective, enterprises also attempt to satisfy secondary goals, such as providing meaningful employment for employees and possibilities for self-development. Ideally, the system realization (its construction) should address all system goals concurrently and adequately. Arguably, satisfying secondary goals is often a prerequisite for success in terms of the primary goal. Unsafe cars are unlikely to provide a successful personal mode of transport. In a similar vein, this also holds for enterprises. For example, the emphasized organismic way of organizing (cf. Chapter 2) is a condition for enterprise success and necessitates the realization of goals pertinent to the employment of people. Recalling the teleological system perspective, one could argue that multiple system goals imply multiple, observation-dependent, teleological perspectives about one and the same system. The latter notion refers to the ontological perspective: what the system *is*. Nonetheless, in order to avoid confusion, we will reserve the teleological, functional perspective for the primary system goal: the delivery of the system's function to the environment. As we will formalize later, secondary goals constitute important objectives relative to certain areas of concern, such as safety (cars) or employment (enterprises).

System design evidently implies the constructional perspective. Knowledge about the internal operation and construction is essential. Designing should not only take the system function into account, but should also address various other objectives concurrently, as indicated above. Concurrently addressing various system objectives is not necessarily synonymous with addressing objectives in an equally satisfying manner however, since the objectives might not be mutually supporting. Nevertheless, the holistic system approach enables – in view of the system function – a balanced consideration between the various objectives. Unfortunately, and unlike many other systems, when enterprises are concerned attention is virtually only devoted to the functional perspective: *what* the enterprise should realize takes the central stage, whereas the question as to *how* the enterprise should be designed in order to realize goals and objectives is not addressed, or only inadequately [Hoogervorst 2004a]. Put a different way, in the case of enterprises there exists a serious and unfruitful chasm between the functional and constructional perspective. As we will outline in Chapter 7, enterprise architecture can be an important vehicle to close the chasm.

4.2.2 Architecture as a Normative Concept

As indicated previously, a system of our observation is considered an artifact: a *goal-conscience, intentional* creation. Consequently, system creation is by its very nature not 'incidental'. In our view, this non-incidental character inevitably raises the question as to *how* the system has to be realized. Not addressing this question seems an absurd and inconsistent position: it denies the intentional character of system creation (while that was the starting point in the first place), and leaves its coming into being to spontaneous, incidental, not governed processes.

In view of the nature of the aforementioned question, the answer is essentially *normative*. That means, the answer provides normative guidance for design: the answer indicates *how* the design must be realized. We fully agree in this sense with Ulrich's critical system heuristic, arguing that the normative aspects of system design must be made explicit [In: Jackson 2003]. Architecture, in our view, provides the answer to the aforementioned design question, and makes the normative aspects of system design explicit.

Normative guidance is thus the essential purpose of architecture. Conceptually, architecture can be considered as the normative restriction of design freedom [Dietz 2004]. Practically, architecture is viewed as a set of principles and standards that guide system design. Architecture is therefore essentially a *prescriptive* concept that expresses *ex ante* how systems must *become*, rather than a *descriptive* concept that depicts *ex post* how systems *are* [Hoogervorst 2004a,b, Hoogervorst and Dietz 2005, Dietz and Hoogervorst 2007]. We acknowledge that the architecture concept is often used in a descriptive sense, whereby high-level designs, with labels such as 'blueprint', 'city plan' or 'organization' are identified as architecture. For example: "The architecture of an enterprise is the basic overall organization within which work takes place" [Martin 1995, p. 56]. The question is however, how did the designs came about? What were the underlying guiding principles? All too often, answers to these questions remain absent, making the adequacy of the design process dubious. The often referenced IEEE definition of software architecture contains both the descriptive and the prescriptive perspectives on architecture: "Architecture is the fundamental organization of a system embodied in its components, their relationships to each other and the environment, and the principles guiding its design and evolution" [IEEE 2000].

As argued above, the normative aspects of system design cannot be ignored. We feel therefore that the descriptive use of the architecture concept has little value. The descriptive notion is essentially passive, and – in view of the description after the fact – cannot provide active design guidance. These views can be related to two philosophical characteristics about conducting science formulated by Windelband, and identified as the nomothetic and idiographic character of science [In: Nagel 1961]. Within the nomothetic view, science is about generally applicable knowledge and the search for laws that generally hold. The nomothetic approach to science is thus, in the literal meaning of the word, 'law giving'. On the other hand, within the idiographic perspective, science is about understanding and describing phenomena that are considered unique, and not guided by underlying general principles. One might argue that the normative, prescriptive view on architecture fits the nomothetic perspective on conducting science.

In light of the high failure rate of strategic enterprise initiatives mentioned earlier, and the underlying causes, the nomothetic perspective is very relevant – to quote Kuhn [1962] – for establishing the 'normal' science concerning the design of enterprises: enterprise engineering, with enterprise architecture as the essential guiding concept. Thereby, attention is not given primarily to case studies (ideographic perspective) but to generally applicable design knowledge and design principles. The enterprise engineering topic will be discussed in the chapter about enterprise governance.

Within the normative, prescriptive view on architecture, we define architecture formally as:

- *Architecture*: a coherent and consistent set of principles and standards that guides system design.

Designing is understood as all activities from defining system requirements until system implementation. Principles and standards can be defined as follows:

- *Principle*: a predefined design action orientation pertinent to one or more design domains
- *Standard*: a predefined design norm (for example 230 V). In this sense, a design pattern can be considered as a specific design norm, based on an earlier design, that is being re-used. A design pattern must itself evidently be

based on principles and standards used earlier. In fact, standards form a particular subset of principles.

Next to principles that pertain to one or more design domains, more general principles are often used, such as that only 'proven' technology may be used. Also the well-known maxim 'reuse, before buy, before build' is an example of such general principles. We will include these principles in our conception of architecture, since they also express an action orientation pertinent to design.

Re-use is an important aspect of architecture. Put another way, architecture is not directed to a specific system, but directed to a system *class*. So, for example, IT architecture for data warehouses or applications is intended not only for one specific data warehouse or application, but intended for the class of data warehouses and applications respectively. One might conceive data warehouse architecture principles like 'No operational data may be stored in the data warehouse', or 'The data warehouse must be read-only'. In terms of applications we might have principles such as 'Portlets may not contain business logic', or 'The execution of a business component must be separated from flow control'. For the non IT-specialist, some of these principles might sound somewhat esoteric, but hopefully they indicate the notion of design guidance and their generally applicable character. Notably, the latter two principles have to do with flexibility of IT systems, hence, with the flexibility of the enterprise. As such, they address 'flexibility' as an area of concern.

4.2.3 The Phases of System Realization

Figure 4.4 shows a number of phases and related concepts schematically, concerning the realization of a system. The process starts with formulating functional requirements. For now, we will limit ourselves to these requirements, but consider them later as a subset of system requirements. Defining functional requirements is often a cumbersome process, due to many stakeholders that may hold different perspectives on the system's function. The strategic transition barriers discussed in paragraph 2.3.4 also make defining functional requirements far from straightforward. Once more, this refers to the various interaction patterns mentioned earlier (cf. paragraph 2.2.2 and 4.1.4) and underlines the importance of the emphasized competence-based governance approach, since clarity about requirements emerges through interaction patterns. When discussing the specific competencies in later chapters, examples of interaction patterns will be given.

Ultimately, the system function is defined by a set of functional specifications. The transition from functional requirements to functional specifications can be labeled as *function design*. This transition takes place in a phase that is often identified as the definition phase: the definition of functional specifications. Important is the notion of the normative guidance for function design: the transition from functional requirements to functional specifications is guided by *function architecture*. These architecture principles define for example, how system interaction

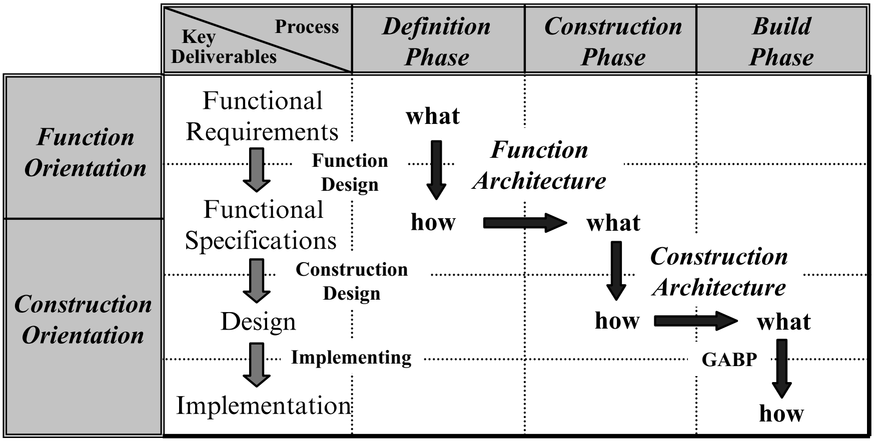


Fig. 4.4. System realization process

takes place. So, for a technical system function architecture might define that warning signals must be both visual and audible.

Next, the transition of functional specifications to the system construction, which is identified as *construction design*, and takes place in the construction phase. With the term 'construction' we will denote the conceptual realization of the system. Normative guidance is provided by the *construction architecture*. For a car, construction architecture principles might read along the lines of 'Two separate braking systems must be used', and 'Both braking systems must operate on the rear wheels'. Evidently, apart from architecture, general theories and methodologies for system construction play an essential role. In our braking system example, this concerns knowledge about mechanics and hydraulics.

The final implementation takes place in the building phase, which concerns the physical realization of the system. Here, generally accepted building principles and techniques (GABP) play a role. As figure 4.4 indicates, the various phases show an alternating *what* and *how* perspective.

4.2.4 Architecturing

Architecture has been positioned as a normative concept that guides system design. Given the fact that there are many system types, the specific nature of architecture is contingent upon the type of system, such as mechanical, chemical, electronic or socio-technical systems. As mentioned earlier, architecture pertains to a certain class of systems, and is defined as a coherent and consistent set of principles and standards that indicates how a class of systems is to be designed. The notion of a system class can be recognized in many instances. For an enterprise, IT architecture provides normative design guidance for the class of IT systems within the enterprise. It is however certainly conceivable that IT architecture can be defined industry-wide, hence for a far larger class of IT systems. Then, IT system design guidance concerns generally applicable principles and standards that are defined from the perspective of IT professionalism itself, independent from a specific enterprise point of view. The fact that IT system design – or the design of technical systems in general – is the subject of general education and research, is actually an expression of that notion. IT architecture then holds for the class of IT systems in general.

Similar considerations can be given for enterprise architecture. Enterprise architecture for a specific enterprise refers to the system class with only one element: the enterprise in question. In case of a holding with various ‘business units’ for which enterprise architecture gives design guidance, one can refer to a class of socio-technical systems. Comparably as before, the fact that organizational science is a subject of general education and research essentially implies the possibility of a general theory about enterprise design (enterprise engineering). Hence, it implies the possibility of enterprise architecture holding (in principle) for the class of enterprises. This refers to the possibility of universally applicable theories about enterprises, discussed in paragraph 3.1.4.

As we saw in the previous paragraph, system design requires architecture for design guidance. Establishing architecture can be labeled as *architecturing*. It seems plausible to call a person who defines architecture an *architect*. Architecturing must be distinguished clearly from designing. Since architecture serves as a guidance for design, its definition must logically precede design. Figure 4.5 shows the complementary nature of architecturing and designing. The class of systems – for example the class of IT systems in an enterprise, or the class of IT systems in general – is the reference for defining architecture, which is used subsequently when designing a specific system in the system class. The process of architecturing is thus fundamentally different from the process of designing. Moreover, since architecture holds for a class of systems, the process of architecturing is not (generally) related to the design of a specific system. Also in this sense, the processes of architecturing and designing are decoupled. Architecturing can thus take place relatively independently from designing.

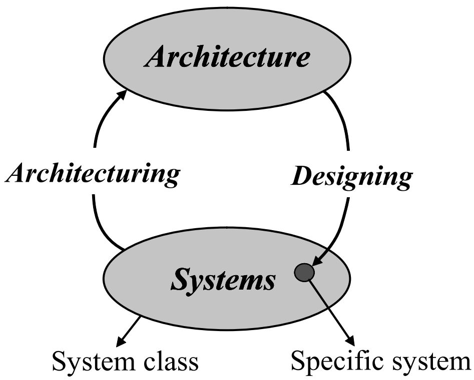


Fig. 4.5. The complementary nature of architecturing and designing

Figure 4.6 illustrates the distinction between architecturing and designing further. Three main activity areas of system realization are shown. First, architecturing, having architecture as its outcome: a coherent and consistent set of principles and standards. The second activity area is designing: the conceptual realization of a system in a function and construction design, whereby function and construction architecture provides design guidance (cf. figure 4.4). Finally, the third activity area has to do with implementing the design: the physical realization of the system.

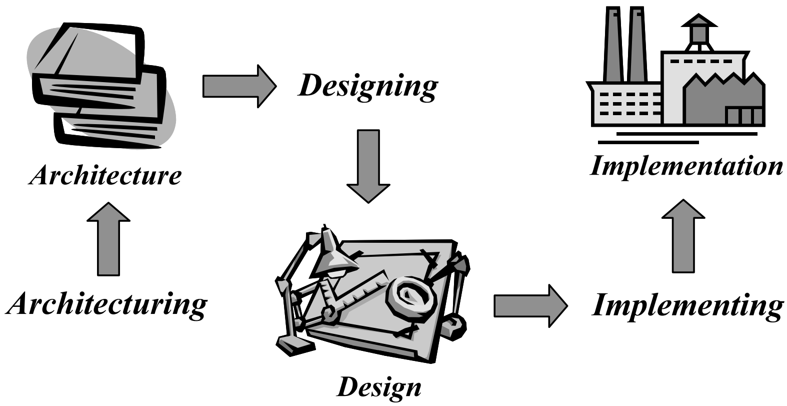


Fig. 4.6. Main activity areas of system realization

The foregoing reflection assumes that the set of principles and standards is necessary and sufficient. Nonetheless, it might be the case that with the initiation of a concrete system realization project, the need for additional architecture appears. Formally then, the design process stops and the process of architecturing starts. The newly defined architecture can then be used subsequently for the remainder of the design process, as well as for future design activities.

4.2.5 Areas of Concern and Design Domains

The question that presents itself when architecture must be defined concerns the type of architecture that is appropriate. Which set of principles and standards must be defined? How does the architect know for which areas architecture is relevant? These questions are essential for the process of architecturing, while their answer – certainly for the enterprise as a system – is far from easy. Naturally, in specific cases the architect will use the principles that have already been defined in a general sense for the particular system class. In this paragraph we are concerned with the basic issues concerning the (initial) definition of architecture. For defining architecture, the system goals, areas of concern, and system design domains serve as a reference. This reference context is shown in figure 4.7 for the ‘car’ system. The primary system goal (the function) is providing personalized

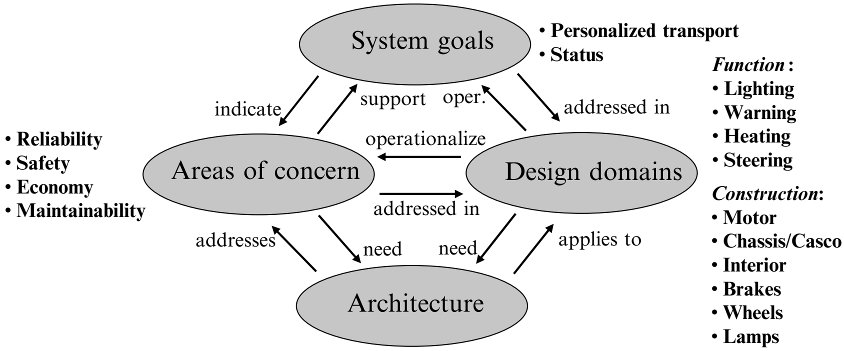


Fig. 4.7. Reference context for architecturing

transport. Secondary goals might also be envisioned, such as conferring certain kinds of personal experiences or status on the owner. The notion of area of concern and design domains will be outlined below.

Areas of Concern

It seems plausible that the definition of architecture necessitates a certain reference context that serves as foundation for the specific character of architecture principles and standards. As stated earlier, a system is an artifact that is created intentionally with reference to a certain system goal (its function) and other objectives that have to do with certain areas of concern, as mentioned in passing in paragraph 4.2.1. Hence, the first category of the reference context for architecturing is formed by *areas of concern*. For a technical system, important areas of concern are for example: reliability, safety, maintainability and user friendliness. As an illustration, figure 4.7 shows certain areas of concern for a car. The system goals indicate (suggest) areas of concern that are considered relevant. Conversely, one might say that attention to areas of concern supports the adequate realization of the system goals. Further, the areas of concern identify facets of the system where (possibly yet to be defined) system behavior is required. Hence, the system requirements extend beyond functional requirements. The various concepts used, can be defined formally as follows:

- *System purpose*: the primary and basic reason for system design, in view of the relationship of the system with (certain elements of) its environment.
- *System behavior*: the intended or unintended manifestation of the system over time. Next to system behavior associated with the system function, disturbances and failure patterns (or their avoidance) are also examples of system behavior.
- *System goal*: an objective to be realized through system behavior. The primary system goal is the realization of the system function (its purpose).
- *System function*: a subset of the intended system behavior, related to the system goal and the intended interaction of the system with (certain elements of) the system environment.

- *System requirement*: the expression of a requisite or a necessity concerning system behavior. A requirement can relate to the system function, but can also relate to areas of concern.
- *Area of concern*: an area of attention for system design in view of desired system behavior.

Design Domains: The Working Area of Architecture

Certainly, the areas of concern provide some reference for the process of architecturing, but generally it remains unclear how the 'concern' is actually addressed. That can only be done through concrete design. So, architecture for data management and data security will, for example, contribute to addressing the concern for the reliability and availability of IT systems. The 'data management' and 'data security' areas can be seen as design domains for the class of IT systems. For the system class 'cars' we have design domains like engine, chassis, interior, wheels, brakes, lights etc. Since design takes place for these areas, architecture has to be defined pertinent to a set of design domains. Therefore, the second important reference category for architecturing is formed by the *design domains* of the system, or generally, the system class. We will define a design domain as:

- *Design domain*: a functional or constructional system facet for which design activities are required.

For a car, the warning system and lighting system can be seen as examples of functional design domains. The function architecture principle mentioned earlier that warning signals must be both visual and audible applies to the design domain 'warning system'. Recalling the ontological system perspective (what the system *is*), it might be appreciated that these systems do not fall within this perspective: dismantling a car will not show either a warning or lighting system. These systems are truly part of the functional (teleological) perspective. The car chassis or engine are examples of construction design domains. The construction design domains make up what a system *is*, hence they are part of the constructional (ontological) perspective. To bring this point home further: car functions can only be realized through constructional domains. So, the warning system is formed by lights, wiring, the chassis support etc.

Obviously, system goals are addressed in the system design domains. This likewise holds for areas of concern. Conversely, the system design domains operationalize the system goals and areas of concern: through design the system goals and areas of concern become 'real'. Defining design domains is not always simple – especially not for the enterprise as a system – and requires specific system knowledge. This knowledge plays a less important role for the areas of concern. Here, system users, system maintainers or the system owner will have a significant say in defining areas of concern.

For the system 'car', figure 4.7 reflects our discussion schematically. The primary system goals (function) concern the provisioning of personalized transport. Examples of areas of concern and design domains are given. Architecture (principles and standards) always pertain to one or more design domains. Earlier, for the design domain 'brakes' two principles were mentioned as an illustration: 'Two separate braking systems must be used', and 'Both braking systems must operate on the rear wheels'. These principles address the 'safety' area of concern. Conversely, the 'safety' area of concern needs architecture principles in order to address the concern. This example is shown schematically in figure 4.8, using the schematic of figure 4.7.

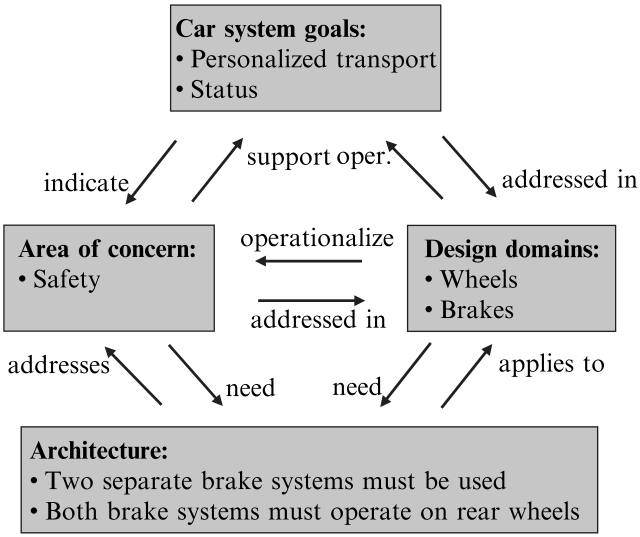


Fig. 4.8. Architecture examples

For every design domain, architecture must be defined. Some architecture principles or standards might apply to more than one design domain. In light of our earlier discussion, architecture – a coherent and consistent set of principles and standards – must ensure a unified and integrated design, while addressing the areas of concern. As mentioned in paragraph 4.2.1, system objectives defined with reference to the areas of concern might not necessarily be mutually congruent. Nevertheless, from a holistic system perspective, architecturing aims – in view of the system purpose – to address the areas of concern in a balanced way, laid down in architecture.

Design Domains: Specialization and Completeness

In general, the set system design domains that must be established depend on whether the system is perceived in its totality, or whether the focus is on part of the system. Detailed observation might be associated with a subsystem, but also with merely an element of the (sub)system. Recalling the car example above, the design domains engine, chassis, interior, wheels, brakes, lamps, windows, etc., are necessary and sufficient design domains by observing the car as a whole. When observing a design domain in more detail more detailed design domains also play a role. For example, within the 'engine' design domain, design domains like 'piston' and 'crankshaft' are relevant. So, from the perception of the car as a whole the 'engine' design domain suffices, but for designing the engine, more detailed design domains have to be defined. This process continues until a level is reached whereby further breakdown is not warranted. We will show in Chapter 7 that the same notion holds for enterprise design domains.

As the illustration shows, there is specialization of design domains associated with more detailed observations. Such specialization thus creates a certain order whereby a more detailed design domain is subordinated under the next higher design domain, in the way that 'engine' is subordinated under the overall design domain 'car', and 'piston' in turn is subordinated under the domain 'engine'. Since architecture pertains to one or more design domains, the aforementioned order holds likewise for architecture. That is to say that a principle or standard a_j may not be in conflict with principle or standard a_i if $D_j \subset D_i$.

Notably, this is an important condition for safeguarding coherence and consistency, which has been emphasized previously as an important objective of defining architecture. Establishing unity and integration not only requires that architecture forms a coherent and consistent set, but also requires that the set of design domains pertinent to a chosen perception is *complete*: necessary and sufficient in view of the system purpose (function) and the objectives associated with the areas of concern. For complex systems, such as enterprise, establishing completeness is far from easy.

4.2.6 Generic System Design Concepts and Process

Object System and Using System

The core subjects discussed previously can be brought together under the label 'generic system design concepts and process'. Following the nomenclature of Dietz [2006], we will denote the system to be designed as the 'object system'(OS). This system delivers its function to certain elements of the environment. In order to illustrate our line of thought, we will consider this environment as the 'using system' (US) that requires the function of the OS. Such a situation is often the case. For example, for the design of a car engine (OS), the car is the using system. Likewise, an enterprise is the using system for an IT inventory planning system (OS). When designing a car (OS), we might consider the totality of arrangements for personalized road transport as the using system (US).

For designing the function of the OS (black-box model) properly, the construction (white box model) of the US – its ontology – must be known. Indeed, it seems pointless to design a car engine without knowledge of the car's construction. After the OS function design, its construction design can be accomplished. Both the function and construction design are guided by their respective architecture. The generic design concepts and process are shown in figure 4.9 [Dietz 2006].

In view of the hierarchy in design domains mentioned in the previous paragraph, a hierarchy of different construction models can be envisioned. The various construction models detail the design such that it can be implemented. The 'highest' constructional model of the OS shows the essence of the system, fully independent of the actual implementation. It is customary to call this implementation-independent model the 'ontological model'. When discussing enterprise design in Chapter 7, examples of ontological models will be given.

Figure 4.9 portrays the function and construction design as sequential phases. Most likely however, some iterations will take place because constructional issues might have an effect on the function design.

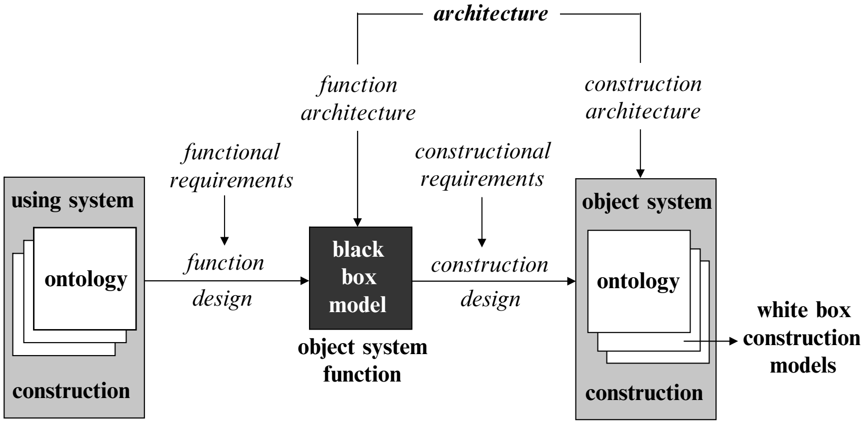


Fig. 4.9. Generic design concepts and process

Requirements Versus Architecture

Paragraph 4.2.5 defined a system requirement as a requisite or necessity concerning system behavior. One might observe that a requirement limits design freedom, since designs that do not satisfy requirements are obviously not allowed. This trivial observation seems not to provide sufficient grounds to ignore the conceptual difference between requirements and architecture. Since architecture guides the design that must satisfy requirements, the distinction between requirements and architecture seems intuitively clear. An obvious difference is that requirements are formulated by the system user, while architecture is defined by the system designer. As we have outlined in paragraph 4.2.4, the process of architecturing precedes design, and is not (generally) related to the design of a specific system for which certain requirements hold. Moreover, since architecture holds for a class of systems, requirements pertaining to specific system are thus not (generally) the basis for defining architecture. The areas of concern form the basis for that, as expressed in figure 4.7. However in various cases the practical distinction might be somewhat blurred. Take the following functional requirements for a car: 'Warning signals must be both visible and audible', and 'Low tire pressure warning must be given'. These functional requirements are such that they might be adopted as function architecture principles that are considered generally valid and can be applied to a class of cars. Hence, these architecture principles are a given for future cars to be designed. However, such straightforward correspondence between functional requirements and function architecture is not always the case. For example, the functional requirements ‘The car must reach 100 km/h within 12 seconds’, or ‘Rear passengers must have passenger entertainment facilities’ do not indicate directions for design directly. Again, the distinction is subtle. Suppose we have a functional requirement stating that ‘Inadvertent system misuse must be avoided’. This qualifies as a requirement since it is still unclear how design fulfilling the requirement should proceed. Subsequent definition of architecture might lead (among other things) to a principle like ‘Critical system switches must have a different shape’. However, it could very well be that knowledgeable system users would have formulated this principle as a requirement, which would then be adopted as an architecture principle.

Similar considerations play a role for the construction design. Constructional requirements like ‘Material xyz may not be used’, or ‘Two separate braking systems must be used’ are examples of constructional requirements that can be adopted as construction architecture. On the other hand, constructional requirements such as ‘At least 50% of the car must be of composite material’, or ‘The car mass may not exceed 1000 kg’, provide no specific design guidance.

The examples given above show the following. Although conceptually there is a distinction between requirements and architecture, some requirements are specifically design-oriented and might be adopted as architecture since they are considered relevant for general application, hence (in principle) valid for a class of systems. However, some requirements can or will not be adopted as architecture. First, a requirement might be so specific, and only relevant for an individual case, that generalization into architecture is not warranted. Second, a requirement might be of such nature that no specific design guidance is provided. So, with reference to the generic design process and concepts, both functional and constructional requirements are also input for the function and construction design respectively, as indicated in figure 4.9. The case study presented in Chapter 8 will elucidate further the difference between architecture and requirements.

4.2.7 The Architecturing Process

For enterprises, the definition of areas of concern, and more specifically, design domains is not a simple analytical or algorithmic process. This holds similarly for the subsequent definition of architecture. The process is often executed iteratively, whereby high-level goals are operationalized through establishing areas of concern, necessary and sufficient design domains, and subsequently architecture. Experience plays an important role. Architecturing is therefore essentially a *heuristic* process [Maier and Rechtin 2002].

As indicated, next to the primary system goal (the system function), various other objectives related to areas of concern have to be addressed. These areas of concern often point to different stakeholders that have an interest in some way or other in system behavior. In our car example, stakeholders are the car owner, the driver, fellow passengers, other road users, the environment, car builders, service technicians, etc. On the one hand, areas of concern point to certain stakeholders, but on the other, stakeholders can identify areas of concern that must be addressed. Clearly, the various stakeholders must be associated with at least one area of concern for having the stakeholders' interests addressed in one or more design domains.

The number and type of stakeholders obviously depend on the specific system type. For a generator as a subsystem in a car, the number and type of stakeholders are definitely smaller than for an IT system as a subsystem in an enterprise. Given the complexity of some systems – like enterprises – the number and type of stakeholders can be considerable. Often, areas of concern and the associated objectives are to some degree not mutually supporting. That might be due to stakeholders having mutually incongruent interests, or due to the inherent character of the design objectives themselves. Defining architecture is therefore also a complex process. Orchestrating the role and input of stakeholders is thus an additional task of the architect within the architecturing process. Next to the heuristic character of this process, the process also has – in the stakeholders' view – a participative character [Maier and Rechtin 2002].

4.2.8 Publication of Architecture Principles

Architecture is used to guide system design. Put a different way, system design must be architecture-compliant. When discussing IT and enterprise governance, we will devote attention to the process of using architecture and the handling of architecture exceptions. Evidently, for architecture to be used as design guidance, it must be published formally. A fruitful publication structure is the following:

1. Principle statement
2. Rationale for the principle
3. Implications of the principle
4. Key actions: possible initiatives necessary for effectuating the principle.

Principle Statement

As mentioned previously, a principle (or standard as a particular instance of a principle) is a predefined action orientation pertinent to one or more design domains (cf. paragraph 4.2.2). The distinction between a requirement and an architecture principle was also addressed in paragraph 4.2.6. Sometimes statements are given as architecture principles that are in fact merely requirements. Statements like 'The car must be fuel efficient', 'IT applications must work together', or 'Our financial information must be transparent' are in our view not architecture principles since they do not give useful design guidance. Various aspects play a role concerning the proper formulation of principles [Lindström 2006]. We feel principles should be:

- Understandable for the designers who must apply the principles
- Unambiguous, excluding multiple, or even erroneous interpretations
- Mutually coherent and consistent
- Applicable to one or more system design domains
- Traceable to areas of concern deemed relevant for the system.

The architecturing process described in the previous paragraph should ensure that the principles satisfy these characteristics. This will enhance architecture acceptance greatly, although as indicated, stakeholders might show different levels of buy-in because of not mutually supportive interests.

Rationale

Basically, the rationale provides the answer to the question as to why the principle has been defined. In view of our earlier discussion, architecture addresses areas of concern covering system behavior. So architecture must be traceable to one or more concerns, which provides the rationale for the principle, and explains why having the principle contributes to the desired system behavior, as shown in the example given in figure 4.8.

Implications

An obvious implication of a principle is its restriction of design freedom. When publishing architecture the notion of 'implications' is understood in a broader sense, and aims to express how application of the principle impacts the relevant system stakeholders. Most likely, the architecturing process in which stakeholders participate, as discussed previously, will indicate important implications.

Implications have a widely varying nature. So, for example, the introduction of technology standards has (life-cycle) implications for the thereby created off-standard technology and the staff involved with using, operating or maintaining the technology, etc. Likewise, the introduction of architecture for secure network access has implications for employees, customers, business partners and suppliers currently using non-compliant access methods.

Key Actions for Effectuating Architecture

Most publications about architecture do not address this important aspect. The relevance of defining key actions follows from the fact that not all architecture principles can be applied immediately, but can only be used under certain conditions. The key actions ensure these conditions, such that the architecture principles can be followed.

As with the aforementioned implications, (possible) key actions also have a widely varying nature. First, key actions might need to be undertaken to address certain implications of the architecture principle. Second, key actions can establish conditions for architecture compliance. For example, a principle stating that 'Data transmission over public lines must be encrypted', can only be followed if an encryption service is available. Arranging the encryption service is thus an important key action. Investigating privacy regulations is an important key action pertinent to an architecture principle stating that 'Customer data must be available at all customer contact points'. As a final example, a key action may take the form of a pilot study or project to verify the feasibility of an architecture principle. As will became clear when discussing IT and enterprise governance, key actions in the form of projects are an important part of the IT and enterprise project portfolio respectively.

The case study discussed in Chapter 8 will show various architecture examples and their publication structure, as discussed previously.

4.2.9 Architecture Framework

The Essence

Various architecture frameworks are presented in the literature, such as the TOGAF framework (based on the work of The Open Group), which is extensively discussed by Perks and Beveridge [2003] for example. They define an architecture framework as "a reasoned, cohesive, adaptable, vendor-independent, technology-independent, domain-neutral, and scalable conceptual foundation for detailed architecture representation" [op. cit., p. 77]. Within this descriptive notion about architecture, "Frameworks structure architecture description techniques by identifying and relating different architectural viewpoints and modeling techniques associated with them" [Lankhorst et al. 2005, p. 20]. Stated briefly, within the descriptive architecture perspective, an architecture framework is a conceptual structure for describing architecture, hence presenting a model of some aspect of design.

Since we advocate the normative, prescriptive notion about architecture, we conceive an architecture framework with reference to the key aspects that define architecture. As illustrated, three aspects play a role in the process of architecturing:

1. The system, or system type, which we will identify with *S*
2. Areas of concern, identified with *A*
3. Design domains , labeled as *D*.

An architecture framework can be presented symbolically as the triplet <*S*,*D*,*A*> [Dietz 2004]. In words, an architecture framework is defined as:

- *Architecture framework*: a conceptual structure related to a certain system type, and consisting of areas of concern and a necessary and sufficient set of design domains pertinent to a taken system perspective [Hoogervorst and Dietz 2005].

Ultimately, a framework is the expression of aspects (areas of concern and design domains) that are considered relevant and must be addressed by architecture to be defined.

An important distinction between design domains concerns those that relate to the system *function*, and those that have to do with the system *construction*. Within this distinction, further detailing is evidently required, and refers to the specialization mentioned earlier. Establishing the necessary and sufficient (complete) set of design domains for a certain (detailed) perception of the system can be a daunting task for complex systems, such as enterprises. Knowledge and experience of the architect concerning the system type in question is obviously crucial. Further, the set of design domains might change over time: what was previously viewed as a necessary and sufficient set of design domains might be considered as inadequate at a given moment in time. Additional or other design domains could be required due to new areas of concern or opinions about existing ones. So, for example, the introduction of the 'entertainment' area of concern within a people transport system will introduce new design domains not present before. This holds comparably for enterprises. Devoting attention to the notion of societal-conscience business conduct for example, will obviously introduce still undefined design domains. What was previously considered necessary and sufficient thus requires amendment. Nevertheless, all this fits within the formal definition of an architecture framework given above. When discussing IT and enterprise governance, examples of design domains and architecture will be given.

As already mentioned, architecture is a coherent and consistent set of principles and standards. An element from this set (principle or standard) pertains to one or more design domains D of the system type S. Appreciably, for a given system, the different (detailed) levels of observation constitute logical relationships between architecture frameworks. As we saw earlier, this follows from the fact that architecture pertinent to design domain D_j may not conflict with architecture of design domain D_i if $D_j \subset D_i$. Such a condition holds similarly if S_j is a subsystem of S_i.

Frequently, architecture frameworks published in the literature do not satisfy the formal definition given above. One might observe that, while the enterprise architecture label is used, in fact IT architecture for the whole enterprise is meant. Despite the 'enterprise' label the system type is apparently not an enterprise. Frequently, the 'business' design domain is added to IT-related design domains, in view of the business processes that IT systems are supporting. It seems evident that 'business' cannot be a design domain within an IT architecture framework. Alternatively one might view such an architecture framework as an enterprise architecture framework, but in that case considerably more design domains than just 'business' are relevant. In short, all too often it remains totally unclear which system type the framework represents, while for a given (or supposed) system type, the set of design domains is not complete.

More fundamentally, one might observe that for many published architecture frameworks, the *normative* notion about architecture is not followed. Lacking a formal normative approach thus necessarily implies the absence of formal guidance of the design process. Important objectives that the normative approach aims to realize are thus not (or are at least inadequately) addressed. That is not only detrimental to the design process itself, but even more detrimental to professionalizing the system design discipline further and the development and utilization of architecture. Finally, system development and implementation aspects are also often part of architecture frameworks. These aspects are evidently important, and must be addressed professionally, but formally fall outside the scope of architecturing. Hence, they should not be part of an architecture framework. Much of what is positioned as an architecture framework is in fact a disguised development or implementation framework. Development and implementation aspects are important areas of attention within the scope of overall enterprise governance. We will address these topics when discussing enterprise governance.

The Importance of a Framework

A framework structures the process of architecturing by devoting explicit formal attention to: (1) the system type for which architecture must be defined, (2) the areas of concern that must be addressed, and (3) the necessary and sufficient set of design domains where architecture must be applied. For a certain perception of the system in question, the set of design domains can be visualized graphically, as we will show later for IT systems and enterprises. Next to structuring the architecturing process, another key purpose of an architecture framework is the following. The importance of coherence and consistency of design principles and standards has been emphasized. These are essential conditions for a unified and integrated system operation. The explicit structure of the architecture framework enables safeguarding and assessing the coherence and consistency of architecture within, and between, design domains, as well as between different frameworks. As we will show in the chapter about enterprise governance, for an enterprise this concerns coherence and consistency between business architecture, organization architecture, information architecture and technology architecture.

4.3 System Thinking and Emerging Enterprise Developments

4.3.1 System Thinking Criticized

Evolutionary and Emergent Developments

In the previous chapters we criticized the mechanistic view on enterprises and argued the importance of the organismic perspective. This latter perspective centers around employee involvement and initiatives. Since cause and effect relationships vanish in enterprise complexity, dynamics and the associated uncertainty, detailed task and job descriptions are unproductive. Employee involvement and initiatives are essential for addressing uncertainty. Moreover, this involvement is the very basis for enterprise learning and the ability to change and adapt, strategically as well as operationally. To a considerable degree, the process of enterprise change and adaptation is emergent: results become manifest in evolutionary, unplanned and unpredictable ways. All these aspects rest on the self-organizing capacity of employees, which is the very essence of the organismic perspective. Emergent outcomes or patterns of behavior follow from interactions and relationships between human actors in enterprises in an unpredictable way.

So, the question that concerns us is, if, and to what extent, emerging, evolutionary characteristics of enterprises are consistent with the systemic view of enterprises. After reviewing criticisms of systems thinking, we will clarify our position on this question in the next paragraph.

Regarding self-organization and emergence, two different perspectives are worth mentioning: (1) the *formative* perspective, and (2) the *transformative* perspective [Stacey et al. 2000, Stacey 2003]. A formative self-organizing process is seen as an emerging process whereby the direction (or end-state) towards which the process is evolving is defined or given by the principles that guide the process. Put another way, the unfolding process is already enfolded by the nature of the principles. There is both determinism and (some) freedom. The former is given by the principles of the change process, whereas the latter is located in the nature of human beings. Stacey et al. argue that the formative self-organizing process produces no novelty, only rearrangement of what is already there [op. cit.].

In case of the transformative self-organizing process, there are no *a priori* guiding principles, only the perpetual evolution of the process itself. The interaction processes between human actors sustain continuity and lead to transformation at the same time. Freedom and constraints arise out of the interaction processes, which form and are formed by themselves. No concept of a 'whole' exists, and an overall blueprint or plan for that whole plays no role.

The key difference between the formative and transformative self-organizing process is not that the latter process is necessarily without limitations. Rather, these limitations emerge out of the social interactions themselves, whereby diversity, differences of opinion and conflict play their role, whereas the formative self-organizing process is guided by previously-given principles. Transformative self-organizing concerns human interactions "that bring forth novel patterns of behavior that are not pre-given. They explore how true novelty arises in the detail of interaction between people who differ from each other as they perpetually and unpredictably construct their future" [Stacey et al. 2000, p. 185]. According to Stacey et al., self-organization is really self-organization if humans interact according to their own principles [op. cit.]. The transformative self-organizing process is sustained and formed by a 'complex responsive process of relating' [op. cit.]. Within these processes, individual minds form and are formed by social relationships at the same time. Hence, "The patterns that emerge in these self-organizing processes are patterns of collective and individual entity at the same time" [Stacey 2003, p. 17]. Thus, "Social and personality structures evolve together" [op. cit., p. 39].

Are Emerging Developments Consistent with the System Thinking?

Two fundamentally different systems views have been mentioned in paragraph 4.1.3: the structural-functionalistic system view and the interpretative system view. Compared to the former view, the system concept is used somewhat vaguely in the latter case. Nonetheless, all share the notion of predefined arrangements (design) that underpin the system view, which is most notably within the structural-functionalistic perspective.

For some, the structural-functionalistic system view amounts to 'social physics': the mechanistic perspective on enterprises, whereby the enterprise is treated as a machine. Concern goes to the holistic enterprise perspective, the relationships between the enterprise parts in view of the overall system purpose [Hassard 1993]. A closed system view is often maintained, whereby attention is devoted to the internal enterprise efficiency. As one proponent of the system approach stated: "By the *system approach to management* is meant the study of a firm's activities in their totality so that the overall objectives of the firm can be realized as efficiently as possible" [Jenkins 2003, p. 211]. The system is viewed as a control system: a corporate planning system comprising management planning and control subsystems. In a pure top-down mechanistic stance it is believed that "Once the corporate planning system has been set up, immediate and lasting benefits will *percolate downwards* from it and exert a unifying influence on the efficiency of the whole organization" [op. cit., p. 215]. Like controlling the room temperature: if the actual profitability (as measured through accounting systems) differs from the desired profitability, an error signal triggers the 'management controller' which is subsequently fed into the organization in order to bring the error signal to zero [op. cit.]. Nonetheless, some fusion between the system approach and behavioral sciences is emphasized, since 'human systems' are considered the most valuable and ultimately determining for enterprise success [op. cit.].

This type of systems thinking considers enterprises as machines to be controlled by management. We have strongly rejected the machine-like view on enterprises in earlier chapters, since the associated mindset is the root cause of many enterprise problems due to lack of attention for self-organizing processes. We have argued that this type of structural-functionalistic thinking is ill-suited for addressing the complex, dynamic and uncertain enterprise context. In fact, this position implies the conviction that the systemic view of enterprises is not necessarily synonymous with the machine-like view of enterprises. Hence, the question then becomes whether the organismic perspective – the perspective that emphasizes employee self-organizing and emergence – is possible within the systemic view of enterprises.

Returning to the two types of self-organizing processes mentioned previously – the formative and transformative self-organizing process – it has been argued that system thinking is necessarily associated with the formative self-organizing process [Stacey et al. 2000]. Often, employee self-organization is management 'newspeak' for delegation. Management defines the self-organization maneuverable space, hence defines where emergence might occur. This is labeled as 'designed emergence': "If managers are choosing what 'emerges' then it is not emerging, if they have a blueprint guiding self-organization, then it is not self-organization" [Stacey et al. 2003, p. 145]. Emerging is constrained by system rules, so emergence merely unfolds what is already enfolded in system design. System thinking is argued to be deterministic: "In all of these system theories, the final form of the system's behavior (teleology), that towards which it tends, is a state already enfolded, as it were, in the rules governing the way the parts interact or in pre-given archetypes, or in the goal and visions that system designers or leaders have put into it" [Stacey 2003, p. 269]. Real freedom and novelty are thus considered to be excluded. Within this standpoint, employees cannot have freedom because that would imply the possibility that the enterprise 'system' would take on a life of its own which might depart from the intended enterprise purpose and its design [op. cit.].

Based on the transformative self-organizing perspective, system thinking is further rejected on the grounds that it assumes an external modeler that is able to model human relationships, while these relationships are rather emerging. These evolutionary relationships are not supposed to depend on any outside design. System thinking assumes a 'whole', while this 'whole' cannot be given, since all is based on really novel emerging outcomes. There is only the process of interaction that perpetuates and produces further interaction, without any notion of a whole [Stacey 2003]. Further, the system notion brings with it a spatial metaphor – the whole – while there are only temporal complex responsive processes.

The systems dynamics approach also ignores emerging relationships. System dynamics assumes the ability to capture the various (nonlinear) interdependencies objectively and make meaningful predictions about the nature and outcome of complex socio-economic, socio-technical and socio-political phenomena (cf. paragraph 4.1.4). Many sociologists, political scientists, urban planners and psychologists followed the system thinking approach in view of the claim that such an approach could solve socio-economic, socio-technical and socio-political issues. Areas of attention the system approach addressed were for example healthcare, poverty, public safety, pollution, unemployment, housing, education, transportation, waste management or energy resources. One might argue that once the relationships between phenomena have been modeled, they have a deterministic character, that bring forth predictable results. Despite examples of evident results, such an approach has been criticized severely, and is labeled as an 'ideology' to address socio-economic, socio-technical and socio-political issues through mechanistic concepts [Lilienfeld 2003]. It's a panacea for society's ailments, whereby its use outside the strictly engineering discipline is questionable: labeling a societal phenomenon a 'system' does not mean that traditional engineering methods apply [Hoos 2003]. Incidentally, this approach has led to the failing Planning, Programming and Budgeting System mentioned in paragraph 2.3.1. Other examples of useless results have been documented, whereby computer models were assumed to provide answers to complex issues. However, debatable model assumptions, model incompleteness, or significant sensitivity to initial input conditions, made results highly questionable [op. cit.]. According to system dynamics opponents, social systems cannot be modeled from an outside perspective, even more so as relationships are emerging. The inevitable conclusion was that "The social world – the world of concrete human history – cannot be encompassed in closed logical systems, no matter how large the computer, no matter how many variables are built into the system" [op. cit., p. 350]. As Hoos observes: "Lost is the methodological rigor sought in its original state; what remains are the empty forms, devoid of content. Jingo and jargon substitute for precision, the more so as system analysis becomes the stock-in-trade of the motley assemblage of practitioners now claiming expertness" [2003, p. 330].

4.3.2 In Defense of the System View

As stated, the systemic perspective is not necessarily synonymous with the machine-like system view. Some writers maintain that "One of the basic contributions of general systems theory was the rejection of the closed-system or mechanistic view of social organizations" [Kast and Rosenzweig 2003, p. 161]. Unlike the machine perspective, the general system view grew out of the organismic perspective posed by biologists.

Many theorists criticizing system thinking do not reject this concept entirely. For Stacey et al., system thinking is useful for understanding and controlling behavior of a repetitive kind [2000]. Indeed, as we have mentioned in previous chapters, a proper structural-functionalistic foundation is essential, since the reliable delivery of enterprise products and services requires some sort of formal arrangements on which said delivery (also) depends. We reiterate that we fail to see how, for example, transport, education, healthcare, utility, or government products and services – on which society daily depends – or the production of material goods, can take place reliably if left *totally* to incidental, emerging processes of which the outcome is essentially unpredictable, such that the delivery of products and services becomes unreliable and is left to chance. Some underlying structural-functionalistic foundation is obviously necessary, but as we have argued in the previous chapters, it is not sufficient. The latter is precisely the reason for the inadequacy of the mechanistic perspective on enterprises.

Moreover, as we have amply stressed, non-mechanistic enterprise characteristics are essential for enterprise strategic and operational success, as well as for the ability to innovate and change. These characteristics have to do with non-planned, emerging developments, which rest on the capacity for self-organization, as indicated earlier. We submit that innovation, flexibility, the ability to change and the capacity for self-organization is not provided by any incidental set of enterprise characteristics. On the contrary, such capacity rests on specific enterprise conditions that must also be arranged (designed). Indeed, it does not seem prudent to leave the creation of these conditions to chance: spontaneous, incidental developments. So, enterprise design must also enable future, yet unknown, enterprise change and adaptation. As mentioned in the introductory chapter, the notion of enterprise design should thus be interpreted broadly and seen as devising "courses of action aimed at changing existing [enterprise] situations into preferred ones" [Simon 1969, p. 111].

Accepting the notion of design, a dilemma confronts those accepting system thinking: "One of the major problems is that the practical need to deal with comprehensive systems of relationships is overrunning our ability to fully understand and predict these relationships. We virtually need the system paradigm but we are not sufficiently sophisticated to use it appropriately" [Kast and Rosenzweig 2003,

p. 168]. Rightly, the system thinking criticisms reviewed above indicated areas where the concept was used inappropriately. Nonetheless, "If organization theory is to advance and make a contribution to managerial practice, it must define more explicitly certain patterns of relationships between organizational variables" [op. cit., p. 170]. Our approach aims to contribute to this requirement by making the system notion specific and operationable in the case of enterprises.

As mentioned above, for some writers the only 'real' form of self-organization is the transformative self-organization process, whereby 'true' employee freedom leads to novel developments. Within this kind of social action, the principles of interaction between human actors are defined by the interacting participants themselves. It is argued however, that social action theory in general undervalues various constraints that enterprise members experience (economic, structural, rules, etc.) and overvalues individual volition. Put another way, the social action theory neglects important enterprise design contingencies [Donaldson 1985]. The transformative self-organizing perspective assumes total employee freedom, whereby interaction patterns among employees could lead to really novel developments. Constraints only emerge out of the process itself, and are not pre-given. Such emerging constraints will most likely preclude an airline transforming itself into a furniture maker through emerging complex responsive processes. However, we feel that in light of the enterprise purpose and goals – such as related to customer satisfaction, operational excellence, quality, service or employee satisfaction – pre-given design principles (architecture) are warranted: emerging processes of self-organization should support, enable and enhance these enterprise performance aspects. Hence, we are inclined to believe that it is unrealistic to expect that truly transformative self-organizing processes, as described previously, can take place within an enterprise context.

This position thus leaves us with only the formative perspective on self-organization. Based on the criticisms reviewed, the formative self-organizing process would not yield novel developments. The question is whether that is necessarily the case. Chapter 3 mentioned various innovative ideas emerging within existing enterprise contexts. Does the enforcement of pre-given (information) technology standards exclude the development of really novel developments through emerging processes? Suppose an organizational pre-given design principle (architecture) is used stating that employees may spend part of their time on developments they consider important, under pre-given constraints requiring, for example, that developments may never compromise safety and must fit within the existing domain of business. Still novel developments might emerge. Unforeseen developments have been shown to emerge in processes that, in the terminology introduced above, can be labeled as formative self-organizing processes [Christensen 1997]. Even 'designed emergence' directed towards company survival can lead to innovative products developed by employees [Hamel and Välikangas 2003].

In summary, we have argued that:

- The system view is relevant for defining the structural-functionalistic foundation that forms the operational core of an enterprise for producing products and services

- Self-organization by employees is essential for addressing unpredictable operational contingencies and creating the ability to (strategically) change and adapt
- Enterprise conditions conducive to self-organization must be created (designed)
- Self-organizing processes are thus not totally free, but guided by pre-given principles
- This so-called formative self-organization does not, in our view, exclude emerging developments that bring forth unpredictable novelty.

So, we feel that the system notion, as outlined from a general perspective in this chapter, can be applied fruitfully in the case of enterprises. System thinking is not necessarily mechanistic – viewing the enterprise as a machine – but can also be used within the organismic perspective on enterprises, whereby self-organizing processes are essential. Within this outlook, system thinking aims to safeguard unity and integration, as critical conditions for strategic success.

Part II: Governance Themes

5 Corporate Governance

Company scandals have recently placed the corporate governance theme strongly within the area of general interest. This chapter will sketch the underlying roots of the ultimate emergence of the corporate governance issue, also from a historic perspective. Important suggestions for corporate governance reform will be highlighted and commented upon. It will be argued that the suggested reforms are partly meaningful, and partly problematic: bureaucracy, high costs, questionable value, or even risky from a business point of view. Paradoxically enough, the financial/economic focus of corporate governance makes this approach unsuitable for addressing the intended interests of shareholders effectively. For that, the necessary wider perspective of enterprise governance will be argued. In view of this, the adequacy of the well-known COSO framework for corporate governance will be analyzed. Finally, we will discuss how corporate governance requirements (compliance) can be addressed effectively. This will illustrate that effectuating corporate governance must occur in the context of overall enterprise governance and enterprise design.

5.1 Introduction

The ‘corporate’ label commonly refers to an enterprise as a group or entity. The term ‘corporate governance’ might thus be generally understood as that which is associated with the overall guidance of an enterprise. As such the ‘corporate’ and ‘corporate governance’ labels are associated with the top (or top management) of an enterprise. However, despite the many facets of overall enterprise guidance, the literature in which the term ‘corporate governance’ originated restricts its denotation to financial, economic and accountancy aspects of governing an enterprise.

Financial scandals that became manifest in recent history within various enterprises, have placed the corporate governance theme strongly within the area of public interest. We will sketch why this theme emerged from a historic perspective, and why attention to this theme increased dramatically at the end of the last century.

Various definitions for corporate governance are presented in the literature. Coley et al. define corporate governance simply as “the system of authoritative direction” [2004, p. 3]. Corporate governance concerns the way enterprises are guided and controlled. But this could still mean anything. As will be amply addressed, the very origin of the corporate governance theme lies in the division (in legal and operational sense) that exists within ‘public’ (stock exchange registered) enterprises between owners (shareholders) and top management of the enterprise. This division raises a fundamental problem that leads to a divergence of the interests of shareholders and top management. The financial scandals mentioned earlier are the extreme consequences in this light. Two significant crises will be sketched, showing that the central notion within corporate governance has to do with controlling top management such that the interests of shareholders are safeguarded, and top management can justify to shareholders that they have exercised their responsibilities effectively in this respect. The question might be raised as to whether the responsibilities of enterprise top management extends beyond merely the interests of shareholders. There are others ('stakeholders') that are more or less affected by the conduct of an enterprise. It will become apparent nonetheless, that within the corporate governance perspective, only the interests of shareholders – or in a more general sense, the economic value of an enterprise – forms the central focal point. This gives corporate governance its financial/economic focus and characteristics. We might observe that this focus seems typical for many Western companies. In contrast, Japanese companies focus on product quality and improvement, and are hardly concerned with shareholder value [Abegglen and Stalk 1988, Rehfeld 1994].

Corporate governance can be distinguished in an *internal* and *external* perspective [Chew and Gillan 2005]. The internal perspective concerns attention for internal systems and structures for control and risk management that ensure that enterprises exercise their responsibilities towards shareholders adequately and responsibly. Notably, the 'internal' label refers not only to aspects within the enterprise itself, but also to aspects outside but related to the enterprise, for which the enterprise bears responsibility. Such is the case with outsourcing certain services for example. Corporate governance should then also include these outsourced services. The internal perspective will receive ample attention, including the suggestions for internal corporate governance reform.

The term 'internal control' is used frequently in corporate governance literature. By 'control' is understood management of 'something' such that undesired outcomes are precluded or reduced to an acceptable (negligible) minimum [Root 1998]. Within the corporate governance viewpoint, that 'something' concerns financial/economic developments of the enterprise. Internal control is thus focused on, and directed towards, precluding undesired financial/economic developments (avoiding risks) within enterprises. Underlying this approach lies the assumption that internal control is the ultimate method to safeguard prudent financial/economic enterprise developments, and avoid risks in this sense. We will assess this assumption later on.

The manner by which internal control is effectuated is also determined by rules (such as issued by stock exchanges) and legislation. Rules and legislation can be seen as *external* corporate governance aspects. These aspects will also be discussed, specifically the American Sarbanes-Oxley legislation.

As mentioned, corporate governance has a financial/economic focus, whereby the interests of shareholders form the central area of attention. The question is however, how the interests of shareholders are best served. As mentioned in Chapter 1, a failing enterprise strategy is likely to jeopardize shareholders' interests. We will outline that some views on corporate governance also include the control of risks related to enterprise strategic initiatives. Hence, alongside the internal and external corporate governance perspectives mentioned, two additional perspectives can be identified (1) a *restricted* perspective, that is concerned with top management supervision and control, and rendering account for the financial/economic state of affairs and the associated reporting, and (2) a *broad* perspective that includes the enterprise strategy within the corporate governance discourse. Evidently, corporate governance in the broad sense has to do with (1) the development of an enterprise strategy and the associated enterprise design, (2) the definition of relevant projects to realize enterprise design, and (3) the execution of projects. Proper enterprise design is essential for operationalizing strategic choices successfully, as we have seen in paragraph 3.2.4. Such design concerns, among other things, human actors and their employment, processes, culture, management practices, leadership, various structures and systems, information technology etc. In our view, these subjects transcend the capabilities of the corporate governance discipline considerably, and can only be addressed properly within the overall scope of enterprise governance.

In view of our reflection above, we will define corporate governance as:

- *Corporate governance*: the totality of internal structures and systems, as well as external rules and legislation, for internal control and risk management that ensures that enterprises exercise their responsibilities towards shareholders effectively and adequately.

5.2 The Emergence of the Corporate Governance Theme

5.2.1 Public Enterprises and Shareholders

Realizing enterprise expansion through one's own (private) means is often problematic. Investments in facilities, machinery and material for example, might require so much capital that invoking external financial means becomes inevitable. Two possibilities are available. First, the required capital can be loaned or borrowed, mostly from a bank. Interest has to be paid over the capital loaned, implying significant costs in the case of high investments. The other possibility for obtaining capital from 'the market' is to issue shares. The shareholder buying one or more shares obtains – as the name suggests – a share in the enterprise. Obviously, the shareholder expects to gain profit from his or her financial venture: a dividend or an increase in the share price. For the enterprise, this form of acquiring capital is considered advantageous, since the cost of capital is nil. Risks rest with the shareholders. Incidentally, there are financial analysts who reject this traditional view of 'costless capital' and argue that a reasonable capital gain for shareholders must be taken into account as capital costs [Steward 2005].

The first signs that enterprises were acquiring capital through issuing shares appeared at the end of the eighteenth and beginning of the nineteenth century [Solomon and Solomon 2004]. Initially, shareholders were legally liable (by the ratio of shares held) for debts the enterprise might accrue over time. Shareholders were seen literally as 'owners' of the enterprises. Evidently, this would drastically reduce the enthusiasm of potential investors for buying shares. Soon after the introduction of the share market, legislation was passed ruling that shareholders could only lose the money they had invested. The emergence of stock exchanges for buying and selling shares became a necessary function within this type of financial market. The New York Stock Exchange, for example, was established in 1792 [Root 1998].

Since shareholders are external 'owners', one refers to public enterprises, listed on a stock exchange. The public enterprise has three characteristics that make it an interesting legal entity: (1) in principle an unlimited lifetime, (2) limited liability of owners (shareholders), and (3) shared ownership, whereby many owners exist and transfer of ownership (transfer of shares) is possible without affecting the operational structure of the enterprise [Coley et al., 2005].

5.2.2 The 'Agency Problem': The First Crisis in Corporate Governance

Shareholders are considered the owners of the enterprise in which they invest. One might debate whether the term 'owner' in this public sense has the same meaning and connotation as in the private sense. The economist John Maynard Keynes questioned the appropriateness, and recognized the difference by observing that investors "are concerned, not with what an investment is really worth to a man who buys it 'for keeps', but with what the market will value it at, under the influence of mass psychology" [In: Solomon and Solomon, p. 94]. Nonetheless, in the legal sense, shareholders are the owners of public companies. Consequently, if an enterprise decides to list (register) itself on a stock exchange, the company becomes a public enterprise and transfer of ownership takes place.

The transfer of ownership brings with it the so-called 'agency problem', which was probably first recognized by Berle and Means [1932]. Factually, the transfer of ownership implies a split between the owners of the enterprise and its management. According to Berle and Means, management should act as an 'agent' of the owners (shareholders): conduct business own their behalf and in their interests, but such management behavior should not be expected. This is due to what is known as the 'agency problem', the likelihood that the goals of owners and management are diverging and conflicting [Solomon and Solomon 2004]. Management is likely to act as an 'agent' of themselves, directed towards their own agenda (or even own interests), not focused on what matters to shareholders. As such, transfer of power takes place from shareholders to management. This power transfer is fuelled further by the fact that ownership is dispersed among many shareholders [Roe 2005]. Also from a practical standpoint it should be acknowledged that an enterprise cannot be managed through shareholders' referenda. Reality forces acceptance of the fact that shareholders cannot be expected to take responsibility for managing strategic and operational enterprise activities [OECD 2004].

The agency problem is identified as the *first crisis* in corporate governance [MacAvoy and Millstein 2004]. Put another way, the agency problem confronts shareholders with the necessity to have power over, and control, enterprise management. This aspect forms the foundation and very essence of the corporate governance theme [Solomon and Solomon 2004]. Comparably, others see the reduction of the inherent drawbacks associated with the division between management and ownership, which is typical for modern enterprises, as the central topic of corporate governance [MacAvoy and Millstein 2004]. Hence, the agency problem defines the inherent focus of corporate governance thinking. Solving this problem is considered the key to protecting the interests of shareholders.

It should be noticed that the 'agency problem' also has to do with differences in *management* thinking and *economic* thinking [Parrino and Harris 2005]. Economic thinking is directed, in a narrow sense, to merely financial aspects of the enterprise, expressed in a multitude of financial figures. Management thinking on the other hand, has a far broader scope, and might, among other things, be concerned with growth (for example to preserve employment, or to create the organization's own financial means), diversification (for example to enable growth), and stakeholders (groups or individuals that have a stake in the functioning of the enterprise). This difference in thinking almost naturally leads to differences in the interpretation of the interests of shareholders and management.

Roughly prior to 1980, management saw themselves as representatives of the enterprise, not as representatives of shareholders. As we saw, this view is the source of the agency problem. Within this outlook, efforts were directed not so much towards enhancing shareholders' welfare, but towards enterprise growth – at least stability – also in view of the interests of stakeholders [Holmstrom and Kaplan 2005]. In the period until about 1980, the first crisis in corporate governance (manifestation of the agency problem) became visible gradually, and in the period through 1990 dramatically obvious. Internal enterprise resources were used for management's own strategic agenda, such as expansion and diversification of enterprise activities, without clarity whether shareholders interests were served, and even when it was evident the these interests were not served. This mechanism was propelled by financial rewards of top management being coupled to enterprise growth, not to shareholder gain [MacAvoy and Millstein 2004]. At the end of the 1980s, it dawned on investors that top management behavior conflicted seriously with their interests, showing the agency problem in its full 'magnificence'. This created the wake-up call to return to the basis of the corporate governance doctrine: focus on creating financial value for shareholders. The aforementioned crisis became manifest for a considerable part in America, partly worsened due to the lagging performance of enterprises compared to their Japanese and European counterparts. As will became clear in later chapters, the renewed attention to corporate governance primarily concerns the structure of governance mechanisms and their associated management responsibilities, such that the financial benefits of shareholders are safeguarded.

5.2.3 *Financial Scandals: The Second Crisis in Corporate Governance*

The agency problem sketched above manifested in the first crisis in corporate governance, and had already been noticed at the beginning of the last century. Not only did Berle and Means published their book in 1932, which draw attention to the agency problem, but a significant financial scandal also occurred around that time, due to fraud within an American company [Root 1998]. That further increased attention being paid to corporate governance (although this term is of more recent origin), as figure 5.1 shows. Although the prelude to the second crisis occurred prior to 1980, the second crisis became manifest in full force roughly between 1980 and 1990 as a result of various financial scandals. As such, the second crisis created a renewed and intensified spotlight on the requirement that top management acts as the ‘agent’ of shareholders. Figure 5.1 shows the increasing attention paid to corporate governance over time schematically [Root 1998, p. 55].

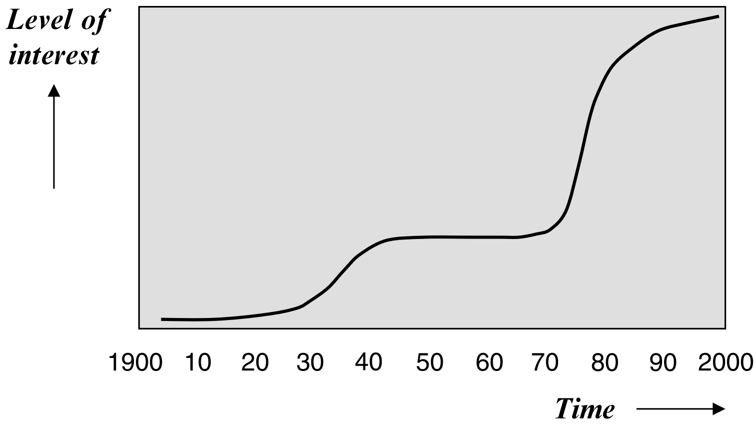


Fig. 5.1. Increasing attention to corporate governance [Root 1998]

The second crisis emerged as follows. Understandably, the attention devoted to shareholders translated into a strong focus on the value of shares. As Drucker observed: “Today nearly all CEOs of large US companies proclaim that they run their enterprises ‘in the interest of shareholders’ and ‘to maximize shareholder value’” [1992a]. Top management remuneration became linked strongly to the share value of the enterprise they were managing. Awarding shares or share-options was seen as an effective way to align top management activities with the interests of shareholders. Much debate exists about whether such an approach is indeed conducive to shareholder interests, also in the long term [Gillan 2005a, 2005b]. Questionable effects have been reported: while in America over the last 20 years the average income of employees increased by 15% (corrected for inflation), that of CEOs increased by 600% [Hall 2005]. These figures correspond to other reports indicating that in 1982 (on the average), CEO income was 42-fold higher than that of the ‘average’ employee, whereas this ratio (after a peak of 531 in 2000) had risen to 282 in 2003 [Moss Kanter 2004].

So much is meanwhile clear: the strong focus on the value of shares led a number of enterprises to present their financial figures in a highly favorable way to stimulate and secure the growth in share price. Remarkably enough, these attempts to polish up reality were partly in accordance with accounting rules, but were nonetheless dubious, while some attempts were outright fraudulent [MacAvoy and Millstein 2004]. In some cases, questionable or even non-existent income was reported. The enormously short-term-focused mindset and activities of enterprises were amplified by institutional investors who were more interested in short-term gain than in enterprise survival in the long-term [Bogle 2004, Solomon and Solomon 2004]. However, much of the apparently wonderful short-term performance turned out to be bogus, based on nothing. Large-scale fraud and malversation was covered-up. Discovery turned out to be disastrous. Various authors argue that management remuneration based on shares or share-options, has caused the aforementioned shortsighted, and in many cases also unjustified, top management behavior [Holstrom and Kaplan 2005].

The mechanism described led not only to serious forms of fraudulent behavior regarding financial reporting, but also to such irresponsible behavior that the enterprise downfall became the inevitable result. The more or less recent examples of enterprise scandals are the publicly-known manifestations of the process sketched above. Much literature portrays a devastating picture of swindling, greed, corruption and financial misconduct by top management in a large number of enterprises [Bogle 2004, Gandossy and Sonnenfeld 2004, MacAvoy and Millstein 2004]. Narcissistic, pathological top management behavior often plays a role [Kets de Vries and Balazs 2004]. Hear what Enron – an American company that broadly portrayed the aforementioned top management behavior – had to say in a press release issued in February 2001, ten months before their downfall, in which employees lost their jobs and shareholders (institutions as well as individuals) were seriously financially afflicted [Watkins 2004, p. 27]:

> Enron Corp. was named today the ‘Most Innovative Company in America’ for the sixth consecutive year by *Fortune Magazine*. “Our world-class employees and their commitment to innovative ideas continue to drive our success in today’s fast-paced business environment”, says Kenneth L. Lay, Enron chairman and CEO. “We are proud to receive this accolade for the sixth year. It reflects our corporate culture which is driven by smart employees who continually come up with new ways to grow our business”.

Shareholders and others having an interest in the value of shares were seriously financially afflicted by the practices sketched. Public opinion became increasingly anxious about failing enterprises and the dramatic reduction of the value of investments in shares of enterprises [Coley et al. 2005]. Corporate governance in general, and the pursuance of shareholder value in particular, came under increasingly heavy fire. Questions were raised regarding the narrow focus on the value of shares and the income per share as the ultimate unit of measure for enterprise performance [Brickly et al., 2005]. For some however, the strong focus on share value is not a defect in the corporate governance 'system', but rather a primary strength [Miller 2005]. The question is nonetheless, whether the second crisis is due to occasional incidents, or indeed finds its cause in underlying issues that have to do with the very nature of corporate governance itself. Many authors have pointed to the latter [MacAvoy and Millstein 2004, Solomon and Solomon 2004, Chew and Gillan 2005, Coley et al., 2005].

Where the first crisis in corporate governance could be attributed to differences in opinion between shareholders and management about enterprise courses of action (agency problem), the second crisis has a moral connotation: it became manifest because of fraudulent, unjustified and immoral behavior. Ironically, the financial focus (e.g., share value) was an attempt to address the first crisis (agency problem), but led to the arguably more serious second crisis. This crisis has initiated important reforms, which we will discuss in paragraph 5.4. In order to put these reforms in perspective, it is first necessary to outline some basic elements of corporate governance.

5.3 Corporate Governance Basic Elements

5.3.1 The Corporate Governance Structure

As we have outlined in paragraph 5.2.2, a division between the interests of owners and management occurs when enterprises acquire capital from shareholders. This led to the agency problem described, and confronts shareholders with the question as to how enterprise top management must be controlled and assessed, such that shareholder interests are served. Answering this question addresses the essence of corporate governance. In the introductory section of this chapter, two perspectives on corporate governance were mentioned: internal and external. The governance structure discussed in this paragraph is a facet of the internal perspective.

In its most basic form, corporate governance is understood to be the way the overall structure for top management control and assessment has been arranged. Two principally different approaches can be mentioned, which are depicted schematically in Figure 5.2: (1) the so-called 'one-tier' structure, and (2) the 'two-tier' structure. The one-tier structure (also labeled as the 'Anglo-Saxon model') is used in America and Great Britain for example, whereas the two-tier structure is used mostly in continental Europe [Solomon and Solomon 2004].

In the case of the one-tier structure, there is one board with a number of directors, chaired by one of the directors. Within this board, the executive tasks for managing the enterprise (the collective of business units in Figure 5.2) are delegated to the CEO (Chief Executive Officer). Often, the function of chairman of the

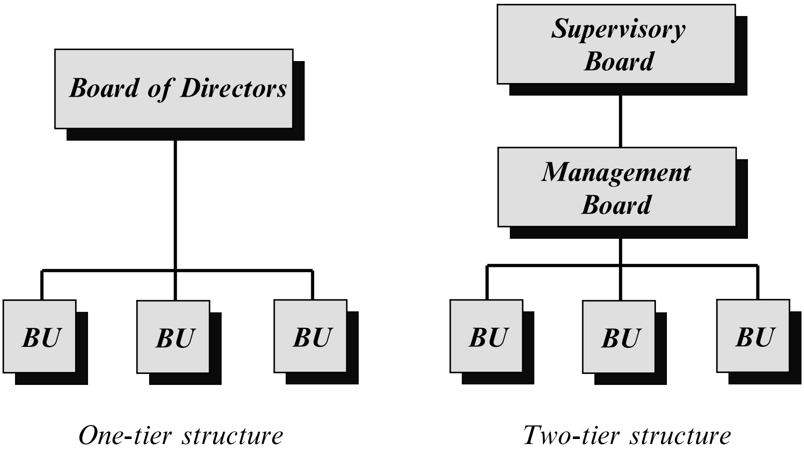


Fig. 5.2. Corporate governance structures

board and CEO are combined. This appears to be the case in 85% of American companies [Coley et al., 2005]. Mostly, the CEO is the only executive director in the board, while sometimes other members of top management are present on the board as executive director.

In view of the agency problem mentioned previously, supervising top management is required such that they act as agents of the shareholders. This supervisory role is performed by so-called (external) non-executive directors. Evidently, this role is a target for governance reform, as we will discuss later.

Structurally the two-tier structure also makes a distinction between supervising and managing, through a separate supervisory board and management board. Executive tasks are the domain of the management board, headed by the CEO. No person of the supervisory board may be part of the management board, or vice versa. Contrary to the Anglo-Saxon model, the supervisory board not only controls and assesses the activities of the management board, but it also determines the remuneration of the management board.

Much can be said about the pros and cons of the two structures. Proponents of the one-tier structure point to the direct involvement of the supervising (non-executive) directors with the activities of the enterprise. Supervision might thus have more substance, since non-executive directors have better knowledge. Despite the formal distinction within the board, the one-tier structure implies that control and assessment concerning the functioning of the board is performed by the board itself. Remuneration is also defined by the board itself. Those in favor of the two-tier structure doubt the independence of the non-executive directors. As indicated, the board is often chaired by the CEO, so the non-executive directors might become – unwillingly perhaps – involved in such a way in ongoing enterprise activities that a distant and independent perspective, required for effective supervision, becomes virtually impossible. The definition of the board's remuneration by the board itself is also seen as undesirable. This possibility is certainly not conducive to avoiding the second crisis in corporate governance sketched previously. Experience indeed shows where such a possibility might lead.

5.3.2 Forms of Ownership

The way corporate governance is performed is partly contingent on legislation and the structure of ownership, which in turn also depends on legislation. Different forms of corporate governance can therefore be noted. In view of the distinction between the internal and external corporate governance perspectives, the forms of ownership can be seen as an external aspect. These forms of ownership are associated with the way enterprises are financed. Both aspects, the form of ownership and the manner of financing, are seen as core aspects that define corporate governance [Solomon and Solomon 2004].

An important criterion concerning the form of ownership is the distribution of shares. When shares are in the hands of a small group of specific shareholders – such as banks, other enterprises or families – one refers to the 'insider model' [Solomon and Solomon 2004, Franks and Mayer 2005]. Instead of the insider model, the 'relationship-model' label is also used, because the specific character of the shareholder groups implies that more direct relationships will be maintained with the enterprise. The well-known Japanese term keiretsu – denoting a group of enterprises that are mutually financially supporting – literally means 'relationship financing'. The term 'bank-based model' can also be found [Franks and Mayer 2005].

A quite different situation exists when shares are in the hands of a large number of different shareholders or institutional investors who hardly have a special relationship with the enterprise. In that case, one refers to the 'outsider model' [Solomon and Solomon 2004]. Since financing of the enterprise takes place through the financial market, the term 'market model' can also be found [Franks and Mayer 2005].

The insider model can be found in Japan, France and Germany for example, while the outsider model is more typical of America and Great Britain. The following distribution example serves as an illustration. The ownership of shares in the 170 largest public companies in France, Germany and Great Britain, gives the following distribution [Franks and Mayer 2005]:

- France: about 80% of enterprises have at least one shareholder with more than 25% of the total shares.
- Germany: about 85% of enterprises have at least one shareholder with more than 25% of the total shares.
- Great Britain: only in 16% of enterprises is there at least one shareholder with more than 25% of the total shares.

For the United States, shares are virtually never concentrated in a major shareholder to a considerable extent [Drucker 1992a].

One might argue that the insider model offers better possibilities for addressing the agency problem: the more direct relationships of a small group of shareholders enables a more direct control of top management. Such a more direct control is evidently more cumbersome in the case of the outsider model, given the relatively large group of individual shareholders. Moreover, another argued advantage of the insider model is its larger resistance to the short-term focus and associated activities. Relationships with shareholders often have a historic origin, and have more than merely an economic content. This makes a more long-term orientation feasible [Drucker 1992a]. In this sense, the American and British financial markets can be characterized as short-term oriented. A dispersed group of many different shareholders lacks relational involvement that is typical for the insider model [Franks and Mayer 2005].

5.4 Corporate Governance Reform

5.4.1 The Primary Focus of Reform

In various countries, the crises in corporate governance discussed earlier have led to broad attention to this theme, and to the necessary reform. A number of related reports have been published. In Great Britain, attention to corporate governance issues was forthcoming in the Cadbury [1992] and Turnbull [1999] reports, while the Tabaksblat report was published in the Netherlands [2003]. From a broad international perspective, the corporate governance theme was addressed by the Organization for Economic Cooperation and Development (OECD) in which a large number of countries participate. The OECD published 'OECD Principles of Corporate Governance' in 1999, and issued a revised version in 2004 [OECD 2004]. Further, much literature about corporate governance appeared. Since different approaches to corporate governance can be observed worldwide, contingent upon local legislation and culture, differences understandably also exist regarding the specific character of corporate governance reform. Nonetheless, some reform initiatives can be identified that are generally undertaken. These initiatives will be discussed in the following paragraphs. Despite some level of similarity, a principal difference exists between the American, *rules-based* approach, and the European, *principles-based* approach.

The ups and downs of enterprises affect a wider area than merely shareholders. Earlier, we identified this wider area as 'stakeholders', such as customers, employees, suppliers, those living in the enterprise vicinity, and the society in general. Although generally not in a comparable sense, stakeholders have an interest in the way the enterprise operates. Even though stakeholders are mentioned in reports and literature about corporate governance, virtually all proposals for corporate governance reform focus only on shareholders. Reform aims to enhance the confidence of investors and protect the interests and rights of shareholders [Turnbull 1999, OECD 2004]. For that, the board is responsible and accountable [Cadbury 1992]. Since owners of a public enterprise have delegated control and assessment of enterprise activities to a representative board of supervising directors, either in a one-tier or two-tier structure (cf. paragraph 5.3.1), these supervising directors appoint top management for the daily management of the enterprise. Within this viewpoint, it is ultimately the board of supervising directors that must render account for the enterprise (financial/economic) state of affairs and be answerable to shareholders [Coley et al., 2005]. In view of the fact that, as sketched, top management did not protect the interests of shareholders adequately and did not execute their supervisory tasks adequately, the proposals for reform focus on: (1) transfer of the formal control and assessment of enterprise strategic behavior back to the supervising board, (2) conditions for controlling and assessing top management successfully, also in view of legal and other regulating requirements, and (3) the formal attention to the interests of shareholders in the renewed structure [MacAvoy and Millstein 2004].

5.4.2 Core Elements of the Proposed Reform

Independent Supervision

Various authors have drawn attention to the fact that the crises in corporate governance resulted to a considerable extent from inadequate supervision. Timely corrective measures in the case of underperforming top management were thus not taken [George 2004]. This danger seems less profound in the two-tier structure, but not totally absent. Within the Anglo-Saxon one-tier structure however, the independence of the supervisory role can be put seriously at risk. In about 85% of American enterprises, the CEO is also chairman of the board [Coley et al., 2005]. This makes the distinction between top management and its supervision problematic. Hence, an important suggested reform concerns the formal division between the CEO and the chairman of the board in a one-tier structure [MacAvoy and Millstein 2004, Coley et al., 2005, Jensen 2005a].

Within the one-tier structure there are two types of directors: external, non-executive directors, and internal, executive directors. Alongside the CEO, other executive directors might also be part of the board. That might also affect the independence of the supervisory role negatively, since executive directors might even outnumber the non-executive, supervising directors. The reform, for example required by the stock exchanges, necessitates that the majority of board members are non-executive (independent) directors. Many enterprises governed through a one-tier structure limit the number of executive directors to the CEO.

Committees of the Supervisory Directors or Supervisory Board

In order to execute their supervisory role more effectively, it is proposed that the board installs committees on which only non-executive directors (in the case of a two-tier structure, only members of the supervisory board) can have a seat. Three important committees are the audit committee, the remuneration committee and the nomination committee [Tabaksblat 2003, Coley et al., 2005]. The role of the audit committee will be clarified below in conjunction with the broader theme of auditing. The remuneration committee deals with compensation of top management and the associated policies, among them the performance criteria to be chosen. The selection, appointment and assessment of top management, as well as supervisory directors, is the task of the nomination committee.

Information and Knowledge Deficiency

An important cause for jeopardizing the independence of the supervisory role is the information and knowledge deficiency that supervising directors might have compared to top management [MacAvoy and Millstein 2004, Solomon and Solomon 2004]. Unlike the supervising directors who are only infrequently involved with the enterprise, top management has continuous involvement with strategic, tactical and operational concerns of the enterprise, and thus have extensive information and knowledge thereof. Top management filter their information and knowledge towards the supervising directors through reports and presentations. Evidently, the information and knowledge deficiency cannot be rectified easily. Some authors propose aiding the supervisory directors with a special staff that gathers information, and carries out analyses, such that supervisory directors are on equal footing with top management, and can thus perform their tasks more effectively [MacAvoy and Millstein 2004]. In fact, this proposal is an upswing to a broader perspective on corporate governance, to be discussed later.

Internal Control and Risk Management

Apart from fraud cases and dubious activities, the downfall of enterprises was also caused by lack of internal financial control and risk management. Risk management and control have to do with the independence of the supervisory directors and the information and knowledge they have on the one hand, as discussed previously, while on the other they depend on internal structures and systems. Among the latter, information systems occupy an important place, hence the strong relationship between corporate governance and IT governance argued in the introductory chapter.

One can define internal control and risk management as the totality of structures and systems (financial and otherwise) and their associated activities aimed at providing reasonable confidence regarding effective and efficient operation, financial prudence, and the compliance with rules and legislation. Within the proposed reform, top management has to declare that internal control and risk management are adequate. As will be outlined later, this aspect is part of the Sarbanes-Oxley legislation. Evidently, the structures and systems for internal financial control and risk management are essential within the corporate governance perspective, but, as we will show later, they can only be established effectively within the scope of enterprise design.

Internal and External Auditing

Central within the corporate governance approach is the notion of 'accountability': to be called upon issues regarding the enterprise and to be answerable about them [Solomon and Solomon 2004]. In this light, the importance of adequate internal control and risk management is considered essential, and therefore makes it mandatory to verify periodically whether the system indeed functions adequately. Many companies have created an internal auditing function for this periodic verification. In view of the responsibilities of the supervisory board, the board itself must assess the adequacy of internal control and risk management independently, also in view of pertinent rules and legislation. This includes reviewing financial reporting and the accounting rules used. The latter aspect is relevant, since as we saw, questionable and partly fraudulent use of accounting rules caused the serious second crisis in corporate governance. Transparency of (financial) data is essential for effective corporate governance, hence it is a prerequisite for effective auditing. Once more, this points to the relationship between corporate and IT governance.

Next to internal auditing, auditing is required by external auditors, who report to the audit committee of the supervisory board, mentioned above. The Sarbanes-Oxley legislation discussed below defines requirements for external auditing.

Information Supply Towards Shareholders

An essential aspect of corporate governance reform concerns timely and correct publication of (financial/economic) information. Financial scandals have led in this respect to special requirements stipulated in the American Sarbanes-Oxley legislation (disclosure). This legislation obliges the CEO and CFO to declare formally that reporting is complete and accurate. This means that they state formally that: (1) reporting does not contain untrue statements about essential facts, (2) no essential facts are omitted, and (3) reporting portrays the true and real picture of the financial condition and performance of the enterprise [Coley et al., 2005]. The legislation mentioned above even requires real-time disclosure about changes in the financial condition of the company [MacAvoy and Millstein 2004].

Shareholder Activism

An obvious way to keep an adequate eye on the interests of shareholders is more direct involvement of shareholders themselves in enterprise activities and the assessment of top management. This might be seen as the ultimate solution for the agency problem. Such direct involvement is sometimes termed ‘shareholder activism’ [Solomon and Solomon 2004]. Shareholder activism is seen by some as an important contribution to effective corporate governance [Jensen 2005a]. Although apparently a proper route to pursue, the question is nonetheless whether shareholders have adequate information, knowledge and skills to make the intended activism effective. Rightly, there has been a warning of ‘pseudo management’ [Cadbury 1992]. When shares are in the hands of a multitude of individual investors, direct involvement becomes cumbersome. The question is whether that also holds when shares are owned by institutional investors, who might have the capabilities to effectuate shareholder activism. Research shows that in these cases too, the value of shareholder activism is not evident [Solomon and Solomon 2004].

5.4.3 The Sarbanes-Oxley Legislation

In America, the corporate governance crises led in 2002 to the so-called Sarbanes-Oxley legislation, named after its drafters, with the goal "to protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws, and for other purposes" [Findlaw 2002]. We will elucidate some aspects. The legislation intends to regulate many aspects, such as:

- Establishing a board that supervises the definition and application of accounting rules, indicated as the Public Company Accounting Oversight Board (Chapter 1).
- Independent external auditing (Chapter 2).
- The responsibilities of an enterprise regarding the arrangement and preservation of a structure for internal control over financial reporting (Chapter 3).
- Timely publication of adequate and correct financial information, and the formal statement of top management thereof (Chapter 4).
- Lawful sanctions (fines and jail time) sentenced as a result of unjustified actions, and the protection of 'whistleblowers' who report these actions (Chapter 8).
- Lawful sanctions for intentionally issuing incorrect financial accounts (Chapter 9).
- Lawful sanctions for obstructing official investigations, for example by changing, falsifying, or eliminating documents (Chapter 11).

For our discussion, the Section 302 'Corporate responsibility for financial reports' (Chapter 3), and Section 404 'Management assessment of internal controls' (Chapter 4) are of specific interest.

Section 302 concerns the arrangement and preservation of the structure for internal control over financial documents and reporting, such that reasonable assurance is given concerning the trustworthiness of financial reporting according to the applicable accounting rules. Changes in the arrangements that have, or realistically could have, a significant effect on the effectiveness of internal control must be made public. In some cases this requirement holds in real time. Top management has the obligation to avoid issuing misleading information about the background of the aforementioned changes.

Section 402 deals with formal statements that top management must issue: (1) the statements that the formal arrangements for internal control over financial documentation and reporting are assessed, and (2) that the arrangements for internal control are adequate and effective. The latter statement implies that reporting does not contain incorrect accounts about essential financial facts, and that no essential financial facts are omitted [Coley et al., 2005].

This legislation concerns not only American companies. Companies are affected by the Sarbanes-Oxley legislation as far as their shares are (also) traded on American stock exchanges. The influence of this legislation might also be manifest in other ways, for example, by requiring compliance with this legislation when operating in the American market.

5.5 Comments on the Proposed Reform

5.5.1 The One-Sidedness of the Shareholder Perspective

An interesting question concerns the primary focus of an enterprise. One might argue that an enterprise – in view of its function, and purpose for being – exists first and foremost for delivering products and services to customers. Hence the primary focus must be on customers and the products and services they obtain. It can be argued further that enterprises have a broader responsibility than just shareholders, so that responsibility, for example, also holds for employees (working conditions, employability). Thus, as we mentioned earlier, there are stakeholders that somehow have an interest in the ups and downs of an enterprise. These stakeholders might also include business partners, suppliers, society and the general environment in which an enterprise operates.

Within the corporate governance discourse the shareholder versus stakeholder perspective can also be noted. Some authors submit that "In serving the needs of its stakeholders most businesses find their purposes" [Coley et al., 2005, p. 5]. Stakeholders should thus be included in the corporate governance perspective [Freeman and Reed 1993]. According to the economist Milton Friedman however, the only social mission of an enterprise is to earn as much money as possible for the owners, whereby the basic rules of society must be adhered to [In: Brickley et al. 2005]. Creating shareholder value is thus seen as the standard for business performance [Rappaport 1986]. In short, in the eyes of many authors, the shareholders must be the only focus, whereby the primary goal of the enterprise concerns maximizing the economic value for shareholders [MacAvoy and Millstein 2004, Jensen 2005b, Miller 2005]. Incidentally, this begs the question as to how economic value is defined and should be maximized. We will return to this question in a later section.

According to Jensen, the single focus on maximizing economic value likewise implies a single goal for management of the enterprise, whereas attention for stakeholders would imply multiple goals [2005b]. These multiple goals are often not mutually consistent, since stakeholders are likely to have different interests. This would confront top management with conflicting criteria for decision-making. Further, within the stakeholder perspective, enterprise means are directed towards issues other than maximizing shareholder value, which is precisely the core of the agency problem discussed in paragraph 5.2.2.

Nonetheless, despite the emphasized singular goal – maximizing shareholder economic value – completely ignoring the interests of shareholders is rejected by Jensen [2005b]. An approach is proposed labeled as 'enlightened value maximization', whereby the interests of stakeholders are brought into considerations about the primary purpose of the enterprise. Thereby, effort must go into value maximization in the long-term, not into profit maximization in the short-term [op. cit.]. Even so, others have disputed this dual position: within a focus on shareholder value maximization it is not to be expected that the interests of stakeholders are addressed adequately, unless this is beneficial to shareholders [Solomon and Solomon 2004].

Meanwhile, attention for stakeholders remains strongly present. There is research showing that enterprises with excellent attention for social, ethical and environmental aspects, with better corporate governance, also performed better pertinent to the value of shares. One might argue that all these aspects have to do with underlying factors like better top management and enterprise performance. Nevertheless, a certain weight of evidence points to a positive relationship between the social responsibility of enterprises on the one hand, and financial performance on the other [Solomon and Solomon 2004]. Experience has shown that enterprises can suffer serious damage (also for shareholders) by neglecting their social responsibilities (in public opinion). Research in 23 countries among 23,000 respondents indicated that more than 90% believed that enterprises have a broader responsibility than profitability [Moss Kanter 2004].

5.5.2 The Economic Value Criterion is Unsuitable for Governance

Convictions about the primary purpose of the enterprise evidently determine the performance criteria primarily used. Within the view that enterprises can only survive and grow if products and services continue to be delivered to customers successfully, the primary performance criteria have to do with customers and their satisfaction, as well as with the quality of the products and services. Within this view, excellent economic results are more a result than a primary goal. The shareholder versus stakeholder issue discussed in the previous paragraph also translates into the type of performance indicators used. A well-known approach that intends to provide a broader perspective than merely a financial/economic one is the 'balanced score card' method, as discussed in paragraph 2.3.3 [Kaplan and Norton 1996]. Four attention areas are identified: customers, internal processes, finance and learning. Essentially, the method aims to present a combined (balanced) picture about enterprise performance pertinent to the attention areas given. If so decided, other areas of attention might be brought into the balanced presentation, such as 'employees'.

From the financial/economic perspective however, it is argued that the balanced score card method does not enable making (financial) trade-offs between the various areas of attention. Within that view, the score card is not 'balanced', but merely a dashboard which presents indicators that cannot be directly financially related [Jensen 2005b]. Since an unambiguous performance criterion is lacking as such, decision-making will fall back on using (often inadequate) financial data from the accounting system. Hence, within financial/economic thinking, the use of a singular goal for the enterprise is promoted: maximizing the economic value for shareholders. Within this view, enterprise performance is often defined in terms of 'maximizing shareholder value'. As we mentioned earlier, the danger of a short-term financial focus is highly likely. Proponents of the aforementioned performance criterion have been criticized by Drucker: “They are, however, surely wrong in defining ‘performance’ as nothing but immediate short-term gains for shareholders. This subordinates all other constituencies – above all managerial and professional employees – to the immediate gratification of people whose only interest in the business is short-term payoffs” [1992a, p. 18]. Moreover, “Such short-term capital gains are the wrong objective for both the enterprise and its dominant shareholders. As a theory of corporate performance, then, ‘maximizing shareholder value’ has little staying power” [op. cit., p. 193].

Nonetheless, the theme of enhancing economic value for shareholders – without necessarily inducing a short-term financial focus – continues to be a focus area within financial/economic thinking. The question there is how economic value should be defined. This appears to be a theme for considerable debate. One might consider the share value or the profit per share as a criterion. The economic value of the enterprise (probably also reflected in the share value) might also be considered. The economic value of the enterprise is advocated by many authors as the preferred criterion. Here the (American) accounting system lies heavily under fire. According to many professionals, financial data produced by this system is totally irrelevant for determining the economic value of an enterprise [Antle 2004, Baylor University 2005, Stewart 2005]. However the question now shifts as to how the economic value of an enterprise must be defined.

Within the perspective of the singular value maximization goal, a criterion has been sought that could express the economic value of an enterprise unambiguously. This issue is also rife with controversies. According to some authors, the criterion sought is ‘economic profit’, also identified as ‘economic value added’ (EVA) [MacAvoy and Millstein 2004, Biddle et al. 2005, Jensen 2005b, Stewart 2005]. EVA is defined as net profit from operational activities minus costs of capital. It is argued that these costs not only pertain to interest for loaned capital, but that a certain financial return for shareholders must also be included in the costs of capital [Stewart 2005]. In view of different capital sources and their effect on the total capital costs, one refers to the ‘average costs of capital’. Establishing the costs of capital in a precise and meaningful way is mentioned as problematic for using the EVA criterion.

The single, unambiguous criterion of economic value based on *current* enterprise performance is mentioned as an important benefit of EVA. Share value on the other hand is (partly) determined by *future* expectations. Notably, the relationship between variation in share value and variation in EVA appears to be weak. Statistical analysis shows that EVA only accounts for a maximum of 30% of share price variation (in some cases only for 10%) [MacAvoy and Millstein 2004]. One might thus question the linkage of top management remuneration with the value of shares in any way.

Despite the EVA promotion, the criterion for economic value continues to be a theme for considerable debate. Apart from the issue of which criterion is applied, the more fundamental question is whether the financial aspects that are addressed within the corporate governance perspective are adequate by themselves to maximize economic value. For many authors, the answer to this question is in fact negative, since they advocate a broader perspective that also includes enterprise strategic issues, as we will discuss in paragraph 5.5.8. Factually, this amounts to acknowledging that the current economic value is a poor predictor for future economic value. Put another way, totally different primary enterprise performance criteria are relevant, whereby economic value is more an outcome than a primary objective. Buying a car from an American car manufacturer which, as the story goes, notified its employees that "We are not in the business of making cars, but making money" does not seem obvious. One might wonder about the success of this strategic motto. In our view, the whole idea of economic value as a primary enterprise objective is totally at odds with the very purpose of why an enterprise is created in the first place. Within the vision that enterprises can only survive and grow if they continue to execute their purpose successfully – delivering products and services to customers effectively – the primary performance criteria lie in that area. Criteria that have to do with customer satisfaction, employee satisfaction, quality, operational excellence or productivity for example, are better predictors for future success.

5.5.3 Sarbanes-Oxley Legislation: Bureaucracy and Juridicalization

Reactions to the Sarbanes-Oxley legislation have not been overly favorable. Attention is drawn to very high costs associated with documenting, validating, authenticating, auditing and reporting (financial) data for example [Economist 2005]. The University of Illinois estimated that in 2004 as much as 132 million man hours were attributed to activities arising directly from the legislation [Bartlett 2005]. Ironically, the legislation appears to be a goldmine for accountants and auditors, precisely those disciplines whose weaknesses did not uncover and report unjustified financial behavior of enterprises or did so inadequately.

Reporting required by the Sarbanes-Oxley legislation is supposed to provide reasonable assurance that internal financial/economic control is adequate, and related reporting is trustworthy. The term 'reasonable' seems crucial, since it is impossible to avoid risks completely [Solomon and Solomon 2004]. Moreover, risks have an uncertainty, which is inherent in the complexity and dynamics of enterprising as argued in Chapter 2. Nonetheless, top management is expected to state that the arrangements for internal control are adequate and that reporting expresses 'reality'. Conceivably, it is precisely here that issues arise within a litigious context. Furthermore, as mentioned earlier, different accounting approaches within the applicable accounting rules can lead to different financial reporting about essentially the same facts, whereby every report apparently satisfies the requirement for 'honest and factual' description of the enterprise's financial/economic state of affairs [Cadbury 1992]. This is also not conducive to avoiding debate.

The Sarbanes-Oxley legislation requires that changes that might have, or reasonably could be expected to have, an effect on (the effectiveness of) the arrangements for internal financial/economic control and the associated reporting, must be made public. Increasing juridicalization is likely to induce the situation where it is no longer knowledge that one is reasonably expected to have which is the starting point for litigation, but what one should have known or expected. Specifically, the danger of increased litigation is seen in America [Shapiro 1994]. In addition, the increased danger of lawful sentences or other sanctions that are associated with this legislation, negatively affects the willingness of people to take up the positions in public enterprises mentioned in the legislation [MacAvoy and Millstein 2004, Solomon and Solomon 2004, Coley et al. 2005, Holmstrom and Kaplan 2005]. The danger of litigation is probably less for enterprises not affected by American legislation. The European (principles-based) approach, for example, differs considerably from the American (rules-based) approach. Apart from the negative economic effects resulting from the considerable bureaucracy and its associated high costs, the increased juridicalization of corporate governance is also seen as an economic risk.

5.5.4 External Auditing: High Costs and Questionable Value

Failing external auditing is considered to be a prime contributing factor to the crises in corporate governance. Audits were performed by accounting firms that were not independent enough from the enterprise being audited [Cadbury 1992]. In view of the interests of investors, the effectiveness and trustworthiness of external auditing is questioned, as is the autonomy of auditors with respect to their assignor [Solomon and Solomon 2004].

Nonetheless, for containing financial/economic risks, much benefit is expected from external auditing. The question is however, whether such auditing can be effective, and does not cause unnecessary discussion or litigation. Indeed, auditing might point erroneously to assumed irregularities. A numerical example can illustrate this risk. We define an audit as positive when no financial irregularities are found, and negative if the auditors are of the opinion that irregularities exist.

We define:

A as the event of a positive audit

$\bar{A}$ as the event of a negative audit

H the state of an enterprise without financial/economic irregularities

$\bar{H}$ the state of an enterprise with financial/economic irregularities.

We base our example on 1% fraudulent enterprises, so

$$P(\bar{H}) = 0,01 .$$

As indicated previously, financial/economic reporting is problematic in view of the different ways that essentially the same facts can be presented. Organization complexity can also be the cause of suboptimal transparency of financial/economic data. Besides, a fraudulent enterprise will most likely manipulate reporting, such that fraud is covered-up. Hence, various factors are causing the audit process not to be faultless: fraud is reported unjustifiably, or conversely, is not discovered. Consequently, a number of conditional probabilities can be identified regarding the audit process: a positive or negative audit under the conditions H or $\bar{H}$. For our illustration, we estimate these conditional probabilities as follows:

$$P(A|H) = 0{,}9 \qquad P(\bar{A}|\bar{H}) = 0{,}7$$
$$P(\bar{A}|H) = 0{,}1 \qquad P(A|\bar{H}) = 0{,}3\,.$$

The conditional probabilities given in the upper row show the nominal situation, whereby the probability that fraud is detected is estimated somewhat lower. The probabilities whereby the audit outcome does not conform to the factual state of the enterprise are given in the lower row.

Since unwarranted discussion or litigation must evidently be avoided, the question that should really concern us is: what is the probability that a negative audit ($\bar{A}$) indeed has to do with a fraudulent company ($\bar{H}$)? Formulated a different way, what is the probability $P(\bar{H}|\bar{A})$? According to Bayes theorem we have [Hoel 1962]:

$$P(\bar{H}|\bar{A}) = \frac{P(\bar{H})\cdot P(\bar{A}|\bar{H})}{P(\bar{H})\cdot P(\bar{A}|\bar{H}) + P(H)\cdot P(\bar{A}|H)}\,.$$

Entering the numbers gives:

$$P(\bar{H}|\bar{A}) = \frac{0{,}01\cdot 0{,}7}{0{,}01\cdot 0{,}7 + 0{,}99\cdot 0{,}1} = 0{,}066\,.$$

This must be termed a dramatic result: for enterprises having a negative audit, in this example there is only a 6.6% probability that fraud exists factually. Put another way, there is a 93.4% probability that enterprises are unjustifiably accused! Under these conditions this makes the costly external audit process virtually useless – at least in this respect. Some variation around the figures given for the conditional probabilities does not lead to a different conclusion. Only when a substantial number of enterprises engage in fraudulent activities, does the audit process become meaningful.

One can easily verify that the audit process is reliable when $P(\bar{H}|\bar{A}) \to 1$, giving the requirement that:

$$P(H)\cdot P(\bar{A}|H) << P(\bar{H})\cdot P(\bar{A}|\bar{H})\,.$$

This is an extremely severe requirement that can hardly be satisfied. Since the majority of enterprises do *not* engage in fraudulent activities, the requirement can only be satisfied if $P(\bar{A}|H) \to 0$. It is not likely that an audit process can have that quality. It is remarkable therefore, that in a domain where financial/economic thinking prevails, much money and energy is poured into a process of questionable value.

5.5.5 Rules and Procedures: Back to the Machine Bureaucracy

A rules and regulations-based arrangement for internal control and risk management is expected to lead to more *formalization.* Arguably, corporate governance with stringent rules and regulations will induce the characteristics of the machine bureaucracy, hence will induce the *mechanistic* way of organizing, discussed in Chapter 2. However, enterprise performance (productivity, quality, service), enterprise learning and innovation, as well as the ability to adapt and renew, require precisely opposite characteristics. As extensively argued in Chapter 2, these conditions necessitate a transfer from the mechanistic way of organizing towards the *organismic* way of organizing. Clearly, the danger of stifling bureaucratic regulations frustrating that transition is hardly imaginary. Lack of flexibility and the inability to innovate timeously are serious business risks. Therefore, the question seems justified as to whether the strong focus on internal control does not in itself constitute a serious business risk, since the increased formalization tends to stifle companies. Indeed, enterprises complain that legislation, rules and regulations regarding corporate governance have merely introduced bureaucracy and red tape, impeding creativity and innovation [Bartlett 2005]. Within the principles-based European approach, as compared to the American rules-based approach, the aforementioned business risk is expected to be lower [Tabaksblat 2003, Solomon and Solomon 2004].

5.5.6 Stringent Legislation: Risk-Avoidant Behavior

Our discussion in Chapters 2 and 3 illustrated that enterprises operate increasingly within a complex context characterized by high internal and external dynamics. As we have argued, uncertainty is inevitably associated with complexity and dynamics, making predictability and control of risks an illusion to a large degree. Risks are thus an inherent aspect of enterprising. Stringent legislation and associated penalties are likely to induce litigation about risks that, in perception after the fact, should have been foreseen. Such a context does not seem conducive to the honest spirit of enterprising. The danger is not imaginary that risk control eventually leads to risk avoidance [Bartlett 2005]. In addition to increased bureaucratization, this form of risk-avoidant behavior also has negative economic consequences.

The Cadbury report addresses this point cogently [1992]. It is all about the right balance between complying with certain standards for corporate governance on the one hand, and the possibility of maintaining the essential ‘sprit’ of enterprising on the other. Rightly, it must be acknowledged that no arrangement for internal control can eliminate risks completely (including those for unjustified behavior) without binding enterprises in such a way that enterprising and competing in the market is impeded [Cadbury 1992]. In view of the increasing juridicalization, specifically within the American context [Shapiro 1994], it is all about the right balance between the ability to call upon top management and the supervisory directors to render account for their actions, on the one hand, and on the other the requirement to have maneuverable space for enterprising in all honesty, without the danger of unjustified legal liability [Brodsky and Adamski 1995]. Cases have already been reported of enterprises that withdrew from stock exchanges for the reasons mentioned above [Solomon and Solomon 2004, Economist 2005].

5.5.7 Rules and Legislation: Will they Work?

Evidently, rules and legislation are necessary to regulate many aspects in a society in an organized, safe and just manner – hence also aspects that concern enterprises. The question here is always when the added value of rules and legislation declines.

The Sarbanes-Oxley legislation stipulates many issues in detail. This is an example of the rules-based approach to corporate governance, that manifests a legislative culture. A fundamentally different approach is provided by the principles-based approach that is generally advocated in Europe, and is used for example in the Dutch corporate governance code [Tabaksblat 2003]. In fact, the principles-based approach is advocated in comments on the Sarbanes-Oxley legislation [Romano 2005]. It is argued that laying down detailed rules invokes precisely the behavior that one intends to avoid: enterprises comply with the letter, but not with the spirit or intention of the legislation [Cadbury 1992, Solomon and Solomon 2004]. As a comparison, a similar objection has been voiced regarding the rules- and procedures-based ISO 9000 approach to quality improvement: bureaucracy that has little effect, or is even counter-productive [Seddon 2000]. Conversely, the principles-based approach might avoid the stifling rules enforcement that impedes enterprise activities. The underlying principle is 'apply or explain' [Tabaksblat 2003, Solomon and Solomon 2004]. A similar distinction holds for the rules-based (American) and principles-based (European) accounting systems [Baylor University 2002].

Alongside the negative economic effects, the effectiveness of the legislation is also seriously questioned. It is argued that the causes of unjustified enterprise (top management) behavior are not addressed by the Sarbanes-Oxley legislation. Put another way, the legislation would not have avoided the financial scandals that became public in more recent history [Economist 2005, Bartlett 2005, Romano 2005]. An extensive analysis by the Yale Law School stated that the Sarbanes-Oxley legislation was "emergency legislation, enacted under conditions of limited legislative debate, during a media frenzy involving several high-profile corporate fraud and insolvency cases" [Romano 2005, p. 1528]. The ultimate qualification turned out to be "quack legislation" [op. cit.].

The risks of stringent rules and legislation have been discussed in the two preceding paragraphs. Concerns about these risks might be compensated by the evident effectiveness of the proposed reform. So, the question is whether the proposed reform will work. Does it lead to avoiding top management misbehavior and better enterprise performance? That does not appear to be the case. Notably, the character of the proposed reform is primarily structural in nature, and does not address the core problem: top management misbehavior in an economic, as well as in an ethical sense. Rules and legislation do not guarantee competence, nor morality [Coley et al., 2005]. A legalistic context with stringent rules and their enforcement cannot establish morality and ethics [Solomon and Solomon 2004, Coley et al., 2005]. Put another way, if top management engages in unethical behavior, no corporate governance arrangement can avoid the ultimate consequences [Solomon and Solomon 2004]. In the end, it all boils down to the ethical quality and competence of top management, whereby leadership and cardinal norms and values are essential [Lane 2004, Moss Kanter 2004]. Hence, it concerns integrity, openness, truth, sincerity, honesty and the appreciation of divergent opinions, precisely the attributes that were absent in fraudulent companies, and were suppressed by the inherent nature of short-term financial goals [Bennis 2004, Toffler 2004]. No enterprise can be honest towards the outside if it is not so internally. The danger of the structural approach to corporate governance reform also lies in the erroneous opinion that adequate corporate governance amounts to 'ticking off' measures on a list: there is compliance with certain requirements, and thus – as is supposed – the threat of unjustified financial enterprise behavior is neutralized, without any further behavior based on the true sense of ethical obligations [Gandossy and Sonnenfeld 2004].

Also in an operational sense, the suggested structural governance reform does not provide any guarantee for better enterprise performance. Research in this area did not provide any (positive) relationship [Gandossy and Sonnenfeld 2004, MacAvoy and Millstein 2004]. Nonetheless, there are organizations publishing corporate governance ratings, based on the degree of compliance with structural governance aspects. In view of the research mentioned, these ratings are of little significance, and have no predictive value concerning enterprise performance. Hence, some authors caution against the 'false recipes' of corporate governance consultants [Gandossy and Sonnenfeld 2004].

Rather than from the proposed structural measures, effective corporate governance follows from its incorporation and integration within adequate enterprise governance, a theme that was introduced briefly in the introductory chapter, and will be treated thoroughly in Chapter 7. The underlying rationale for this viewpoint follows from the justified observation, mentioned previously, that inadequate enterprise behavior pertinent to strategy development, its implementation, and the ultimate operation, constitutes the largest threat to the interests of shareholders. Within this line of thinking, corporate governance is placed within the context of enterprise-wide aspects concerning the primary business function, and the organizational, informational and technological arrangements supporting that function. Within this perspective, the limitations of the accountancy and auditing perspective – and the associated COSO framework – will be argued below.

5.5.8 The Limitations of the Financial/Economic Corporate Governance Focus and the Necessity for Enterprise Governance

Proponents of the structural corporate governance approach submit that the arrangement for internal control and risk management is crucial in view of effective and efficient realization of enterprise goals [Turnbull 1999]. Similarly, the Organization for Economic Cooperation and Development views corporate governance as a structure within which enterprise goals, as well as the means to realize them, are being established [OECD 2004]. The question however is, whether that is possible within the structural realm of the financial/economic perspective. Many authors about corporate governance in fact (implicitly) answer this question negatively, as will be corroborated below. Hence, the limits of financial/economic corporate governance perspective are thereby factually confirmed.

The internal aspects of corporate governance reform have to do with structural governance arrangements in view of shareholder interests. This begs the question as to whether these interests are best served this way. As sketched in paragraph 1.3.2 some authors on corporate governance emphasize involving the enterprise strategy into the corporate governance perspective, since the focus on strategy and subsequent successful implementation serves the interests of shareholders better than merely focusing on compliance with legal requirements concerning financial/economic risk management and reporting [Coley et al., 2005].

We indicated that the corporate governance theme has to do in this broader sense with the development of strategy, the design of the enterprise, the definition of programs and projects to implement the design, and the execution of these programs and projects. It is not the internal arrangement for (financial) control, risk management and reporting which is the primary focus of attention, but the strategic development of the enterprise in its totality. Recalling our discussion in Chapters 2 and 3, a multitude of enterprise (design) aspects have to be addressed for safeguarding enterprise performance and for defining and implementing strategic initiatives successfully. This concerns a wide spectrum of attention areas: employees, human resources management, management practices, processes, culture, information, technology and so on. Aspects that have to do with the strategic development of the enterprise – the business, organizational, informational, and technology aspects – require a perspective that encompasses the enterprise in all its facets, and subsequently requires a perspective on the totality of the design. This points to the theme of enterprise governance, a theme that many enterprises ignore. This is as much remarkable as problematic, since – referring to our discussion in Chapters 2 and 3 – the success rate of strategic initiatives is rather poor. Lack of unity and integration was identified as a primary, if not the prime, cause of failure.

Obviously, for realizing a unified, integrated comprehensive enterprise design, the limited financial/economic corporate governance perspective is *inherently* unsuitable. Rightly, totally different areas of attention, as indicated, are relevant.

Appreciably, a car cannot be designed by focusing on its financial/economic aspects!

In reiteration, one might argue that a fundamental conceptual and methodological problem within the corporate governance approach lies in the limitations of the financial/economic perspective, since adequate enterprise performance and the control of risks in the financial/economic domain require an approach that greatly transcends that domain; an approach that cannot be developed *inherently* within that domain. These limitations will also become manifest when discussing the COSO framework for corporate governance below.

5.6 Frameworks for Corporate Governance

For the purpose of our discussion in this section, a framework can be considered as a conceptual structure with important areas of attention that one should address in the interests of arranging a certain topic properly. In our case, this topic concerns the arrangement of effective corporate governance, whereby the framework identifies essential areas of attention that are supposed to yield effective governance when adequately addressed. Understandably, the framework for corporate governance is contingent upon the vision on corporate governance and the associated concepts. The profession within which the framework is developed evidently plays an important role. Below, we will reiterate the COSO framework, defined from within the accountancy and auditing profession. Incidentally, similar professions in different countries have led to different frameworks [Root 1998]. After discussing the COSO framework, as an illustration we will discuss other governance frameworks that have been developed from totally different perspectives, and therefore define other areas of attention for governing an enterprise.

5.6.1 The COSO Initiative

We have discussed how the attention for corporate governance has grown over the years, driven to a considerable extent by various financial scandals in which enterprises were involved. In America, this attention led to establishing the National Commission on Fraudulent Financial Reporting, chaired by James Treadway, identified in short as the Treadway Commission. This commission issued a report in 1987, containing various suggestions for avoiding financial misconduct. Since the commission consisted of various representatives of the financial/economic domain, the report voices the perspective of accountants and financial auditors. The commission addressed the notion of internal control, as sketched in the previous paragraphs [Root 1998].

After the report was issued, the question arose as to how to implement the recommendations for internal control the Treadway Commission had published. Subsequently, the organizations that supported the commission met again to formulate guidance for implementing the previously formulated recommendations. Hence the name COSO: Committee of Sponsoring Organizations of the Treadway Commission. In the next paragraph we will outline the COSO framework briefly, since this framework receives broad attention, and is seen as the 'standard' for internal control. Thereafter, paragraph 5.6.3 addresses the issue as to whether the COSO approach is adequate.

5.6.2 The COSO Framework

We will confine ourselves to some essential aspects of the framework. COSO distinguishes four categories or result areas for enterprise risk management [COSO 2004]:

1. *Strategic*. Concerns high-level goals that are supportive of the enterprise mission.
2. *Operational*. Has to do with the effectiveness and efficiency of the utilization of means, and the degree of attaining enterprise goals.
3. *Reporting*. Concerns the trustworthiness of reporting, such that the actual (financial/economic) state of affairs is presented with reasonable certainty.
4. *Compliance*. Concerns satisfying (financial/economic) rules and legislation.

The framework identifies eight components which, provided adequate attention is given, are supposed to bring success pertinent to the four result areas mentioned previously:

1. *Internal environment*. This forms the basis for the other *components*, and in fact concerns the enterprise context in which internal control (managing risks) takes place.
2. Objective *setting*. Given the emphasis on risk management, the formulation of objectives pertinent to the four result areas is important, since otherwise it remains unclear which events imply risks for realizing the objectives.
3. *Event identification*. This has to do with the identification of external and internal events that might affect the realization of objectives. Distinction is made between risks and opportunities.
4. *Risk* assessment. This concerns the assessment of risks in view of the stated objectives pertinent to the four result areas.
5. *Risk response*. After the identification and assessment of risks, the proper response must be defined, also in view of the risk level that is considered acceptable.
6. *Control activities*. Within the COSO perspective, primarily this concerns 'policies and procedures' for effectuating internal control. Given the background of the participants in the COSO activities, the policies and procedures reflect the accounting and auditing perspective.
7. Information *and communication*. This concerns a broad area of financial and non-financial information, its quality and the systems that produce the information.

8. Monitoring. This last category concerns the periodic process of verifying whether the arrangements for internal control are operating effectively. Given the mentioned accounting and auditing perspective of the COSO framework, this includes internal and external auditing.

Within the COSO view, one refers to effective internal control, hence effective enterprise risk management, if supervisory directors and top management have reasonable assurance about the degree of attaining strategic and operational objectives, reporting is trustworthy, and rules and legislation are adhered to.

5.6.3 Is the COSO Approach Adequate?

Important within the COSO approach is the identification, assessment and control of risks pertinent to the objectives concerning the four result areas. This could be risks resulting from unauthorized access to IT systems (event identification), which could lead to the manipulation of data, thereby jeopardizing the trustworthiness of financial reporting and the compliance with rules and legislation (risk assessment). Measures concerning data security and access to company data networks are possible answers to this threat (risk response). Other (operational) risks can also be identified in a comparable sense, such as those having to do with the arrangement of processes and the availability of resources. Achieving back-up or redundancy are possible answers to such risks.

Identifying and controlling risks is evidently relevant. The COSO premise holds that a powerful system of internal control is essential for managing and containing risks. All this takes place within the 'internal environment' of the enterprise, which is the enterprise-wide context for producing products and services for customers. Such a context thus includes a plethora of facets and activities for (risk) management directed towards realizing objectives, such as formal operational and support processes, information supply, technology, culture, organizational structures and systems, human resources management, etc. This comprises a whole spectrum of concepts and theories from the literature about the development and arrangement of enterprises. As our previous examples about information security and operational process continuity illustrate, internal control of risks is primarily a matter of proper enterprise *design*. One might observe that identifying risks meaningfully already assumes adequate knowledge of the totality of enterprise arrangements – its design – in order to be able to recognize risks and define an adequate response. Put another way, in the terms of Chapter 4, one should have a *constructional* perspective that embraces the enterprise in all its design aspects, in order to identify and assess risks meaningfully, precisely the perspective the COSO approach does not seem to offer. The focus in the COSO framework points strongly towards 'control activities' laid down in 'policies and procedures'. Proper enterprise design appears not to be an area of concern.

As outlined, the origin of the corporate governance approach had to do with insufficient attention for the interests of shareholders, whereby an important question concerned the manner by which these interests are best served. This appeared to be an issue for considerable debate, also involving the proper performance criteria for an enterprise (cf. paragraph 5.5.2). The narrow or broad perspective on corporate governance outlined in paragraph 1.3.2 determines the answer to the question as to how the interests of shareholders, or the economic value of the enterprise, should be addressed optimally. Within the narrow perspective the answer to this question boils down to financial/economic control aspects, reporting and auditing. The broader perspective acknowledges that financial/economic risks for enterprises, hence for shareholders, have to do not so much with inadequate reporting or auditing, but with failing enterprise strategies. Although strategy (strategic result area) receives attention within the COSO framework with the purpose of identifying and controlling risks that might jeopardize strategic initiatives, paragraph 3.2.4 argued that strategic success has to do first and foremost with realizing a unified and integrated enterprise design. As mentioned earlier, the design aspects do not receive adequate attention within the COSO framework.

The following can be said concerning events having a negative effect on realizing strategic intentions. Strategic risks are (also) related to the risks inherent in doing business. Much can be said about the latter, in any case that doing business brings with it uncertainty resulting from an uncertain, dynamic and literally unknowable future. As sketched in Chapters 2 and 3, this uncertainty is caused by many factors, not only associated with the enterprise strategy itself, but also by factors associated with the market, consumer behavior, the economy, the geopolitical situation, governmental influence, the climate and so on. Alongside external factors, internal factors also contribute largely to uncertainty. As argued in Chapter 2, enterprises are very complex systems that cannot be treated in the traditional mechanistic manner, let alone predicted [Stacey 1996, Sterman 2000]. Apparently ignorable causes can have major, unforeseen effects. Insights from theories about complexity and chaos teach that a limit, often quickly reached, exists for the ability to predict and control beforehand, as we have argued in Chapter 2. The organismic way of organizing has been stressed for dealing with complexity, dynamics and the associated uncertainty. The COSO-emphasized attention for 'policies and procedures' seems to be based on the mechanistic, deterministic vision (cf. Chapter 2), whereby a supposedly definable process can define a bounded set of risks in a meaningful way, and can subsequently assess and control them. Not surprisingly, it is stated that the COSO framework enables management to deal effectively with uncertainty [COSO 2004]. In view of the essential characteristics of enterprising, and the associated complexity, dynamics and uncertainty, this viewpoint seems debatable [Root 1998]. We might recall that a fundamentally different perspective on strategy development was presented in paragraphs 2.3.4 and 3.2.2. Other than the mechanistic methods for internal control, the competency-based approach was emphasized (cf. summary of paragraph 2.5). The typical mechanistic stance of the COSO framework can be compared against the CobiT framework for IT governance, discussed in the next chapter.

5.6.4 Other Governance Frameworks

As mentioned previously, the attributes of the framework for governance are contingent upon the profession and vision on which it is based. One might thus argue, that something other than the financial/economic outlook on enterprising and enterprise goals will also lead to another framework, with different areas of attention. For example, in paragraph 3.2.4 we presented the 7S-framwork of McKinsey [In: Peters and Waterman 1982]. This framework defines seven areas of attention that are considered relevant from an overall governance perspective. MIT developed a somewhat comparable framework with the attention areas of 'strategy', 'technology', 'structure', management processes' and 'individuals and roles' [Scott Morton 1991]. In this model, the three latter areas of attention determine the culture of the enterprise, comparable with 'shared values' in the 7S model.

In paragraph 5.5.2 we stated that one might rightly argue that enterprises can only survive and grow if products and services continue to be delivered to customers successfully. Enterprise goals will then obviously concern customers and service, as well the internal arrangements to produce products and services in a quality- and service-oriented manner. Within this view, excellent economic results are a result, rather than a primary goal. As such, quite different areas of attention are relevant. We will return to this aspect more thoroughly in the chapter on enterprise governance. For now we will illustrate the notion of different areas of attention by referring to the framework often used within the Total Quality Management philosophy. Figure 5.3 shows the framework of the European Foundation for Quality Management [EFQM 2003]. The framework has nine areas of attention that need to be addressed in a unified and integrated way in order to develop and maintain a quality-oriented enterprise. As the model shows, the areas of attention defined from the quality philosophy are rather different to those of the COSO framework, defined from the financial/economic (accounting and auditing) discipline.

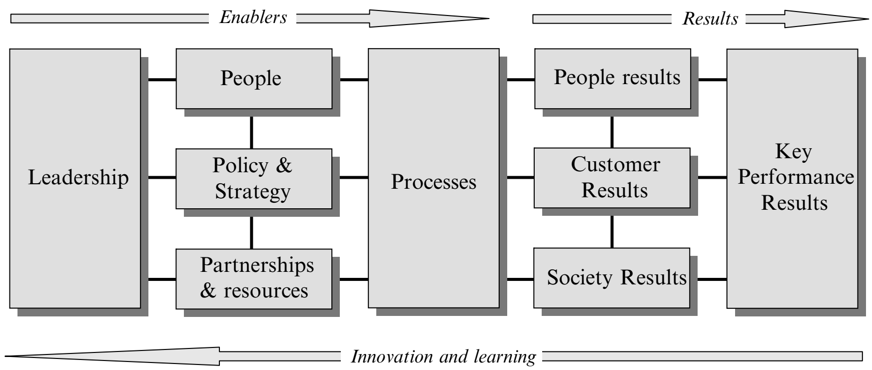


Fig. 5.3. EFQM Quality framework [EFQM 2003]

Obviously, the focus on quality fits within the view that excellence in product and service delivery, and the attraction and retention of customers, should be the primary enterprise goals. Precisely this is arguably the best guarantee that the interests of shareholders, and the economic value of the enterprise, are best served. Such an outlook implies a totally different management vision, whereby attention does not primarily go to short-term financial goals, with all the possible consequences described in this chapter. Remarkably enough, as far as we could assess, no quality- and service-oriented companies were involved in the financial scandals.

About the areas of attention that the different frameworks define, the following should also be said. As shown, different perspectives lead to different areas of attention that are deemed necessary for providing overall enterprise governance. This raises the following remarks:

- The areas of attention are of different character. Aspects that have to do with (strategy) development on the one hand, and the arrangement of the enterprise on the other, are not formally distinguished.
- It remains unclear according to which underlying theory and associated methodology the attention areas are defined.
- It remains unclear whether the areas of attention are necessary and sufficient (complete).
- No attention is devoted to the core issue: how to arrange the enterprise such that the areas of attention are actually operationalized.

We feel the remarks are due to the lack of a formal theory and associated methodology for enterprise design. Chapter 4 outlined the underlying concepts of such theory, which will be applied to enterprises in Chapter 7.

The COSO approach offers a limited operationalization of the notion of ‘internal control’, strongly determined by the financial, accounting and auditing disciplines. As illustrated, totally different domains for ‘internal control’ can be, and are identified, from within other disciplines for realizing enterprise goals. Examples of other frameworks were given. COSO-comparable initiatives in other countries have also come up with different frameworks [Root 1998]. It is however certainly conceivable that the COSO framework is accorded a dominant position in view of the mainstream financially/economically oriented corporate governance outlook. The COSO approach is deceptive, in so far as the suggestion is created that an adequate arrangement for internal control is presented that secures the financial/economic health of the enterprise, despite the claim that the framework enables organizations “to effectively identify, assess and manage risks” [COSO 2004].

Our advocated perspective rests on viewing the enterprise as a system, and using the associated theory and methodology to design the enterprise comprehensively in a unified and integrated way, given certain areas of concern. Among these areas of concern, requirements following from corporate governance viewpoints (e.g. compliance) can be taken into account in a concurrent, coherent and consistent manner. Anticipating the discussion in Chapter 7, some considerations for the fundamental design perspective will be given in the next section.

5.7 Corporate Governance: How to Arrange it?

As mentioned earlier, effective arrangement of corporate governance must be based on, and integrated with, the design of the enterprise as a whole. This will be the theme of Chapter 7. Considerations for the integrated approach are given below.

5.7.1 Compliance: Financial Reporting

Compliance has to do with satisfying rules and legislation. Internal corporate governance arrangements must thus satisfy external corporate governance directives. An important aspect of compliance is the form and trustworthiness of financial reporting. Various regulating bodies have defined accounting rules or principles, such as the US Federal Accounting Standards Advisory Board that defined the set of 'Generally Accepted Accounting Principles/Practice' (GAAP), or the International Accounting Standards Board that issued the 'International Financial Reporting Standards' (IFRS) [IASB 2007]. The latter set of standards is used by many countries, and is mandatory within the European Community. The two sets of standards differ in various areas, whereby from an overall perspective the IFRS is considered principles-based with little application guidance, and the GAAP is considered rules-based, with specific application guidance [Solomon and Solomon 2004]. The IFRS covers a wide range of topics concerning the financial treatment of assets, acquisitions, joint ventures, mergers, inventory, loans, debtors, creditors, profit, taxes, costs, amortization, etc. Further, the IFRS indicates how the various financial statements must be interpreted and presented. Examples of IFRS principles might be (in our own wording): (1) financial assets must be based on the 'fair' (actual) value, (2) negative goodwill must be recognized immediately in the profit and loss statement, or (3) the effect of events (e.g. transactions) must be recorded financially when they occur, not when cash is received or paid. Accounting principles should evidently be applied when designing the administrative organization and the management information supply. Put another way, accounting principles must be designed formally into the respective IT systems. Further, since events that have a financial impact occur in operational processes, these processes must be linked to financial informational systems. This points to a broad perspective on enterprise design.

The broad focus on enterprise design also follows from a fundamental IFRS requirement, which holds that enterprises must adopt the 'management approach' to financial reporting, implying that enterprises must use the same underlying data for financial reporting as is used for managing the enterprise and enterprise performance. In doing so, financial (performance) reporting can be linked transparently to operational performance and reporting. The approach is also efficient: data is used that is already available from enterprise operations. Clearly, in this sense, financial reporting is not something separate, but an integrated deliverable from the enterprise as a whole. Again, proper financial reporting thus requires a broad perspective on enterprise design.

5.7.2 Compliance: Internal Control

As we have seen, another important aspect within corporate governance is the notion about internal (financial/economic) control. A typical facet concerns the systematic gathering, recording, and processing of financial/economic data for internal control and effectuating accountability. Evidently, this requires such measures that financial data and reporting are trustworthy. Understandably, the trustworthiness of financial reporting depends on the trustworthiness of the financial data itself, which might degrade due to:

- Flawed informational or documental process design, creating diverging or incompatible data
- Inadequate data management
- Inadequate data or system security
- Faults or disruptions in IT systems
- Deliberate manipulation.

This summary of possible causes for degrading data quality also brings the design, utilization, operation and maintenance of IT systems formally within the scope of compliance. The requirement thereby is that the utilization of IT systems and the activities within IT operations management – among them change, problem and release management of IT systems – should not affect the trustworthiness, completeness, and availability of (financial) data. This also points to the operation and design of the enterprise and IT systems within. This concerns processes and their informational aspects, data management and security for example. Various operational policies – applicable to various organizational domains – should thus be defined to safeguard the integrity of the informational system. Table 5.1 gives some examples.

Table 5.1. Examples of operational policies relevant to compliance

Operational rules relevant to compliance
All functional and operational IT system changes must be documented and auditable
All IT systems must be classified pertinent to security and continuity considerations
Only certified access equipment may be used
Network access must be based on two-factor authentication
IT operational management must focus on the end-to-end customer service process
Non-approved end-user created applications may not be used
Any IT system changes may only take place after back-up and roll-back is arranged
Authentication and authorization data must be managed centrally
Dual authorization is required for transactions over amount ‘x’

As we have mentioned in paragraph 5.4.2, the notion of internal control extends beyond merely safeguarding the trustworthiness of financial data, but also tends to focus on operational integrity, such as through assessing and avoiding risks. Within this broader view on internal control, the following aspects play a role for example:

- Tasks, authorizations and responsibilities
- Tasks execution, policies and rules (including those for avoiding unwarranted risks)
- Process control, execution and improvement
- Resources and their planning
- Performance criteria.

This view on internal control necessitates attention for a wide range of operational, support, informational and documental processes. As argued previously and in paragraph 1.3.1, the utilization of information technology must also be included in the perspective for arranging internal control, since operational systems, decision support systems, management information systems, knowledge systems and office automation are all dealing with aspects relevant to internal control. Hence we submit that properly effectuating internal financial/economic control inevitably leads to attention for the arrangement of the enterprise as a whole. Put another way, the proper arrangement of corporate governance should take place within the overall enterprise governance context.

Alongside formal arrangements for internal control, corporate governance has an ethical dimension: norms and values, as well as certain desired management and employee behavior, in the interests of avoiding unjustified or fraudulent behavior. In Chapter 3 we argued that norms, values and behavior are determined strongly by the internal enterprise context. For example, certain behavior might be stimulated or invoked by structures and systems for employee review and reward, as well as by the associated reporting structures about unit, process and employee performance. Desired forms of behavior should thus be enabled and supported by the enterprise behavioral context. This ethical aspect also points to a unified and integrated design of the enterprise as a whole.

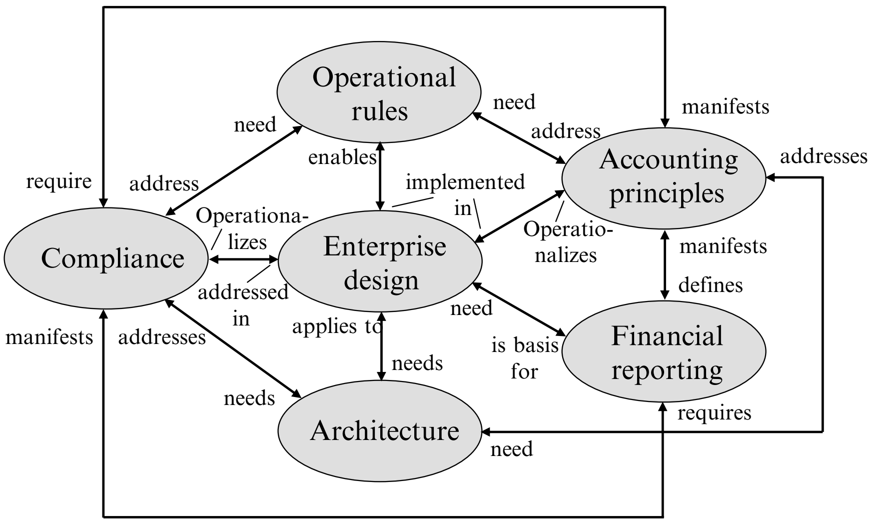


Fig. 5.4. Aspects of compliance and the central role of enterprise design

Figure 5.4 aims to illustrate the central notion of enterprise design in view of addressing compliance.

5.7.3 Design Principles for Compliance

We argued earlier that the broad corporate governance perspective, which also takes the enterprise strategy into consideration, leads inevitably to attention for the design of the enterprise in its totality (cf. paragraph 5.5.8). However, as we have argued previously, the more narrow focus on compliance (financial reporting and internal control) also leads inevitably to the similar enterprise-wide scope. Compliance is thus an integral part of enterprise-wide design. So, for example, design activities for IT systems providing secure network access and the management of the associated authentications and authorizations, is relevant to enabling customers, business partners, employees, and suppliers to have secure access to the enterprise network. Evidently, this is essential in view of the primary enterprise purpose and objectives, such as pertinent to e-business, or end-to-end process integration. However, the IT systems to be designed from the primary enterprise purpose and objectives are likewise relevant from compliance considerations. This illustrates that compliance is connected implicitly to the design of the total enterprise.

Chapter 4 considered the enterprise as a system. As we elaborated, system design takes place with reference to the primary system goal (its function) and objectives pertinent to certain areas of concern. Appreciably, and anticipating our discussion in Chapter 7, ‘compliance’ can be seen as an area of concern. Further, Chapter 4 taught that architecture – a coherent and consistent set of principles and standards for system design – is essential for unified and integrated design, while taking into account the objectives following from the areas of concern. Architecture should thus also be defined in view of the ‘compliance’ area of concern. The IFRS directives for accounting can be translated into principles for design. For example, the accounting principle that ‘The effect of events (e.g. transactions) must be recorded financially when they occur, not when cash is received or paid’ can be translated into an architecture principle reading: ‘Financial operational events must update financial informational systems in real-time’. As an illustration, table 5.2 below shows examples of architecture principles that are relevant from the compliance perspective.

As emphasized earlier, satisfying compliance requirements generally follows from the design of the enterprise, and the design of IT systems within, based on considerations such as process excellence, quality, efficiency, security and so on. Put another way, IT architecture and enterprise architecture will contain principles that are also relevant from the corporate governance (compliance) viewpoint. Most of the architecture principles in Table 5.2 illustrate this point. We underline yet again the importance of the competence-based governance approach, since the IT governance competence, jointly with the enterprise governance competence

Table 5.2. Examples of architecture principles relevant to compliance

Architecture examples relevant to compliance
Procurement and payment processes must have 'non-repudiation' protection
Financial data should be stored at only one location
All process steps requiring authorization must store executional data
All operational authorizations must be linked to personnel data
Essential and critical IT systems must have operational failure protection
Network access must be based on authentication and role-based authorization
Network access must be based on two-factor authentication
Process design must exclude the necessity for data reconciliation
Financial operational events must update financial informational systems in real-time
Process events must be logged in read-only data storage

should define architecture principles and standards, among those which are (also) relevant for corporate governance. It will become clear in Chapter 7 that the architecture principles of Table 5.1 are part of either the organization architecture, information architecture or IT architecture. The case study presented in Chapter 8 will exemplify further that satisfying compliance requirements implies a focus on the design of the enterprise as a whole.

6 IT Governance

After introductory remarks about the reasons for information technology (IT) governance, we will illustrate briefly that IT has developed into a technology affecting virtually all facets of society fundamentally. The developments sketched show how IT governance could grow into a problematic phenomenon, and makes it plausible why the theme of 'business and IT alignment' is addressed frequently in the literature. This theme and a number of IT governance perspectives will then be discussed. We will show that IT governance approaches presented in the literature are primarily structurally oriented, with a strong focus on control and decision-making arrangements. The limitations of such an approach will then be argued. These limitations provide the context for arguing that the realization of real business value through IT applications can only be established through a focus on design, whereby IT architecture provides the normative, guiding support. This will be emphasized as a core aspect of the competency-based IT governance vision. Three essential IT governance core competencies are discussed. These competencies provide the answer to the limitations of the structural approach to IT governance, as well as providing the answer to the necessary design focus. Pertinent to the IT governance core competencies, the overall governance process will be illustrated, and related formal meetings are indicated. Support competencies are mentioned briefly. In view of the tasks of these core competencies, the necessary central position of the IT governance competence is stressed, also in view of reducing IT legacy complexity. Finally, the often mentioned CobiT framework for IT governance is discussed, and our own perspective on IT governance maturity will be presented.

6.1 Introduction

6.1.1 Definition of Terms

Information Technology

The term IT governance necessitates the definition of two terms: 'information technology' and 'governance'. By 'technology' is understood the totality of knowledge, methods, physical means and materials for realizing and utilizing technical systems. Hence, *information technology* can be defined as the technology for gathering, handling, processing, storing and accessing data. One might observe that only then can 'information' be referred to if data has meaning (value) for an individual. In fact, a better term would be 'data technology'.

In view of the communication aspect, the ICT label is often used. One might consider *communication technology* as the technology for transmitting messages.

Jan A.P. Hoogervorst, *Enterprise Governance and Enterprise Engineering.*

The term ‘messages’ must be interpreted broadly, and denotes anything that can be transported through telegraph, telephone, radio or television. Due to the digitization of both data and messages, the difference between both technologies becomes virtually nil. This is not only the case for transmission itself – no distinction in the digital manifestation of speech, images or data – but much communication equipment also has computational capacities. In fact, communication technology can be viewed as a specific facet of information technology. We will therefore refer simply to IT rather than ICT.

IT Governance, IT Management and IT Functions

The notion of ‘governance’ has been outlined and defined in the introductory chapter (cf. paragraph 1.2.2), where the difference was highlighted between governance and management. We indicated that views of IT governance presented in the literature are rather structure-focused and linked strongly to enterprise (top) management. It appears to be suggested that IT developments will progress in the desired direction once the framework for decision-making and accountabilities is defined. How it should be determined what the desired IT developments should be, remains unclear. We submit, and will argue extensively later, that IT governance is more than committees, decision-making and accountability structures, but must primarily concern the *substance* that must be (eventually) decided upon. With reference to the notion of ‘competence’ outlined in paragraph 1.4.2, and to the emphasized organismic way of organizing discussed in Chapter 2, ‘IT substance’ is determined by an organizational competence: a unified whole of enterprise IT skills, knowledge and technology that rests on employee (IT) competencies. Hence, rather than viewing IT governance from the structural, management-oriented perspective, this chapter aims to prove that IT governance must be seen as an organizational competence that rests on employee competencies. Additionally, we will address how the organizational IT governance competence must be arranged, and which core competencies are essential.

Given our interpretation of the term ‘governance’, we will consider IT operational activities (the provisioning of IT services) as part of the IT management domain. To a considerable extent, this also holds for the development of IT applications (based on approved designs). These IT services might be outsourced, whereby management of these services will take place outside the enterprise domain. Competencies that have to do with relationship, contract, and service level management remain internally important, but these competencies also have an operational (management) character. Understandably, IT governance must be retained as an essential internal competence, since the manner by which the (outsourced) IT services are delivered to the enterprise, is determined to a considerable extent by requirements stipulated by IT governance. Consider architecture for application development, and the security for service delivery, or directions for project execution and reporting. Sometimes, and somewhat confusingly, IT management is identified as “information management” [Earl 1989].

The notion of ‘IT function’ can generally be defined as an organizational entity that carries out activities pertinent to, for example, either strategy development, IT architecturing, the design of IT systems and networks, or their implementation and operation (exploitation). Concerning the arrangement of IT functions, different approaches can be distinguished [Earl 1989]:

- *Centralized.* All IT functions are part of a central unit.
- *Decentralized.* IT functions are part of enterprise units, and are executed autonomously. Duplication of functions is thus inevitable.
- *Federal.* Both central and decentral functions exist.

This chapter will address IT functions in so far as they pertain to IT governance.

6.1.2 Why IT Governance?

The enormous influence of information technology (IT) on the arrangement of organizations and society is experienced by almost everyone. The historical developments of IT, briefly sketched below, show that IT progress can be termed as revolutionary. Its enormous and revolutionary influence makes guiding the application of IT an evident area of attention: IT governance. The IT developments discussed below show that these developments increased dramatically from the second part of the 1980s. Given the necessity of devoting attention to the revolutionary character of IT progress, the notion of IT governance emerged at the end of the 1980s and beginning of the 1990s.

The frequency with which the IT governance theme is addressed in the literature and at conferences is still high. One might interpret this high frequency positively: a revolutionary technology and its successes is likely to draw attention, also from a governance perspective. All too often however, the reason for the mentioned high frequency is less positive: enterprise management associates IT, justified or not, with complexity, high costs, rigidity and responding inadequately to enterprise needs. Within this perspective, IT governance must be geared to increasing IT performance [Bloem and Doorn 2004].

We will devote ample attention to the emergence of this picture and its origins. A possible answer might be found in a fundamentally different reason for promoting the theme of IT governance, which has to do with the apparent limited interest of enterprise (top) management for IT, and with that the inability to acknowledge the revolutionary character of IT for their own organization. Already in 1991, the outcry was that “Few boards appeared to be concerned to exploit the possibility [of computer applications giving a competitive edge] as a deliberate, pioneering initiative” [Grindley 1991, p. 49]. Broad research among many enterprises in various countries showed that “The top problem for IT directors in all countries was not a technical difficulty, it was the culture gap between those who believed they were facing an information revolution and those accused of looking the other way” [op. cit. p. 88]. Some years later the situation had not improved much: limited interest and support from top management, whereby IT was seen merely as a cost category [Gianotten 1997, 1998]. Others report that “Managers have often delegated or abdicated decisions to information technology professionals" [Weil and Broadbent 1998, p. 18]. Still, research conducted in 2003 among Dutch companies showed that the IT strategy was determined primarily by the IT budget, rather than by the value of investments for creating long-term economic value for the enterprise as a whole [Gianotten 2003]. Cost reduction appears the primary concern: "The Butler Group has consistently found that management in 9 out of 10 companies have never considered the use of IT other than achieving labor displacement" [Butler 2005, p. 7]. Yet, "The ability to think beyond labor displacement will single out IT losers from the winners" [ibid.].

For now, these observations suggest not reducing attention paid to IT governance. An important additional reason for doing so concerns the poor success rate of IT strategic initiatives. We will argue that successful IT implementation requires not merely a technology focus, but needs an enterprise-wide focus, within which IT receives unified and integrated attention. Put another way, IT governance is only effective within the overall enterprise governance context. This latter context is seldom present, but adequate IT governance is also often absent. Although the necessity for such a regulating function is acknowledged by top management of Dutch companies for example, IT governance hardly appeared to be established [Gianotten 2001].

Worth mentioning is a worldwide IT survey among 7,000 respondents with a representative distribution pertinent to geography, enterprise size, industry sector and enterprise market position [IT Governance Institute 2004a]. The survey showed a clear difference between the desired and actual situation regarding governing IT: virtually all respondents acknowledged the importance of IT for realizing enterprise strategic objectives, and acknowledged the need for better IT governance, but only a minority actually practiced their convictions. The necessity for proper IT governance continues to be high, given the significant challenges for successful IT deployment caused by the problematic relationship between IT investments and enterprise performance, the low success rate of IT projects, high IT costs, and long delivery time on IT developments [Bloem and Doorn 2004]. According to Weil and Woodham, "An effective IT governance structure is the single most important prediction of getting value from IT" [2002]. We will argue that not so much the *structure* of governance, but governance *competencies* are determinants for IT success. Successful governance is gainful, since research teaches that enterprises with an advanced use of IT are more profitable compared with laggards [Earl 1995].

6.2 IT Dynamics and Governance Paradox

Information technology progress has been labeled 'revolutionary', since this progress has affected the arrangement of society fundamentally, and will continue to do so. Rightly, one refers to the 'digital revolution' [Negroponte 1995]. The revolutionary character of digital technology makes the theme of IT governance inherently relevant. Indeed, how could one deny the relevance of a technology with a revolutionary character? As mentioned earlier, experience teaches that the impact of the digital revolution is not always properly acknowledged, leading to suboptimal or even counterproductive use of IT, while the opportunities IT offers are not recognized. Partly, the limited attention for IT has to do with historic developments that attributed an esoteric character to IT for a long time: interesting for specialists, but not for enterprise (top) management. Primarily at the end of the last century, the revolutionary character of IT increased dramatically as a result of multiple, concurrent, mutually reinforcing developments within various domains. As such, the impact of the digital revolution was difficult to oversee in its full magnitude. Some IT developments will be sketched briefly below, thereby illustrating the appropriateness of the term 'digital revolution', and illustrating that – in view of the IT governance to be discussed – IT governance has grown into a problematic phenomenon.

6.2.1 IT Dynamics

From a historic perspective, IT progress shows enormous dynamics stimulated to a considerable extent by the development of computers [Hyman 1982, Bird 1994, Davis 2000]. Developments directly prior to, during and immediately after the Second World War led to the first wave of computers, and turned out to be the prelude to the digital revolution and Toffler's third wave: the transformation from the agricultural, the industrial, towards the *informational* era [Toffler 1980]. Already back in the 1960s, Joseph Licklider – at that time employed by the research institute of the American Ministry of Defense, which laid the foundation for the development of the Internet – foresaw the enormous progress of computer capacity by stating that the cost-effectiveness of computer hardware would double every two years [Licklider 1965]. Later a comparable prophecy became known as 'Moore's law', formulated by Gordon Moore of Intel, which states that the processing capacity of microcomputers doubles every twelve to eighteen months. This progress is also expressed by stating that the performance over price ratio doubles in that period. It is expected that this law will still hold for a considerable time. As an illustration of the enormous progress, the following example might suffice. The ENIAC computer, operational in 1946, contained 18,000 vacuum tubes and 1,500 relays, weighed 27 tons, and consumed 160 kW of power. Given the multitude of parts and their reliability, the ENIAC computer was initially only available for about half of the time. In 1971, the total ENIAC computing capacity was realized on a single Intel 4004 microchip [Moore 1997].

A similar dynamic can be noticed in the area of communication [Kennedy 1977, Keen and Cummings 1994]. For decades the transmission capacity has tripled every year. The Internet is a well-known example: the enormous increase in transmission capacity enabled the similarly enormous Internet growth, whereby at the end of the 1990s a new www address was created every few seconds [Downes and Mui 1998]. In the early stages of Internet development, it was primarily IT equipment (including personal computers) which was connected. That equipment currently makes up only a fraction of the devices connected to the

Internet. All kinds of other devices with internal intelligence, varying from elevators to vending machines, are connected to the Internet in order to transmit data about their status. It is expected that eventually practically all household equipment will have an Internet connection [Dornan 2001]. A washing machine can thus download applicable programs. Meanwhile, many devices have microcomputers (embedded 'chips') that give devices intelligence and communication capabilities. Further miniaturization, combined with the possibility of providing minuscule microchips with energy, means that in the near future many material objects will have intelligence and can communicate. One refers to 'ubiquitous computing', or 'pervasive computing', which turns the environment into 'ambient intelligence' [Aarts and Encarnação 2006]. Presently, network communication already consists for more than 90% of communication between devices. The Internet will therefore become the worldwide information utility.

Many technology developments have led further to all manner of Internet access devices that can often be operated wirelessly and mobile ('always connected'), with a high level of mutual interoperability, varying from personal computers, laptops, personal digital assistants and (mobile) telephones to televisions. These access devices also have considerable intelligence due to the aforementioned computer capacity progress. It is this distributed, partly mobile, intelligence that gives the Internet its enormous potential [Louis 2001]. Digitizing information and communication enables extensive integration of previously distinct media. Convergence of data presentation, automation and telecommunication thus enables convergence on the informational level: information that had to be treated separately can now be presented (through multimedia) in a unified manner. This real-time integration offers inconceivable opportunities for coordination, cooperation and collaboration between individuals.

6.2.2 Coordination, Cooperation and Collaboration

The developments outlined previously exercise a major impact on human activities within and between organizations. As discussed in Chapter 3, enterprises are social entities with human actors engaged in goal-oriented activities. Certain relationships exist between human actors that structure the activities mutually. Three core types of relationships can be identified: coordination, cooperation and collaboration.

Coordination concerns mutual synchronization of activities to avoid the overlap or absence of tasks. The emphasis lies on harmonizing roles, tasks, and their planning. All that assumes a certain level of routinization. With cooperation, more emphasis lies on togetherness: accomplishing certain results jointly, whereby activities often do not have a routine character. Finally collaboration concerns the realization of objectives that cannot be accomplished effectively without joint activities.

One might argue that the relationships between human actors in an enterprise are primarily, if not entirely, *informational* ones. Mechanization of labor has led to the situation where physical collaboration is almost no longer required.

Moreover, labor has shifted from manual to ‘knowledge work’ [Drucker 1993]. According to Drucker, the essence of organizing is “to make knowledge productive” [op. cit., p. 49]. Knowledge is *the* resource for realizing goals within enterprises and society. Changes are fundamental: “This fact changes – fundamentally – the structure of society. It creates new societal and economic dynamics. It creates new politics” [op. cit., p. 45].

IT developments enable coordination, cooperation and collaboration, independent of time and place, not only between actors within one enterprise, but likewise between actors of different enterprises. Networks of collaborating enterprises (‘extended enterprise’) are a manifestation of this. Enterprise service centers (like call centers) can operate from a totally different part of the world than the location of the enterprise itself, or of the recipients of the service. Comparable observations can be made pertinent to the coordination, cooperation or collaboration between enterprises and customers (or the public), or between customers (or the public) mutually. Thus, technological networks with all their informational capabilities make networks of relationships possible on an almost unimaginable scale. It is precisely these networks of relationships which enable fast and seamless interaction, and stimulate collaboration and creativity [Moss Kanter 2001].

The enormous scale of coordination, cooperation and collaboration enabled by IT has led to new research disciplines, such as ‘computer-supported cooperative working’, that develops possibilities of IT in this area further [Bannon 1998]. It is this extensive informatization concerning coordinative, cooperative, and collaborative relationships that gives IT its revolutionary character.

6.2.3 IT Governance Paradox

From different perspectives, much has been written about the way the impressive, briefly sketched, historic developments of information technology have impacted society and enterprises. These perspectives concern society as a whole for example [Moss Kanter 2001], and the adaptive manner in which the future generation grows up in the ‘digital world’ [Tapscott 1998]. Attention is drawn to the emergence of a ‘new economy’ with new rules [Tapscott 1996, Kelly 1998]. New ways of doing business are described under labels such as ‘e-business’ or ‘digital economy’ [Peppers and Rogers 1997, Kalakota and Robinson 1999, Vervest and Dunn 2000]. Others have described the onset of a new ‘media revolution’ [Bloem et al., 2008].

As we saw in Chapter 3, IT-induced other ways of doing business have led to the dilution of traditional boundaries between business domains, as well as between products and services. We might recall our example of a car producer becoming a provider of mobility services by adding complementary services to the purchase of a car. In turn, these complementary services contribute to the dilution of traditional business boundaries. Further, it is argued that IT developments have changed the business and organizational context of employees significantly, having considerable implications for human resources management (cf. paragraph 2.4.7). An interesting example of different IT-enabled business conduct is that of a large provider of logistics services who used the Internet-accessible community of individuals for arranging point-to-point transport services for (some) packages, thereby avoiding the necessity to route the packages through (central) distribution hubs. Finally, IT is seen as a technology that might change the relationship fundamentally between enterprises and their customers, since IT capabilities enable the argued necessary transition from a transaction-oriented relationship with custommers towards a support-oriented relationship [Zuboff and Maxmin 2003].

The hype that is sometimes associated with the dynamics of IT advances must be judged with some sense of realism in terms of its predicted effects: certain predicted effects did not occur, or occurred less prominently than expected, while unpredicted effects manifested themselves [Seeley Brown and Duguid 2000]. So as an illustration, the modern office is still far from paperless, while, for example, the enormous growth of SMS messages was not foreseen. Evidently, all this has to do with dynamics sketched in Chapter 3, and the inability to predict developments with reasonable accuracy (cf. paragraph 3.2.1). Nonetheless, based on the effects that have actually occurred, IT must rightly be characterized as a revolutionary technology with an enormous impact.

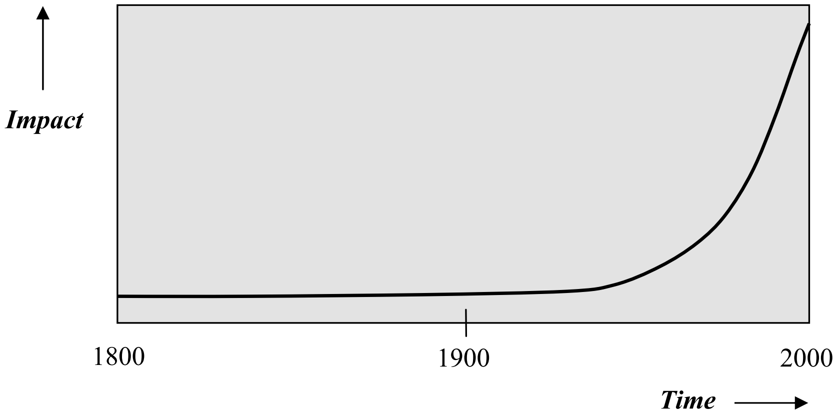


Fig. 6.1. Impact of IT developments over time

We will not attempt to define the notion of the ‘impact’ of IT precisely. In any case, as illustrated, the effects of IT developments appear in different ways and in different domains. Based on an intuitive and plausible picture of IT impact, Figure 6.1 shows the increase over time. Appreciably, few could have foreseen such an increase. In 1943, the president of IBM at that time stated that, in his opinion, there would be a worldwide market for possibly only five computers. In view of the enormous weight of the first computers, Popular Mechanics magazine wrote in 1949 that future computers might weigh no more than 1.5 tons [Aarts 2005].

As illustrated above, from roughly the 1980s, IT developments progressed at such a pace that the term ‘digital revolution’ was coined [Negroponte 1995]. This revolutionary progress had such an internal dynamism that the outcome appeared, even more than in the past, hardly predictable. Remarkably enough, the inability to foresee these developments even approximately, also appeared to hold for those involved with these developments. Even at the end of the 1970s, the president of Digital Equipment at that time saw no reason why people would want a computer in their home. Around the same timeframe, someone presented the idea to Gordon Moore, one of the founders of the Intel company, for what was basically the personal computer, to sell it in the home market. Other uses than housewives storing recipes on it were not envisaged. As Gordon Moore recalls, “I personally didn’t see anything useful in it, so we never gave it another thought” [Moore 1997]. Some years later, the president and founder of Microsoft thought that 640 Kb of storage capacity would be enough for people who might after all want a home computer [Aarts 2005]. One might appreciate the enormous progress of IT, realizing that these statements were all made just a few decades ago. In 1971 Intel developed the first microprocessor, which, as mentioned previously, had the same computational power as the massive ENIAC computer developed 25 years earlier. By 1980, the microprocessor had found its way into more than 2,000 product designs. At that time IBM selected the Intel microprocessor for its first personal computer. With hindsight, the same (understandable) inability to foresee the future played its role: “While we knew the IBM product was significant, we had no idea how that single decision would change Intel and the industry” [Moore 1971].

Recent history thus shows that IT developments occurred in a relatively short period, and had such dynamics that neither the direction nor the possibilities and opportunities of these developments could be comprehended fully. For a long time, IT was something for specialists, where computers in remote data centers were carrying out tasks that were troublesome to do manually. In themselves, these tasks were thus not of such a different character that enterprise activities became essentially different: tasks were merely automated. Hence there was no need to have management heavily involved in these matters. One might, following Earl, label this period as the ‘data processing’ period [1989]. Then IT developments geared up in such a way that society and enterprises were affected fundamentally. One might argue that these developments were of such a nature that management – even more than the specialists mentioned earlier – could not comprehend them in their full magnitude. Somewhat inflated, the situation portrayed seems to lead to the following IT governance paradox: when it was possible to involve management heavily with IT developments, there was seemingly less need, and while at that moment there was a need to involve management heavily, it was apparently less possible. Evidently, efforts should have been made not to take the paradox as inevitable. Nonetheless, these observations make it additionally plausible as to why IT governance could grow into a problematic issue.

The IT paradox has consequences for the arrangement of IT governance, since the dynamic, revolutionary character of IT progress is far from diminished [Aarts and Encarnação 2006, Bloem et al. 2008]. Hence predicting and comprehending these developments continues to be problematic. The issue here is not technology as such, that can be simply acquired, but concerns the meaning and possibilities of technology for one’s own enterprise, and the successful integration of technology within the whole enterprise context. As we will argue extensively, the primarily structurally-oriented IT governance approach is inadequate for this.

6.3 IT Governance Perspectives

6.3.1 IT Alignment

Literature about the relationship between information technology and enterprise objectives frequently mentions the notion 'IT alignment', or 'business and IT alignment'. The 'business' term in this sense is used somewhat loosely, and can be interpreted similarly as 'enterprise', or its primary function, but when discussing IT alignment the term is also frequently interpreted as referring to that part of the enterprise not related to IT. For convenience' sake, we will occasionally follow this customary interpretation.

The dictionary notes that 'to align' means 'to be or to come into precise adjustment or correct relative position', whereby the 'alignment' term denotes 'the act or state of being aligned'. Alignment can thus refer to a *process* or a *state*. The notion of IT alignment as mentioned in the literature has to do with unity between the enterprise and IT strategy and its execution. The term 'harmony' is sometimes used [Weil and Broadbent 1998]. The core goal of IT governance is seen as obtaining strategic alignment of 'business and IT' such that IT adds value to the business [IT Governance Institute 2003]. Understandably, the *state* of alignment is not incidental, but requires intentional activities: the *process*. We will return to these activities later. The notion of alignment emerged out of frustration with the deployment and results of IT. This frustration continues, since it is perceived that:

- The benefits of IT investments are unclear or doubtful
- Linkages between IT investments and the enterprise strategy are vague
- Frequently IT systems limit enterprise flexibility
- IT developments are often technology-driven
- Unproductive relationships exist between IT users and IT professionals
- IT functionalities suffer from long delivery times
- High costs are associated with IT deployment and operation.

The aforementioned drawbacks would be eliminated through adequate governance. Within the perspective of alignment as 'state', the question is through which concepts and methodologies the notion of alignment can be operationalized practically. Put another way, how can the state of alignment be ascertained? Although the state of alignment may be understandable intuitively, the aforementioned questions can hardly be answered satisfactorily. In fact, alignment appears to be a concept that is difficult to operationalize. Nonetheless a number of alignment models are mentioned in the literature. A frequently mentioned model will be discussed below in order to portray the essentials of 'alignment thinking', as well as to depict why and where our approach differs.

Strategic Alignment Model

MIT research on the utilization of IT within the enterprise context led to the development of a 'strategic alignment model' [Venkatraman 1991]. With some changes of the terminology used, this model was published later by Henderson and Venkatraman and is shown in figure 6.2 [1993]. The model distinguishes between business and IT (columns) and the external versus internal focus (rows). Here, four cells or areas of attention are defined that are considered important for obtaining alignment. The unity between business and IT strategy is called 'functional integration', and that between the external and internal perspective the 'strategic integration'. For overall integration, multiple alignment perspectives concurrently play a role, as indicated by the arrows between the four areas of attention. Within these four areas, some sub-domains are indicated for which mutual alignment is considered important. Hence, one might refer to a multi-variable, co-alignment perspective [Avison et al., 2004]. The multiple facets are an indication of the difficulty of operationalizing the alignment concept practically, at least by means of these concepts.

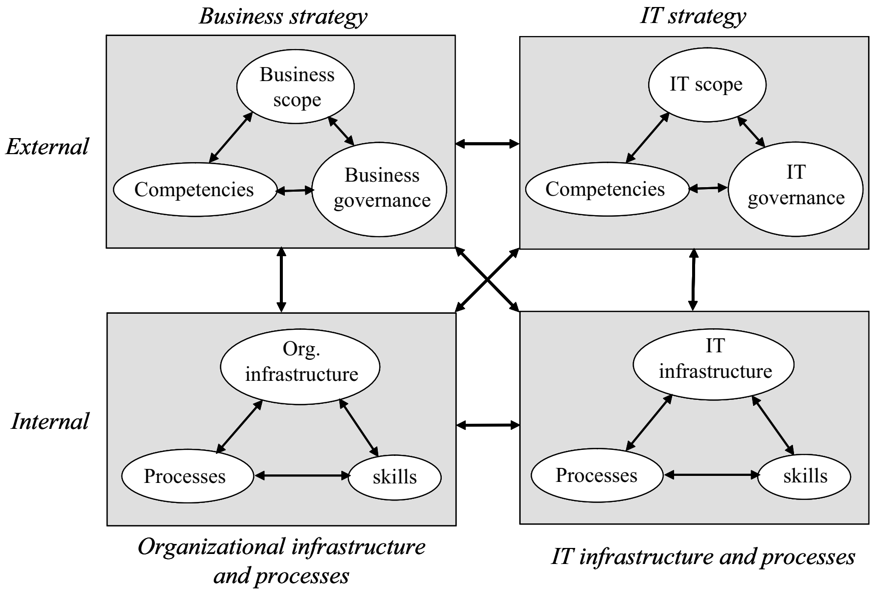


Fig. 6.2. Strategic alignment model [Henderson and Venkatraman 1993]

Alignment Processes

Within the strategic alignment model, the *process* of alignment is understood as using a certain pattern to bring into unity the relationships between (remarkably only) three of the four areas of attention (alignment as *state*) [Macdonald 1991]. Four patterns are distinguished, depending on the chosen starting point. That starting point is called the 'dominant alignment perspective'. The four alignment patterns are shown in figure 6.3. With the first pattern, the dominant alignment perspective is called *strategic execution*. The starting point is the business strategy, which subsequently defines the organizational infrastructure and processes that must be supported by the IT infrastructure and processes. Notably an explicit IT strategy is not addressed within this dominant alignment perspective. The IT function is seen merely as a service and cost center. Possibilities and opportunities offered by IT for arranging the organizational infrastructure and processes differently are thus not considered within this perspective. The second dominant alignment perspective, and associated pattern, is labeled *technology potential*. Here too the business strategy is the starting point, but is used to formulate the IT strategy that subsequently defines the IT infrastructure and processes. Within this perspective the central issue concerns how to use technology for supporting the business optimally. The *competitive potential* is the third dominant perspective. In this case the IT strategy is the starting point, where the renewing possibilities and opportunities that IT can offer are utilized for defining an innovative and competitive business strategy. Subsequently, the business strategy defines the organizational structures and processes. Finally, the fourth dominant alignment perspective is labeled *service level*. Again, the IT strategy is the starting point, but unlike the third perspective, the focus lies with arranging the IT infrastructure and processes such that IT services can be delivered effectively and efficiently. One can also label this the IT supplier perspective, since the business strategy does not play a primary role. It is emphasized that the four perspectives (and associated alignment patterns) are dominant, but not necessarily exclusive. Given a certain dominant perspective, the other perspectives might play a role.

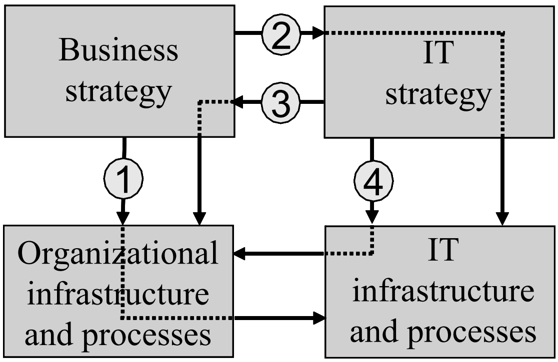


Fig. 6.3. Alignment perspectives

The strategic alignment model contains relevant areas of attention, with recognizable dominant perspectives and associated patterns. However the following remarks can be made. First, within the notion of alignment as a process, merely 'perspectives' are offered with no indication as to how alignment is accomplished, and how, given a certain dominant perspective, the aspects falling outside the dominant perspective are brought within the alignment process. Put another way, there is no attention for organizational competencies, processes and methodologies that bring about alignment. Second, according to the model (figure 6.2), governance is part of strategy, while one might argue that rather conversely, the governance competence is the source for defining strategy. Third, governance is limited to the external perspective. However as we will outline later, governance clearly has an internal aspect and must encompass the total spectrum from strategy development, the subsequent enterprise design (including IT), the definition of projects to implement design, to the implementation of projects. The model does not address these aspects. Fourth, the precise meaning of the sub-domains within the cells remains unclear, while further, one might question whether the four cells and their sub-domains are sufficient. Additional areas of attention can be identified that are relevant from the enterprise and IT design, hence alignment, perspective. One might consider customer interaction channels, informational aspects, human resources engagement, employee behavior, the behavioral context and so on, aspects that will be addressed in Chapter 7.

In view of our fourth comment, some publications argue for extra rows and columns. An example is the 'nine-cell model' shown in Figure 6.4 [Maes et al., 2000]. An extra row is created by dividing the internal perspective into a structural and operational perspective. In essence, the structural perspective concerns the organizational blueprint: essential (functional) units and their duty. These units perform by means of processes and skills, which are contained in the operational perspective. Further, the extra column follows from considering 'information and communication' as an area of attention between the business and IT perspective, which is the bridge between information and communication needs of the business on the one hand, and IT (the technology) answering these needs on the other. The extra row and column create five additional cells. The creators of the nine-cell model pay little attention to elucidating the precise meaning and alignment activities of these additional cells (and the other cells for that matter). Nonetheless, the extra cells are considered essential in view of establishing alignment.

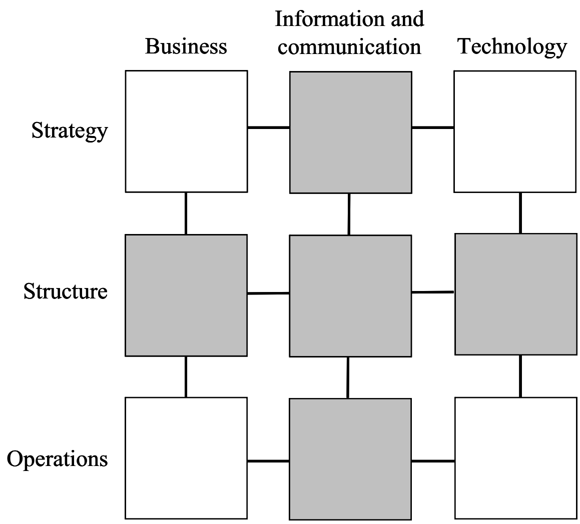


Fig. 6.4. The 'nine-cell model' [Maes et al. 2000]

A variant of this model is created by dividing the 'technology' column into two columns, pertaining to information systems and technology infrastructure respectively, thereby creating a 12-cell model [Maes et al. 2000]. Yet others have added even more extra cells and have defined – in a comparable sense as before – alignment patterns based on dominant alignment perspectives [Avison et al., 2004].

Recalling our earlier comments, one might question the practical value of categorizing different alignment perspectives, in light of an alignment model chosen. As indicated, certain alignment patterns are associated with chosen alignment perspectives. These patterns are expected to bring about alignment, but how that is supposed to happen remains unclear. Put another way, there is no attention for organizational competencies, processes and methodologies that bring about alignment. Our fundamental difficulty with these models and the alignment patterns provided is that they appear to be introduced without a formal underlying theory and associated methodology for establishing alignment: the theory and methodology for *designing* systems. Anticipating our later discussion, we contend that alignment as 'state' has to do with the design of the enterprise as a whole, in which information supply, and with that information systems, are designed concurrently in a unified and integrated manner. Within this vision, alignment as a 'process' has to do with the realization (the process) of design – with applicable guiding principles and standards (architecture) – and its ultimate implementation. The creators of the nine-cell model have also acknowledged the importance of design for realizing alignment [Maes et al. 2000].

6.3.2 IT Enablement

The previous alignment theme is connected mostly to the notion that IT has a supportive role. Hence, the IT strategy follows, is derived from, and should be aligned with, the enterprise strategy. This notion concurs with the second dominant alignment perspective of the Strategic Alignment Model discussed previously. The first dominant perspective is also based on the supportive role of IT: supporting organizational processes. In this case, the supportive notion is even more profound, since an IT strategy is not a primary focus within this perspective. This can be detrimental: "Companies pursuing IT implementations the old-fashioned way (i.e. by articulating business strategy and then aligning IT) usually find that IT is a bottleneck rather than a strategic asset" [Ross et al., 2006, p. 191].

Contrary to IT alignment, the IT enablement theme is all about the possibilities and opportunities offered by IT to arrange the enterprise differently, or even arrange a different enterprise. Innovative use of IT in production or logistic processes for example, might lead to a significantly different enterprise. IT also enables the creation of new enterprise functions (businesses). The previously-mentioned complementary services connected to the use of an automobile is an example, whereby IT enables a shift in the character of the enterprise: from a producer of cars towards a supplier of mobility services. This vision is included in the third dominant perspective of the Strategic Alignment Model discussed in the previous paragraph. Obviously the new opportunities offered by IT can only materialize if the *design* of the enterprise, in harmony with IT, makes that possible. Failing 'e-business' initiatives as a result of improper design are a case in point [Kalakota and Robinson 1999, Vervest and Dunn 2000]. We might observe that the IT enablement theme is a specific instance of enterprise enablement discussed in paragraph 3.2.6.

The alternative IT enablement perspective does not seem to be generally accepted as relevant. It is argued that "Enterprise [IT] architecture must be driven top-down from a business standpoint instead of being IT-driven and potentially irrelevant, misguided, or just plain wrong in the longer term" [Perks and Beveridge 2003, p. 80]. Indeed, it must be avoided that IT developments progress for their own sake, which evidently should not be the connotation of IT enablement. An important aspect of IT enablement is the ability to create enterprise flexibility and the capability to change. As outlined in Chapters 2 and 3, the current enterprise context is highly dynamic, partly induced by IT itself. Adding to that is the dilution of business boundaries, as well as the dilution between products and services. Increased competition, deregulation and globalization are likewise drivers for dynamics. We might recall from Chapter 3 that the frequency of introducing new products or adapting them increases, an example of the more general trend that the timescale of changes and subsequent responses, reduces. As mentioned earlier, research among more than 500 top executives certainly indicated that they qualified their domain of business as dynamic to highly dynamic [Prahalad and Krishnan 2002]. However the ability to change appeared highly inadequate. Specifically, IT systems and infrastructure did not enable expeditious change. Such change capability presumes that IT has been arranged such that – without prior clarity about the precise nature of the changes – changes can be anticipated. Within the traditional IT alignment perspective this important notion is evidently not addressed: IT follows the enterprise strategy tightly. Rightly, Ciborra questions: "Is it better to have a highly flexible infrastructure that enables the firm to seize a wide range of future unplanned business redesign options, or an infrastructure that is perfectly aligned with the current strategic intent?" [2002, p. 58]. Comparable remarks have been made by others. An enabling infrastructure offers strategic flexibility and the capability to accommodate future, yet undefined strategies more expeditiously than where the IT systems and infrastructure are coupled strongly to the current enterprise strategy [Weil and Broadbent 1998, Ross et al., 2006]. Flexibility and the ability to change can only be achieved if the *design* of the enterprise, and IT within it, enables that Figure 6.5 shows the different notions of IT alignment and IT enablement.

Notably, the IT enablement perspective does not fit very well within the traditional top-down, management-oriented governance perspective. On the contrary, the IT enablement perspective is provided by an IT governance competence that assesses and operationalizes the new possibilities and opportunities offered by IT in a coherent IT strategy, which contributes subsequently to defining the

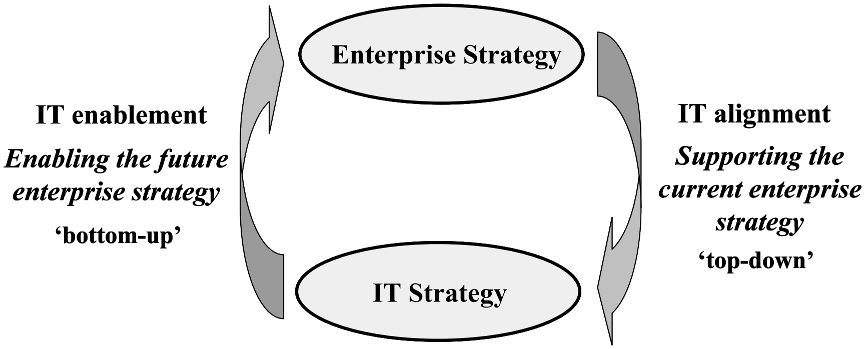


Fig. 6.5. The IT alignment and enablement perspective

enterprise strategy. Successfully applying and exploiting the IT enablement perspective thus calls for the organismic, competence-based view on governance, since "The process through which new technologies enable new organizational forms is both iterative and cumulative. It is both a learning and discovery process as greater experience with IT is accumulated" [Nolan and Croson 1995, p. 8].

6.3.3 Information Economics

Initially, IT systems were applied primarily from an efficiency (cost reduction) perspective, for example, by simplifying administrative processes. In such cases, costs of IT systems and their economic benefits can be established relatively easily. Economic decision-making about IT thus concerned no more than simple investment decisions. Such decisions are based mostly on methods for comparing investments financially. A simple method is computing the pay-back time: the period required to earn the investment. Methods that take the time-value of money into account are preferred. In these cases, future income is discounted to the value at the time of decision-making. Two methods can be mentioned [Weston and Brigham 1981]. First, the method based on the net present value (*NPV*), which is defined as the value of future income discounted (based on the costs of capital) minus the investment costs. If $NPV > 0$, a positive investment decision is expected to be made. In the case of multiple projects, decision-making can occur based on the relative order of *NPV* values. The second method is based on the internal rate of return (*IRR*), defined as the interest rate whereby the current (discounted) value of future income equals the investment, thus $NPV = 0$. A positive decision can be made if the actual interest rate is lower than the *IRR*. This method also allows a comparison of multiple projects. It appears that both methods do not always lead to a similar outcome. Preference for the *NPV* method is therefore argued [Weston and Brigham 1981].

Some shortcomings are associated with the *NPV* method [Earl 1989]. For example, the introduction of IT often changes the way enterprise activities are carried out significantly, such that future financial effects are difficult to estimate.

Further, it is not always clear what costs of capital must be applied. More fundamental however, is the problem that non-financial benefits remain outside the analysis. One might consider benefits related to flexibility, responsiveness, competitive advantage, etc. In summary, one might argue that the *NPV* method is too 'mechanistic' and exclusively 'economic' and hardly applicable in case of complex IT systems: one-dimensional economic logic enforced in multidimensional considerations [op. cit.]. The problem with traditional financial assessment criteria is "that decision-making is reduced to a numbers game that shields management from understanding the projects themselves" [Parker and Benson 1988, p. 62].

Selection of projects in a portfolio based on financial criteria is often voiced by writers about IT project portfolio management: "If two or more mutually exclusive investments with equal risks have positive *NPV's*, the project having that largest *NPV* is the one selected" [Bonham 2005, p. 69]. Others have argued comparably that project selection should be based on 'optimizing' the IT project portfolio, much like a financial investment portfolio [Maizlish and Handler 2005]. So, "Portfolio management is an investment method" [Kaplan 2005, p. 25].

The character of IT developments implies that IT can have an effect in almost every aspect of an enterprise, and enables fundamentally different ways of organizing and execution of business functions. More than merely a technology for realizing efficiency, IT can enable significant competitive benefits. This makes decision-making about IT inherently more difficult, since costs and (financial) gains are difficult to establish. This problem is aggravated because multiple (not easily assessable) dependencies exist, and will be created, in relation with a broad deployment of IT. Within the 'information economics' method, introduced by Parker and Benson, a broader perspective on IT benefits is exercised that aims to capture the business value of IT for improving enterprise performance [1988]. For a number of reasons, this method differs from methods briefly discussed above, whereby the relative contribution of projects is only judged based on a traditional financial criterion. Within the information economics method, the traditional financial assessment criterion, based on directly identifiable costs and benefits, is complemented by categories of enterprise value – translated to financial units of measure – that the IT system provides. One might consider the financial benefits of receiving payments more rapidly, or the avoidance of loss of income or customers. First, the value of the chosen financial criterion is rated with a number lying between 0 (low) and 5 (high). Subsequently, the enterprise value or risks are assessed, such as pertinent to [Parker and Benson 1988]:

- Strategic match: coherence with enterprise strategy
- Competitive advantage
- Improving management information
- Competitive response
- Project or organizational risk.

Technology assessment is based on:

- Alignment with overall IT strategies
- Uncertainty about IT system requirements and specifications

- Uncertainty about deploying the technology used successfully
- IT infrastructural and organizational risks.

Similarly, these aspects are rated with a number between 0 and 5, while a weighing factor is also attributed. Summation of the individual ratings multiplied by the respective weighing factor, and adding the rating of the financial criterion, gives the overall project score. This score then, is the basis for prioritizing projects.

The advantage of the method lies in the attempt to involve important enterprise values in a quantitative analysis. According to Parker and Benson the goal of information economics is the creation of a clear relationship between IT investments and improved enterprise results [1988]. The question however is whether such a clear relationship actually exists. The method suggests a high level of quantitative exactness, but is for a considerable part based on (inevitable) subjecttive assessments, translated to ratings and the choice of weighing factors. Changing either of these numerical values will obviously change the priority ranking. Parker and Benson also acknowledge that. Moreover, they point to the fact the choice of weighing factors depends strongly on the enterprise culture. One might consider this as the expression of the different ways enterprises use IT. Nonetheless, it is likewise the expression of the method's subjective character. All too often, undesired project ratings are changed by altering ratings and weighing factors.

As will become apparent, the information economics approach fits the management and structurally-oriented IT governance approach that will be discussed in the next paragraph. Ultimately, the approach is about financial analysis and subsequent prioritizing, whereby the design aspect is not addressed, although it is stated that "To achieve real lasting impact from information technology, the business itself must change" [Parker and Benson 1988, p. 44]. This change evidently requires a new design. It is through the new design that the real impact (value) of IT becomes manifest; it is through the new design that the priority of projects can be established. Under the label 'new information economics', the aforementioned approach has been adapted to the so-called 'strategy-to-bottom-line value chain' with a similar management- and planning-oriented flavor, having its focus on effective planning, resource decisions, budgets, projects and operational plans [Benson et al. 2004].

6.4 The Mechanistic IT Governance Approach

6.4.1 Core Aspects of the Structural, Management-Oriented View on IT Governance

The introductory chapter mentioned a number of IT governance definitions. Much of the IT governance approaches focuses, as indicated, on structural aspects pertinent to decision-making and accountability, whereby management takes the central stage. Fully reminiscent of our discussion in Chapter 2, the belief in the central role of planning is also expressed in the case of IT governance: "What does it take to control IT costs and produce higher IT impact? Simply, we need effective planning processes, appropriate resource decisions, and workable budgets" [Benson et al., 2004, p. 5]. Both business and IT strategic planning are viewed as advantageous since "Planning avoids chaos by defining a cohesive approach to change" [Perks and Beveridge 2003, p. 43]. Planning is expected to produce alignment: " Strategic Information Systems Planning (SISP) is a widely adopted method for achieving IT/Business alignment" [Grembergen and Haes 2008, p. 37].

Measurability is seen as a key aspect of goals and objectives, which are 'passed-down' in a true top-down, deterministic and reductionistic stance: "Strategies therefore are plans defined to provide mechanisms for achieving organizational goals. Organizational-level goals then are passed down to individual managers and their staffs. This enables units to understand what must be achieved at a micro, and ultimately an individual, level to ensure that the organization is successful" [op. cit., p. 44]. Management is considered crucial for establishing the deterministic causal chain from strategy to the ultimate financial gain: "The key to cause and effect on the bottom line is management action" [Benson et al. 2004, p. 35]. Others argue that the failure of IT to deliver enterprise value is due to the fact that those enterprises have no formal system for managing and monitoring IT decisions [Weil and Ross 2004]. Associated with that perspective is the conviction that for obtaining IT alignment it is important to see information technology "through the lens of an investment portfolio" [Weil and Broadbent 1998, p. 25]. Decision-making about such a portfolio is considered first and foremost a management affair and "a control point in the entire IT management system" [Kaplan 2005, p. 55]. This decision-making is seen as the very essence of IT governance [Maizlish and Handler 2005]. Again, the emphasis on decision-making voices a strong management prerogative. Others have emphasized the structural aspect of IT governance comparably. According to Symons, IT governance has three important elements: (1) the *structure* that clarifies who makes decisions and what the related responsibilities are, (2) the *process* that defines how decisions are made, and (3) the *communication* about decisions and measuring the results [2005]. Typical structures for governance are those whereby decision making takes place centrally, decentrally or in a federal manner. The latter is a hybrid structure with central decision-making for enterprise-wide aspects, and local decision making for specific enterprise unit aspects [Symons 2005]. This typology is similar to that of the different IT functions, mentioned in paragraph 6.1.1.

Weil and Ross have conducted broad research considering IT governance structures and forms of decision-making. They distinguish six so-called IT governance 'archetypes' [2004]:

- *Business monarchy*. Decision-making rests centrally with one or more persons of business executive management. IT management is not involved in decision making.

- *IT monarchy*. In this case, decision-making lies with one or more persons of IT executive management. This archetype also has a central character.
- *Federal*. This concerns shared decision-making, whereby executive management, business unit management and often also IT executive management is involved.
- *IT 'duopoly'*. Two specific groups of IT and business management respectively decide about IT.
- *Feudal*. Here, decision-making is strongly tied to decentral business unit management or process owners. These are relatively autonomous 'kingdoms'.
- *Anarchy*. No formal governance, but only individual, ad-hoc decision-making.

Associated with these archetypes are so-called 'decision-making domains' that define the subjects decided on within the archetype. These domains are [Weil and Ross 2004]:

- *IT principles*: general statements regarding the way IT is deployed, for example that only proven technology will be used. These principles are based on 'business principles'.
- *IT architecture*: rules and technological choices pertinent to data, applications, and infrastructure for ensuring that enterprise and technology integration is realized.
- *IT infrastructure strategies*: strategies for providing IT services (network, helpdesk, security, data center, etc.) reliably.
- *Business application needs*: specifying applications to be purchased or developed internally.
- *IT investments and prioritizing*: deciding where, when, and how much is invested in IT projects.

The six governance archetypes and five decision-making domains define 30 possible modes of decision-making. Research among 256 enterprises in 23 countries yielded a diverse picture, shown in Table 6.1 [Weil and Ross 2004].

The columns total 100% of the researched enterprises, except in some cases due to lack of data or inconclusive data. Dominant percentages are given in bold type. What is striking is the difference between the governance structure used for decision-making input, and the structure for decision-making itself. So, in 83% the input for IT principles is arranged in a federal way, while subsequent decision-making differs greatly, and does not take place primarily in the federal way. Comparable patterns can be noticed with other decision-making domains. Governance archetypes used most frequently are IT monarchy, federal and IT duopoly. As expected, the decision-making center of gravity lies within the respective expertise domain.

Despite the mentioned notions of IT principles and IT architecture – which are associated with design – the emphasis seems to lie on management decision-making and its linear, planned, top-down mechanisms, as indicated previously.

Table 6.1. Percentages of enterprises using certain modes of decision-making pertinent to governance archetypes and decision-making domains [Weil and Ross 2004].

	IT Principles		IT Architecture		IT Infrastructure		Business Applications		IT Investments	
	Input	Decision	Input	Decision	Input	Decision	Input	Decision	Input	Decision
Business Monarchy		27		6		7	1	12	1	**30**
IT Monarchy	1	18	20	**73**	10	**59**		8		9
Federal	**83**	14	**46**	4	**59**	6	**81**	**30**	**93**	**27**
IT Duopoly	15	**36**	**34**	15	30	23	17	**27**	6	**30**
Feudal		3			1	2	1	18		3
Anarchy				1		1		3		1

Additionally the research of Weil and Ross mentions other governance mechanisms [2004]. Given the emphasis on decision-making, committees are often mentioned: executive committee, IT leadership committee, architecture committee, investment committee and so on. When governance processes are concerned, attention goes to topics such as cost allocation mechanisms, service level agreements, monitoring IT projects and the resources used, and evaluating how IT creates business value. Such an accent on governance structures and mechanisms is the general picture [Weil and Woodham 2002, IT Governance Institute 2003, Grembergen and Haes 2008, Benson et al. 2004, Kaplan 2005, Maizlish and Handler 2005, Symons 2005].

The aforementioned research among the 256 enterprises also attempted to demonstrate a relationship between the level (performance) of IT governance and enterprise performance. The relative performance of IT governance was determined based on answers to two questions regarding:

- Cost-effective use of IT
- Effective use of IT for enterprise growth
- Effective use of IT for utilizing enterprise resources
- Effective use of IT for creating enterprise flexibility.

The first question considered the *importance* of the four aspects that proper IT governance should address. Scoring could vary between 1 (no importance) and 5 (very important). Using the same scoring scheme, the second question addressed the actual *influence* of IT governance on the four aspects. Per aspect the maximum score is thus 25 (importance × influence). The relative performance of IT governance then follows via:

$$\textit{relative performance} = \frac{\text{total score}}{5 \times \text{importance score}} \cdot 100 \,.$$

This gives relative performance scores between 20 and 100. The research showed that scores varied considerably, with the average between 60 and 70. Notably, when enterprise respondents opted for the mid-point score (3) for all questions, the relative score would be 60. One might thus verify that the reported average score over all enterprises does not, on average, indicate an overly adequate level of governance among the enterprises researched, moreover since it seems likely that the 'importance score' would be higher than the mid-point score. According to Weil and Ross, the relative performance score for IT governance correlates significantly with financial enterprise performance indicators [2004]. Such an outcome might however be induced by the questionnaire methodology: management is also inclined to attribute good financial results to proper IT deployment governed by them.

6.4.2 The Focus on Form Rather than Content

Traditional IT governance approaches are based on, and emphasize, linear, planning-oriented, management-oriented, top-down processes, whereby control and decision-making are core elements supposedly to establish business and IT alignment. Within this view, IT governance has four main goals [Symons 2005]:

- *IT value realization and alignment*: Ensuring that only those IT projects are approved, financed and prioritized that are 'aligned' with the enterprise strategy.
- *Risk management*: Identifying and controlling IT-related risks such as security, continuity, and project risks.
- *Accountabilities*: The answerability of IT management for 'return on investment' of IT.
- *Performance measures*: Concerns performance pertinent to enterprise value realization and alignment, as well as operational quality.

Clearly, this outlook manifests the typical mechanistic characteristics discussed in Chapter 2, and fits thinking about strategy development as a planning process: a mechanistically considered causal chain of cause-effect relationships, starting with formulating strategic goals, and ending with their implementation and reaping benefits. All that is supported and controlled through measurable performance indicators. Ignoring complexity, dynamics and uncertainty, as well as the strategic implementation barriers mentioned in paragraph 2.3.4, management is supposed to define courses of action precisely. "The litmus test is simple: if a manager in an enterprise looks at strategic intentions, the manager should be able to describe *in specific terms* what will be done differently tomorrow to help achieve the objectives and show how the functional area can contribute to moving the enterprise forward" (italics added) [Benson et al. 2004, p. 75].

Exemplary for the mechanistic outlook is the process that the IT Governance Institute depicts [2003]. This process starts with the formulation of IT goals, whereby governance is seen as an arrangement of internal control and risk management (comparably with the corporate governance view) that permeates all layers of the enterprise. This concerns ‘cascading down’ strategic goals and regulations to lower levels of the enterprise, ensuring that IT becomes ‘aligned’ with enterprise goals that are translated into actions for employees on every level. Clear accountabilities for risk management must be anchored throughout the enterprise, based on an all-encompassing control framework [op. cit.]. Performance must be measured against enterprise value and competitive advantages that IT delivers. It is advised to use a limited, though precise, set of performance indicators that can be linked directly and demonstrably to the enterprise strategy [op. cit.].

As some writers about IT portfolio management hold: “One of the most effective ways to change behavior is to create clear metrics, linking individual performance [to] strategic objectives, with incentives based on desired behavior and positive adjustments to meet performance and objectives” [Maizlish and Handler 2005, p. 26]. In a clear deterministic mindset it is advised that “Key performance measures must be clearly defined, well communicated and reinforced. Measurements must be linked to performance standards, reviewed frequently, and closely tied to reward and recognition systems” [ibid.].

In a similar vein, a typical example of the mechanistic, top-down, and planning-oriented governance of IT is the legislative attempt to regulate and control IT performance within the American federal government: the ‘Information Technology Management Reform Act of 1996’, also identified as the ‘Clinger-Cohen Act’ [Findlaw 2002]. It is about “capital planning and investment control” concerning IT systems and reporting about enterprise performance realized as a result of the investments. For this, “performance-based and results-based management” is needed that rests on “effective and efficient capital planning processes for selecting, managing and evaluating the results of all major investments in information systems”. Performance criteria for IT must be defined in terms of enterprise results, so that the contribution of IT can be reviewed periodically as part of the budget process. The characteristics of mechanistic, deterministic thinking, outlined in Chapter 2, are clearly manifest. Chapter 2 also argued the problematic nature of this type of thinking, which we will illustrate below from the IT governance perspective. The praxis also confirmed the problematic nature of the approach the Clinger-Cohen Act advocated: the intended reform turned out to be totally unsuccessful [Bloem and Doorn 2004].

We should stress that the aspects about decision-making mentioned do identify valid areas of attention. However, the emphasis on decision-making is associated with a structural and management-oriented governance approach. Within this approach, the purpose of IT governance is to ensure that decisions about IT are taken “wisely and effectively” [Weil and Ross 2004]. How the structure of decision-making can effectuate that is unclear. Appreciably, “wisely and effectively” seems to have more to do with the content about which must be decided, than with the decision-making structure itself. Nonetheless, within the approach sketched the focus appears to lie more on the *form* (structure and process of decision-making), than on the *content* (the substance of decision-making). This conclusion seems to be supported by research showing that “The bulk of IT governance work is carried out by committees and for many organizations committees work at different levels to carry out IT governance processes" [Symons 2005, p. 12]. As remarked earlier, the definition of decision-making and meeting structures is not without merit, but business and IT alignment – hence the possibility of IT to create business value – has to do with substance. This substance is not created through structural arrangements for decision-making and meetings.

6.4.3 IT Performance in Terms of Enterprise Value?

The examples of the mechanistic approaches to IT governance given in the previous paragraph emphasize that the performance of IT (or specifically IT systems) must be judged by how well IT adds 'value' to the enterprise. It is about ensuring optimum return – defined mostly in financial terms – on the portfolio of IT investments [Kaplan 2005]. Hence, "assuring [that] IT investments are performing according to plan" [Maizlish and Handler 2005, p. 4]. Thus, judging IT performance by enterprise (financial) performance. Evaluating IT performance in terms of enterprise results seems curious for a number of reasons.

First, experience teaches that a clear linkage between IT investments and enterprise performance is inherently problematic. Reasons that underlie the untenability of mechanistic, deterministic thinking, mentioned in Chapter 2, similarly lie at the heart of this problematic linkage. Many, often diffuse, interdependencies and influencing factors determining enterprise performance blur the linkage. Since IT is not an 'independent variable' these influencing factors are also caused by the introduction of IT itself. Positive and negative effects of IT introduction often occur in areas where they are not easily 'counted'. For example, a high – often unproductive – information demand from overhead functions can easily mask positive effects in operational areas. In an extensive study, numerous enterprise performance, cost and organizational ratios were examined for a possible relationship with various IT investment ratios. No relationships were found: "The more we examined the details, the greater the differences and the less significant were any comparisons. Increasingly refined analysis led nowhere" [Strassmann 1990, p. 9]. The overall conclusion appeared to be that "Unfortunately, simple comparative indices of computer spending do not exist. If someone proposes one, it will be arbitrary, irreproducible and not amenable to after-fact analysis" [op. cit., p. 10]. So, "There's no simple correlation between the money spent on computers and a company's financial result" [op. cit., p. 54].

Second, and adding to the remarks in paragraph 6.1.2, there is considerable evidence showing that much of the alleged IT underperformance is the result of inadequate IT governance. Inefficient and ineffective business processes were merely automated, which did not enhance enterprise performance, but often only increased costs. Enterprise silos and lack of business and IT collaboration continued the IT mess. As Kaplan notes persuasively: "The IT condition was a product of decades of bad decisions, decentralized execution without enterprise coordination, corporate politics and bullies, ad-hoc processes, average employees earning average compensation, complacency and ignorance" [2005, p. 43]. So, for a considerable part, the cause for IT underperformance lies elsewhere.

Third, one might argue that evaluating the performance of an IT system in terms of enterprise performance criteria is fundamentally wrong. A system can only be evaluated through criteria that are inherent to the system. Put another way, a system can only be evaluated against its intrinsic performance requirements. So, the performance of a truck used for transport services can be evaluated in terms germane to the truck, such as reliability, fuel efficiency, load factor, payload-range characteristics etc. Performance requirements must be formulated pertinent to these areas of concern. One cannot require from the truck that customer satisfaction for parcel delivery increases, hence it cannot be evaluated against that. If customer satisfaction does not improve, but the truck operates according to the intrinsic performance requirements, something else is the matter. Among other things, it might be that the requirements do not match the enterprise logistic characteristics very well: unity and integration are absent. Similar considerations hold for IT systems. Of course the question as to how IT can enhance enterprise performance is evidently relevant. But that question cannot be addressed within the IT domain; it can only be addressed from the (design) perspective of the enterprise as a whole. As we will show in paragraph 6.5.2, the fundamental reason for inadequate benefits from IT systems lies in lack of unified and integrated enterprise and IT design.

6.5 The Necessary Focus on Design

6.5.1 Limitations of Structural, Management-Oriented IT Governance

The characteristics of the 'mechanistic', top-down, structural and management-oriented governance perspective has been discussed amply in Chapter 2. Specifically regarding IT governance, similar mechanistic characteristics can be noticed pertinent to the prevalent manner by which IT governance is addressed and arranged. Hence the drawbacks that are associated with mechanistic thinking likewise hold for this type of IT governance.

Our fundamental objection to the mechanistic character of many IT governance views is the misleading illusion of a simple solution for a complex problem. Management's credo is control and measurement, under the conviction that if it can't be measured, it can't be controlled (or conversely, what gets measured gets done). However, this credo and conviction are naïve in light of the dynamic and complex business context [Ciborra 2001]. Recalling our discussions in Chapters 2 and 3, we reiterate that predictability and control cease under complexity, dynamics and the associated uncertainty, making predictability and controllability an illusion in these cases. Yet it is precisely this illusion on which the structural, mechanistic IT governance approach is based. With that goes a naïve belief in a planned sequence of events: the definition of enterprise goals, and from these, the directly discernible IT goals and their realization, the identification of risks and their control, up to the definition and measuring of performance indicators with a direct and demonstrable linkage to strategic goals; all that, according to the proponents of the structural IT governance approach, occurs within a context where predictability – hence the ability to plan – reigns.

We have mentioned the strategic transition barriers identified by Weil and Broadbent [1998, p. 42]: (1) “expression barriers”, that have to do with the inability to articulate the strategic direction and goals clearly and explicitly, including the importance of IT, (2) “specification barriers” identifying the inability from the business perspective to specify what the IT strategy must accomplish, and (3) “implementation barriers”, which are caused by various (technological) restrictions following from the current complex systems and infrastructure. In view of our reflections earlier, these barriers are highly understandable, and also to be excepted. We contend that the mechanistic, top-down, planning-oriented approach cannot remove these barriers. For that, the IT governance competencies to be discussed later are essential.

Experience confirms the problematic character of the aforementioned approach. Not overly favorable strategic successes are reported, as discussed in paragraph 3.2.4. As shown, the deep-seated problem facing nearly every enterprise had to do with the inability to implement its strategy successfully. The high failure rate holds similarly when IT is part of the strategic initiatives. Given this high failure rate, the idea that the structural IT governance approach is supported by a formal underlying methodology for the design of IT systems and the realization of IT alignment, does not seem defensible [Ciborra 2002]. One the one hand, this has to do with the fact earlier mentioned that the mechanistic, structural approach lacks attention for unified and integrated design. On the other, the structural, top-down approach makes enterprises blind to other processes that enable and enhance the adaptive capability of enterprises, and with that, are better at addressing business and IT alignment and IT enablement dynamically.

Despite strategic alignment models and structural governance approaches, research on the actual development practices for IT systems and networks shows that development does not generally progress according to the intended top-down, planned, mechanistic pattern. Other than the linear, analytical, top-down picture, actual strategy development appears to be characterized by “incrementalism, muddling through, evolutionary development, improvisation and experimentation” [Ciborra 2002, p. 35]. Comparably, others state that “Strategies are derived and emerge from the firm’s complex set of business, competitive, organizational, and environmental circumstances” [Weil and Broadbent 1998, p. 30]. Interestingly, Japanese attention for quality improvement appears to be associated with emergent, rather than planned IT developments [Bensaou and Earl 1998]. These visions compare poorly with the structural, mechanistic, top-down, and planning-oriented governance viewpoint. Hence, there is a serious chasm between the governance model and the actual praxis. Due to this chasm, essential competencies that could make the actual praxis successful are not established. Evidently, many conditions are relevant for making strategy possible as a learning process. For that, the competence-based approach to IT governance is crucial.

In summary, the limitations of the mechanistic IT governance approach are as follows:

- Lack of attention for the considerable environmental dynamics
- The untenable notion of IT strategy development as a planning process, and lack of attention for incremental, emerging developments
- Lack of attention for strategic transition barriers
- The inability to operationalize the notion of IT alignment as ‘state’ and ‘process’
- Lack of attention for IT enablement
- Lack of attention for unified and integrated design.

6.5.2 Alignment, Enablement and the Value of IT Resulting from Design

Unity and Integration: An Example

As indicated, the notion of business and IT alignment is central to IT governance. Alignment as ‘state’ implies unity and integration between business and IT arrangements: IT functions are supporting business processes and tasks optimally. To illustrate the ultimate source of unity and integration, consider the following example. Suppose that pertinent to the operation of a car, management decided that the strategic focus should be on enhancing car safety and comfort. In a genuine top-down, strategic planning fashion, the plan for an air-conditioning system was formulated. Economic calculations showed a favorable return on investment as a result of increased sales, so within the prevalent decision-making structure, management decided quickly in a positive sense. The project was executed with the result shown in Figure 6.6 below.

Fig. 6.6. ‘Unity and integration’ between car safety and comfort

Based on the result shown, one might question safety. Hence, one might question the adequacy of unity and integration between car safety and comfort. We submit that neither deciding on projects based on financial figures, nor the management of the car's project portfolio, will solve the unity and integration issue. Indeed, the only area where unity and integration between car safety and comfort can be arranged, and is manifested, is the area of design.

The necessity for unity and integration plays a role at various levels. To remain with our car example and to illustrate the lack of unity and integration at the enterprise level: in one car manufacturing company the introduction of robots for production automation flopped because the company "did not train workers properly to use it, and did not design its cars for easy robot assembly" [Laudon and Laudon 1998, p. 183].

Unity and Integration Between Business and IT

The concept of IT alignment was introduced from the perceived poor unity and integration between business and IT developments. One might consider IT governance as a structure for decision-making and accountabilities, and assume that such a structure can establish business and IT alignment. This viewpoint totally ignores that business and IT alignment are determined by enterprise design. We are convinced that the structural IT governance approach cannot bring about unity and integration between business and IT. The notion of 'alignment' was shown to have two facets: alignment as *state*, and as *process*. Alignment as *state* has to do with unity and integration of business and IT, which can only be obtained through a focus on design, as illustrated in the previous car example. Comparable considerations hold for the notion of IT enablement. New, IT-provided possibilities to arrange the business differently, or even to arrange a different business, actualize themselves only through business and IT design. The discussion about Information Economics (cf. paragraph 6.3.3) also showed that to get real value from IT, the business itself must change. This necessity again points to the design of the enterprise as a whole, and the unified and integrated design of IT systems within. Taken from this is the crucial insight that the value IT can deliver is not primarily a function of technology itself, but first and foremost a function of how IT is used, as will be further corroborated below. Hence we emphasize that unity and integration between business and IT, the utilization of new IT-provided possibilities, as well as maximizing the added value of IT, can only be realized through design of the enterprise a whole, in which IT functionality is addressed concurrently. We reiterate what we have emphasized earlier: design should also address the capacity to change and adapt (IT enablement).

Chapter 4 argued that system unity and integration is not established 'spontaneously', but must be created intentionally in view of the system function and various areas of concern. Further, as we have mentioned previously, various transition barriers limit the easy operationalization of strategic choices. In particular all these aspects can be addressed through design activities. Precisely here lies the possibility for business and IT alignment. However useful structures for decision-making and accountability may be to some extent, unity and integration are not created by them. The realization of the initial design, or subsequent possible changes, requires an effective design process and associated methodology: alignment as *process*. The effectiveness of the design process is determined on the one hand by essential organization competencies that we will discuss later, and on the other by the organizational context defined by culture, management practices, and other organizational conditions. It is this context that determines the effectiveness and productivity of business and IT relationships as alluded to in paragraph 6.4.3, and discussed below in paragraph 6.5.3.

The foregoing observations are supported by an interesting comparison between the handling of IT by Japanese and Western companies [Bensaou and Earl 1998]. It is argued that "In Japan, IT is seen not as something special, different, and problematic, but rather as part of a fully integrated picture" [op. cit., p. 122]. The previously mentioned system view for creating unity and integration is emphasized: "What Western companies do not usually recognize is that the integration of IT with the organization has to be from top to bottom and systemic, not structural" [op. cit., p. 127]. Notably, these observations compare with the aspects of Eastern thought mentioned in paragraph 2.1.4.

Core Reason for Failing Strategic IT Initiatives

Paragraph 3.2.4 discussed that the majority of (strategic) enterprise initiatives fail. These failures are likewise manifest when applying technology in enterprises. Technology often plays a significant, and mostly crucial, role in many initiatives. Failing initiatives are thus also associated frequently with failing technology introductions. Much has been reported about that in a general sense, but also more specifically about failing IT introductions [Scott Morton 1991, Galliers and Baets 1998, Rechtin 2000]. As we mentioned in paragraph 6.4.3, rather remarkably, research over a lengthy period of time did not prove any positive relationship between IT investments and measurable improvements in enterprise performance [Pisello and Strassmann 2000]. That means that high IT spending can be associated with low enterprise performance, and vice versa, as figure 6.7 portrays schematically. The relative IT investment level is the percentage of revenue spent on IT for example, or the expenditure level per employee. Various relative performance indicators have been used, such as return on assets, shareholder returns or profit per employee. All these comparisons yielded the same picture: no relationship [Strassmann 1990].

Other studies showed remarkably similar results [Martin 1995]. An analysis among 38 service firms of the relationship between profitability and IT spending showed that 'over-achievers' had lower IT budgets than the 'average' and 'under-achievers' [Strassmann 1990]. Ironically, "Large computer expenses are not an indication of favorable financial results" [op. cit., p. 47]. Later research among 300 enterprises on enterprise financial performance on the one hand, and the level of IT expenditure on the other, yielded a similar picture [Pohlmann 2002]. The financial performance was defined as the weighted sum of three variables: three-year revenue growth, three-year average return on assets, and three-year cash

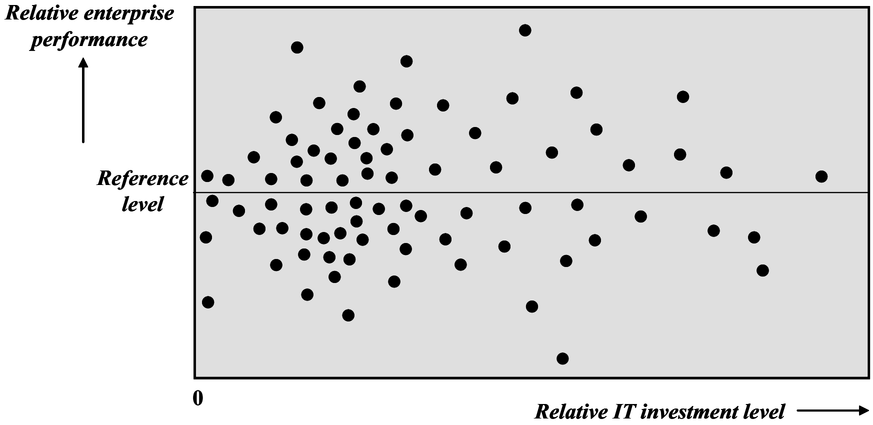


Fig. 6.7. Lack of relationship between IT spending and enterprise performance

flow growth. Using this criterion, four categories of performance were used: excellent, above average, below average, and poor. IT expenditure was defined as the percentage of revenue spent on IT. Excellently-performing enterprises spent only marginally more on IT than poorly-performing enterprises, and less than the above- and below-average companies. This research also shows that high IT spending does not necessarily lead to better (financial) enterprise performance [op. cit.].

For some writers, the issue can be solved simply: “Research has found that 70% of IT projects are deemed unsuccessful. The root cause is failure to define success criteria at the start of the project” [Maizlish and Handler 2005, p. 47]. In our view, the observations above find their cause in the suboptimal use of IT. All too often, “Computers have been used to automate ancient processes and fit into ancient corporate structures” [Martin 1995, p. 103]. Excellently-performing enterprises however, use technology such that unity and integration is established between the possibilities of technology and the context in which it operates. This assertion is confirmed by MIT research on the effect of IT on enterprise performance. Only enterprises that also changed the arrangement of the enterprise in conjunction with the introduction of IT – hence established unified and integrated design – realized significant productivity improvements [Brynjolfsson and Hitt 1996]. Chapter 3 viewed an enterprise as a socio-technical system. Within this perspective enterprise performance “is optimized when both the technology and the organization adjust mutually to one another until a satisfactory fit is obtained” [Laudon and Laudon 1998, p. 15]. This adjustment is crucial since “Information systems and organizations have a mutual influence on each other” [op. cit., p. 75].

Enterprise performance is thus not primarily to do with the use of modern technology, but with the total quality of the enterprise arrangements, of which technology is a part. Rightly, “The introduction of a new information system involves much more than new hardware and software. It also includes changes in jobs, skills, management and organization” [Laudon and Laudon 1998, p. 385].

So, "The organizational change, human skills change and development of new IT need to be managed jointly, implemented in tandem and synchronized, otherwise successful implementation of the new value stream will not occur" [Martin 1995, p. 115]. Many cases investigated showed that the new organizational arrangements that IT offered were the drivers for significant performance improvements, not IT as such [Strassmann 1990]. So, better enterprise performance "would tend to come not from the technology itself but from organizational, people, and process changes made in the wake of installing technology" [Brynjolfsson, in: Carr 2004, p. 156]. This calls for integrated design, whereby the context in which technology must operate is brought into the design perspective. Hence, a focus on the design of the enterprise as a whole. Concerning IT, the competence for IT design will be addressed when discussing the IT competencies.

6.5.3 Contextual Conditions for Effective Governance

Realizing business and IT alignment is a central theme within the IT governance literature. We have indicated that unity and integration between business and IT (alignment as *state*) can only be realized, and be manifested, through the design of the enterprise. Design activities operationalize the notion of alignment as *process*. Hence, these are the two aspects that successful IT governance must arrange: a unified and integrated design, and an effective design process. The question is then, what are the conditions for effective IT governance? In view of our earlier reflections, structural IT governance aspects – however useful to some extent – do not provide these conditions.

Three critical aspects have been argued that determine the ability for IT to create business value: (1) IT competence (knowledge, skills, methodologies, etc.), (2) the IT systems and infrastructure, and (3) the business and IT relationships [Rockart et al. 1996]. As we will discuss later, IT governance competence is the crucial function for creating the second condition, the unified and integrated IT systems and infrastructure design, as well as for the third condition, establishing and maintaining effective and productive business and IT relationships. In our view, the inherent effectiveness and productivity of these relationships can hardly be stimulated through structural governance aspects. On the contrary, the effectiveness and productivity of the relationships are determined by the proper mindset and convictions about the importance of IT for the enterprise [Bensaou and Earl 1998]. Evidently, the mindset portrait in paragraph 6.1.2 is not conducive to effective IT governance. In the case of proper relationships, Earl and Bensaou refer to "organizational bonding" [op. cit., p. 125]. After reviewing the governance 'features' of Japanese companies, they state: "We stress organizational bonding because none of the distinguishing features noted above is structural in nature. That is, they do not depend on setting up committees, creating new liaison roles or tinkering with the degree of centralization – all devices favored in the West. The focus is on proximity, cross-training, shared understanding and relationships" [op. cit., p. 126]. According to this view, strategic insight emerges based on considerations regarding: (1) customer satisfaction, (2) product and services quality, and (3) operational performance. These strategic insights form the basis for decision-making, not a basis defined by projects prioritized by financial ratings [op. cit.]. Notably, this approach compares with the strategic learning process discussed in paragraph 2.4.5.

The foregoing perspective is confirmed by research among a number of enterprises, indicating that effective IT governance is more than the definition of decision-making structures and the formal allocation of accountabilities [Peterson et al. 2000]. However useful these structures might be to a certain extent, they turn out to be ineffective in a complex, dynamic environment. The research showed that enterprises with high strategic and operational IT performance were not only directed to the innovative use of IT, but that additionally, IT governance was characterized by a high level of informal social interaction, participation, and the integration of various business and IT stakeholders. Evidently, these contextual conditions were conducive to the innovative use of IT. Meaningful dialogues (for example supported by scenario analysis), shared visions and understanding appeared to be typical characteristics [op. cit.]. Conversely, a focus on IT costs and exploitation appeared to be associated with merely structural IT governance mechanisms and a low level of strategic and operational IT performance. For social interaction, participation and integration – hence 'organizational bonding' – the competence-based view on IT governance is crucial. In their discussion about IT project portfolio management, Maizlish and Handler introduced the notion of an 'IT discovery portfolio', which contains IT projects that might contribute to future enterprise success [2005]. In line with the observations in this paragraph, they observed that this approach can only be successful if business and IT have a highly (socially) effective relationship, which research shows occurs in only 2% of enterprises [op. cit.].

6.6 IT Governance Competencies

The notion of 'competence' was introduced in paragraph 1.4.2. Contrary to the mechanistic view on governance, the organismic view centers around employee competencies, embedded in, and constituting the organizational governance competence. In the case of IT, this competence plays a central role. We aim to show that the driving force behind realizing alignment does not come from 'strategic planning', but from an *organizational* governance competence (knowledge, skills, methodology, etc.), with competent professionals: "a great amount of caring performed by various actors involved in the design, implementation and the use of IT infrastructures" [Ciborra 2001, p. 30]. We reiterate from paragraph 3.2.5 that it is this competence that interprets the, partly technology-driven, environmental dynamics; that operationalizes, details and works out vague, generally formulated strategic intentions and objectives into possible IT developments. It is this competence that – other than the linear, top-down, planning view suggests – initiates IT developments bottom-up, which anticipate possible business developments and its associated dynamics (IT enablement). It is this competence that constitutes and shapes the strategic business and IT dialog, and the (in)formal social interaction, participation of stakeholders, mentioned in paragraph 6.5.3. It is this competence that ensures a unified and integrated IT design and its implementation. It is this competence finally, that provides the very fundament for further professionalizing the competence itself, hence further professionalizing IT governance. This competence, and the core competencies within, are the topic of this section.

Competencies can be distinguished at two levels: the enterprise level and personal level. We will confine ourselves to competencies at the enterprise level. When discussing enterprise governance, personal competencies will be addressed. These are comparable with personal competencies within the IT governance perspective.

6.6.1 Core Competencies of IT Governance

Enterprise competencies exist at various levels within the enterprise, since evidently, integration of skills, knowledge and technology is required at different levels for delivering certain internal products and services. So, in our view, for the IT governance function we can refer to an enterprise competence for delivering the IT governance products and services. As we will show in Chapter 7, this competence is part of the overall enterprise governance competence.

In view of the competency notion, IT governance concerns the integration of skills, knowledge and technology for providing unified and integrated attention for IT development: (1) establishing IT strategic initiatives, (2) the development of IT architecture for guiding IT system design, (3) the design of IT systems, (4) the portfolio of subsequent IT projects for implementing design, and (5) the implementation of IT projects.

So, we will define IT governance as:

> *IT governance is the organizational competence for continuously exercising guiding authority over IT strategy and architecture development, and the subsequent design, implementation and operation of IT systems.*

Below we will discuss three core competencies we believe to be essential for the overall IT governance competence, and thus in fact make up the competence. These three competencies have a rather different character, but have strong mutual relationships as we will sketch later. The three core competencies are:

- IT strategy and architecture *conceptual, design focused*
- IT project portfolio management *financial, administrative*
- IT program management *execution, implementation.*

These core competencies cover the IT governance domain in a unified manner, and are essential competencies that must be retained in-house. Using a comparable nomenclature, others have also identified these core competencies [Allega 2003, Buchanan 2003]. As will become apparent from the discussion below, the IT strategy and architecture competence is central within the IT governance competence, since that competence determines the nature of the activities within the two other competencies. The three core competencies are shown schematically in figure 6.8.

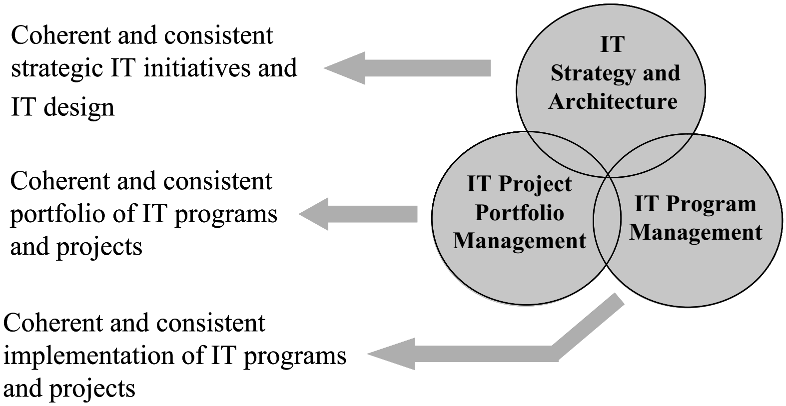


Fig. 6.8. Schematic depiction of the IT governance core competencies

Specific skills and knowledge are evidently relevant within each core competence. For example, pertinent to the design of IT systems or the execution of projects and their management. To a considerable extent, specific skills and knowledge are provided by particular education, and will therefore not be our focus of attention. Further, technology regarding the IT governance competence has to do with supporting IT systems for example. One might consider systems for modeling IT systems, project portfolio management or project management. These technology aspects are also outside the scope of our present discussion. Hence our discussion about the core competencies will center around their main organizational aspects: function and tasks.

6.6.2 IT Strategy and Architecture Competence

In paragraph 3.2.2 we defined a strategy as the totality of choices that provide an overall orientation for future enterprise developments. An IT strategy is a subset of the enterprise strategy and thus concerns choices pertinent to the deployment of information technology within the enterprise. Further, strategy development was characterized as an emerging process based on learning rather than planning (cf. also paragraph 2.3.4 and 2.3.5). Various topics play a role in defining the IT strategy:

- Enterprise developments
- IT architecture development
- IT commodity infrastructure and services developments

- IT life-cycle management
- Information technology developments.

These topics will be discussed below in order to understand both their influence on IT strategy development and the emerging nature of strategy development, thereby appreciating the necessity for a competence-based focus.

Enterprise Developments

Our discussion in the previous chapters indicated numerous topics that guide and determine enterprise developments. According to paragraph 3.2.3, strategic choices can be divided in two main categories: (1) 'position', concerning the products and services to be delivered, and the target customers and markets, and (2) 'perspective', having to do with the way of working, norms, values and convictions. Various enterprise developments are associated with these two strategic categories. Within the 'perspective' category, the principal distinction between the mechanistic and organismic way of organizing, discussed in Chapter 2, entails fundamentally different enterprise developments. More specifically, attention for productivity, quality, service, enterprise learning and innovation, human resource employment, employee behavior and the behavioral context, the collaboration in and between enterprises; all those aspects will guide and define enterprise developments. This holds similarly for the topic of corporate governance and compliance. In view of the central role of information, all those enterprise developments define the IT strategy to a considerable extent. We will illustrate later that the strategy development process is far from linear, top-down and planned.

IT Architecture Development

In relation to system development, the notion of architecture and architecturing has been outlined in Chapter 4. Everything that has been said thus applies to IT architecture, which provides the normative guidance for the design of IT systems and is defined as:

- *IT architecture*: a coherent and consistent set of principles and standards that guides how IT systems must be designed.

An IT system can be defined as "a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision-making and control in organizations" [Laudon and Laudon 1998, p. 7]. Multiple IT systems will deliver IT functionality to the enterprise. This totality can be viewed as the overall IT system of the enterprise, which we define as the unified and integrated whole of IT elements (components or IT subsystems) for the provisioning of IT services to the enterprise. Conforming to the nomenclature and concepts used in Chapter 4, in a later paragraph we will give examples of design domains for the enterprise IT system and provide examples of architecture principles.

Both enterprise and information technology developments drive the need for IT architecture. For example, the collaboration of enterprises in a network for joint activities also requires IT architecture for seamless operation. Likewise, the development of the wireless communication capability requires IT architecture for effective use of that capability.

It is important to note that IT architecture is not only relevant for future IT system design, but that the definition of IT architecture can also lead to the development of IT commodity – general purpose – infrastructure and services. An example might illustrate this point. Suppose an IT architecture principle reads: "Network access must be based on authentication and role-based authorization". The implications of this principle can be numerous, and can relate to interfaces with customers for example, or the associated security, the linkage with data sources, etc. Given the architecture principle and the associated implications, possible subsequent activities must be defined in order to be able to actually apply the principle. The development of 'identity management services' for providing secure access to the enterprise network is an example of such consecutive activity. These general purpose identity services will subsequently be part of the IT commodity infrastructure and services portfolio, and their development part of the IT strategy.

IT Commodity Infrastructure and Services

Increasing IT functionality is available for general use. Put another way, the IT functionality offered is not enterprise-specific, or (within an enterprise) business unit-specific. Many different units or functions within an enterprise make use of the same (generic) IT solutions. Increasingly therefore, IT products and services are acquiring a commodity character [Carr 2004]. As mentioned previously, we will identify these products and services as IT commodity infrastructure and services (IT CI&S). Various well-known infrastructural arrangements and provisions such as computers, networks and access devices (e.g. PCs), are part of the IT commodity infrastructure. Multiple infrastructural services can be identified that are required for delivering IT functionality properly, like services related to system and network management [Perk and Beveridge 2003]. Increasingly, business-related services such as e-mail services, content and document management services, electronic purchasing and payment services, e-learning services, security services, video conferencing services, etc., are also all examples of IT commodity services. Unfortunately the commodity character of these products and services does not mean that they share the same standard or mode of operating worldwide. For a commodity such as electrical energy this is also not the case. It does mean however, that within one enterprise different manifestations must be avoided of essentially the same IT commodity infrastructure and service. Notably, the commoditization of IT confirms once more the opinion voiced in paragraph 6.5: the business value of IT is not determined by technology as such, but by unity and integration with the enterprise as a whole.

The notion of IT commodity infrastructure and services, whereby uniform products and services are provisioned for various enterprise units, implies that at a central level ('above' the individual units) it must be established what the IT

CI&S elements should be. This is an important task of the IT strategy and architecture competence. It is important that the central governance function has the financial means to stimulate IT CI&S developments into the desired direction. For example, the need for a specific commodity service might emerge in a certain business unit, whereby enterprise-wide use necessitates additions or changes to the service that can only be arranged through corporate funding. Financials for IT commodity infrastructure and services should thus rest with the central IT governance competence. Similar considerations play a role with reducing IT legacy complexity successfully, as will be shown in paragraph 6.8. In a survey among 103 CIOs, this practice of centralized funding was highly valued, and practiced by 75% of the surveyed enterprises [Ross et al. 2003, p. 102].

To a considerable extent, developments pertinent to IT CI&S are driven by: (1) the current IT CI&S functionality, technology condition, and costs, (2) future technology trends and progress, and (3) business strategic developments. It is important to note that the development of IT architecture contributes for a significant part to the definition of IT CI&S. Recalling our example above, the IT architecture principle necessitated the development of 'identity management services' as an IT commodity service. The example indicates that, as with architecture compliance, IT CI&S developments also necessitate the involvement of the IT strategy and architecture competence with the (high-level) design of IT systems. The case study presented in Chapter 8 will illustrate these observations further.

Two important reasons stand out for positioning the IT strategy and architecture competence as a central (corporate) competence: (1) the development of IT architecture as an enterprise-wide guidance for the development of IT systems, and (2) the development of IT commodity infrastructure and services for enterprise-wide use.

IT Life-cycle Management (IT Asset Management)

Management of the life-cycle of IT systems (networks, applications, components, etc.) deals with the formal process from development, design, implementation, improvement, up to the ultimate replacement or discontinuation of the system. The latter can be caused by various reasons, or combinations thereof, such as technology obsolescence, cost level, or functionality which is no longer required. The cost level is often expressed by the total cost of ownership, as driven by operational costs of service delivery, licenses, functional and corrective maintenance, depreciation and so on.

In view of the increased importance of IT commodity infrastructure and services, they constitute a major area of attention for life-cycle management. Since the IT strategy and architecture function is, as sketched, responsible for defining the IT CI&S, carrying out the tasks for IT CI&S life-cycle management evidently fall within this competence. A twofold relationship might be noticed. On the one hand, IT strategy and architecture development is the implicit manifestation of (certain aspects of) life-cycle management, since new systems are created as a result of strategy and/or architecture development. On the other hand, life-cycle management also contributes to the development of IT strategy and architecture:

new system developments and architecture principles and standards might be due to life-cycle management considerations.

In fact, business-specific applications must be included in life-cycle considerations. First, these applications use underlying IT commodity infrastructure and services, whereby application life-cycle management might have consequences for the IT CI&S, and conversely, life-cycle management of IT CI&S might have consequences for applications. Second, business-specific applications might provide functionality that can be transferred to IT commodity services. Hence, life-cycle management of business applications thus transcends the mere business unit scope. Also for this issue, the previously mentioned effective business/IT relationship is essential (cf. paragraph 6.5.3).

Since life-cycle management concerns IT assets, one might consider using the term 'asset management'. IT asset management generally has to do with the optimum use of IT assets within their respective life-cycle. This perspective points to IT operational service management and the associated efficient and effective utilization of IT assets. For example, central consolidation of IT hardware falls under IT asset management. So, life-cycle management necessarily implies asset management, but the latter does not imply the former. From the IT governance (strategic) perspective, we thus prefer the term life-cycle management.

Information Technology Developments

The rather revolutionary progress of information technology was discussed earlier. So, assessing and analyzing information technology progress provides important inputs for defining the enterprise strategy and IT strategy. Technology assessment and analysis must cover a broad range of aspects such as new functional possibilities, business opportunities, the social and operational consequences of new technologies, possible risks in light of technology maturity, and the direction in which, and period over which, technology developments will progress. These proactive assessments and analyses are crucial for: (1) possible new business applications (IT enablement), (2) new elements in the IT commodity infrastructure and services, (3) carrying out IT systems life-cycle management, whereby necessary discontinuation and replacement of existing technology is addressed, and (4) the development of new architecture. Studies and pilot projects are important tools for assessing and analyzing new technology. The formal introduction of new technology is evidently also a strategic IT aspect. Since, as argued in paragraph 6.5.2, successful deployment of technology rests on unity and integration of technology within the overall enterprise design, assessments of future information technology developments must likewise be integrated within the overall enterprise governance competence.

IT Strategy Emergence

Three levels of strategy definition can be identified [Earl 1989]:

- *Information utilization*: This concerns *what* (which functionality) IT must provide.

- *Information technology design and implementation*: This strategy level has to do with the arrangement of IT. Hence, it concerns *how* the desired IT functionality must be provided.
- *Information technology management*: This considers the organizational arrangement of the IT function providing the IT services.

One might interpret the categorization above in a top-down, sequential manner as discussed previously. However a reverse order is perfectly plausible. For example, an IT function that designs and implements new IT provisions proactively creates the conditions for new information utilization. The very notion of IT enablement discussed in paragraph 6.3.2 fits within this reverse order. Unlike the top-down, sequential view, paragraph 6.6.6 will therefore portray a very different picture, characterized rather by bottom-up, iterative and parallel activities. Earl also put a sense of nuance to the top-down, sequential outlook: a multiple-facetted approach is argued with insights and inputs from multiple sources [1989].

Understandably, strategies concerning IT design and implementation, as well as IT management, are part of the overall IT strategy. However, strategies concerning the utilization of IT should be a business focus, hence should be part of the business strategy. Nonetheless, since IT must provide the required functionality, the business functionality must also be addressed within IT strategy development. Further, as argued above, the extensive commoditization of IT gives another important reason for bringing IT functionality considerations within the scope of IT strategy development.

As might be appreciated from our previous discussion, the various topics that define the IT strategy have mutual influential relationships. The six topics shown in figure 6.9 define 15 mutual relationships. These relationships do not occur, hence cannot be addressed, in a planned, sequential order. On the contrary, the relationships are present concurrently, whereby events in one area affect other areas in an often unpredictable way. The picture is complicated further when business-specific applications are brought into view, which brings the number of relationships to 21. All the topics shown in figure 6.9 might be affected by developments pertinent to business-specific applications, and conversely, the topics might affect these applications. It seems plausible that it is not so much the structural, management-oriented aspects of IT governance, but rather the IT governance competence, which can address the multitude of relationships, and their substance, adequately. The essential role of the IT governance competence might be appreciated further if we imagine the manifestations of these relationships, concurrently and/or sequentially, over time. In summary, it is the IT strategy and architecture competence that comprises the totality of knowledge and skills for carrying out the various activities pertinent to the topics discussed, and translates the outcome of these activities into IT strategic themes and the development and design of IT systems. As emphasized previously, the definition of IT strategic themes depends on competency-based group dynamics, whereby – within the organismic perspective – new developments emerge through collaborative actions [Scarbrough 1998].

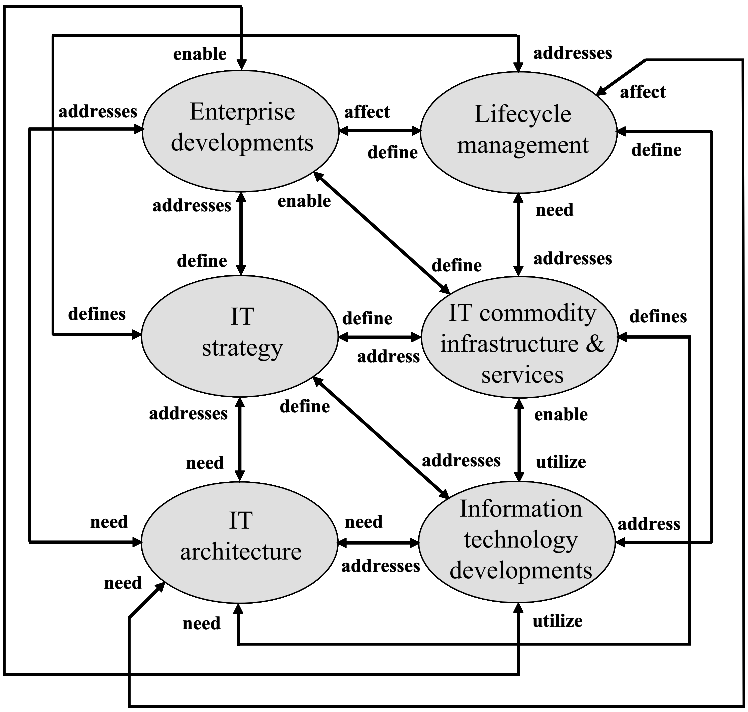


Fig. 6.9. Various topics defining the IT strategy and IT system design

6.6.3 IT Architecture Management

For effectuating IT architecture as normative guidance for the development of IT systems, the following organizational tasks are important: (1) definition, review, approval and publication of architecture, (2) supervision of related processes and actions, and (3) ensuring the use of architecture in the design process. These organizational tasks form the core of architecture management, and will be discussed below.

Evidently, designers of IT systems should have knowledge about architecture that they should apply in the design process. Hence, architecture must be published formally. In accordance with the structure for architecture publication discussed in paragraph 4.2.8, we have:

1. The architecture principle (or standard) statement
2. The rationale for the architecture principle or standard
3. The implications of the principle or standard
4. Possible key actions (through formal projects of programs) necessary to effectuate architecture.

As already stated, architecture is normative, prescriptive, thus has a 'legislative' character. Before architecture can function as such, it has to be approved formally as legislation. Depending on the type of architecture principle or standard, the approval process might be cumbersome, due to different viewpoints stakeholders might have. Formal approval can be organized through the arrangement of an 'Architecture Review Board' in which the various stakeholders participate. It should be stressed however, that it is architecture that gives normative guidance, *not* the approval board about architecture [Leganza 2003]. An important task of architecture management is managing the process from issuing initial architecture drafts, the handling of comments and the formal approval, to the ultimate final publication.

As illustrated earlier, the definition of architecture can necessitate various subsequent activities. Subsequent activities might take the form of initial studies, pilot projects or formal projects or programs. For that, close relationships are essential with the two other core competencies to be discussed later: IT project portfolio management and IT program management. A second important task of the architecture management function is the preservation and continuation of these relationships.

Finally, published architecture is only then effective when adhered to in the design process. Hence, architecture *compliance*. Consequently, it must be stated formally that the design of the IT system is architecture-compliant. Such a formal statement can take the form of a 'building permit' issued by the architecture function. It could be however that for various reasons, the designer believes that some architecture principles or standards cannot (yet) be satisfied. In these cases, the architecture function must consider a formal exception request from the designer to deviate from the published architecture. The architecture function might approve the exception and stipulate possible conditions, for example a temporal exception with the obligation to migrate to the compliant situation within a certain period. Only through this formal approach can architecture survive and mature into a normative, legislative concept for IT system design. A final important task of architecture management thus concerns the management of 'compliancy': building permits, exception handling and the controlling of temporal exceptions. The verification of compliance implies that the IT strategy and architecture function must assess the (high-level) design of IT systems, and if necessary modify the design in view of architecture compliance. A large sample of surveyed enterprises showed that 70% used a formal architecture compliance process, whereas 60% had an exception handling process [Ross et al. 2006, p. 102].

6.6.4 IT Project Portfolio Management Competence

It is useful to sketch the difference between a project and a program. We define a *project* as a carefully planned and organized set of activities for realizing a specific, clearly defined, one-time goal. Hence, painting a door or installing a new computer server, are projects. In many cases however, the goals are not specific, but formulated in general terms, such as lower costs, shorter throughput time, higher market share, higher customer satisfaction, and so on. In these cases projects must be defined – in our view, based on design – that are supposed to contribute to the general goal. Those projects are then executed under the overall umbrella of a program. A *program* can thus be defined as a cluster of projects whereby their execution must be coordinated to achieve an overarching (strategic) goal.

Strategy development and subsequent design ultimately leads to the definition of projects and programs that should operationalize the strategic choices through realizing the design. As far as IT is concerned, this concerns programs and projects with either a specific business or commodity character. Both categories of IT programs and projects define the *IT program and project portfolio*. We define the IT program and project portfolio (often identified in short as the IT project portfolio) as a central, unified list of all enterprise IT programs and projects and the associated core data. Core data concerns examples like reasons for initiating programs and projects, goals, resources, costs, delivery time, etc.

The importance of enterprise unity and integration has been emphasized repeatedly in view of achieving enterprise objectives successfully. So a unified and integrated design is the basis for a coherent and consistent set of projects. That is why the IT strategy and architecture competence is crucial for defining IT projects, as mentioned earlier. The central notion of an IT project portfolio is the transition from managing individual projects to managing a cluster of related projects [McFarlan 1981, Gliedman and Visitacion 2004]. In view of this we define *IT project portfolio management* as the totality of activities for ensuring that the project portfolio is accurate and up to date, such that project management and pertinent evaluation and decision-making is facilitated, for example about resources needed, project execution priorities, project execution risks, project progress, etc.

We have to stress that the coherence and consistency of the project portfolio, in our view, can only be based on a unified and integrated design. All too often, notably within the structure-oriented IT governance approach, the IT project portfolio is defined, or cleansed, by selecting projects based on some financial criterion ranking. One might seriously question on what (theoretical) grounds such an approach could lead reliably to a set of coherent and consistent projects. As our previous car example aimed to illustrate, unity and integration cannot be established through merely managing a portfolio of projects.

Notably, some authors conceive the notion of IT portfolio management differently than above. Within this different view, IT portfolio management is considered the very core of IT governance: "IT governance is the system by which an organization's IT portfolio is directed and controlled" [Maizlish and Handler 2005, p. 65]. Similarly, "IT portfolio management is where the *real* financial management decisions are made", whereby IT portfolio management is seen as a "control point for the entire IT management system" [Kaplan 2005, p. 54/55]. In accordance with the management-oriented governance perspective, portfolio management is regarded as a decision-making vehicle. In a familiar vein: "A central feature of the IT portfolio management method is that it demands accountability – complete with both the authority to meet objectives and real consequences for failing to do so – for IT investment decisions" [op. cit., p. 75]. IT portfolio management is seen as the mechanism for ensuring optimum returns on the portfolio of IT investments. These returns are mostly defined in financial terms, but non-financial objectives might also play a role [op. cit.]. Others claim that IT portfolio management is “the next best thing to a silver bullet: a practical value and revenue-generating and cost-reduction approach that works” [Maizlish and Handler 2005, p. 2]. It assures that IT investments are performing according to plan through “clearly defined and measurable business and strategic objectives and accountability” [op. cit., p. 4]. Essentially, “The IT portfolio, much like a financial investment portfolio, needs to have articulated objectives, acceptable returns, and diversified (and tolerable) risks” [op. cit., p. 218]. Apparently, not the enterprise and IT design, but the (financially) ‘optimized’ portfolio defines the projects to be executed. Remarkably, within this view, IT portfolio management is considered the driver for IT success.

Arguably, IT project portfolio management in this sense is conceived broadly in order to satisfy the alleged results this function is to deliver. Indeed, various activities are included in IT portfolio management, such as business case and risk assessment, cost estimates, financial (ROI) calculations, asset management, etc. Others have opted likewise for the central role of IT portfolio management through the notion of an IT Portfolio Management Office [Bonham 2005]. Activities that concern architecture (often perceived in a descriptive sense) and project management are considered to fall within the broad domain of IT portfolio management [Kaplan 2005]. The IT portfolio management office (PMO) is deemed to play a central role: “The IT PMO is a well-positioned organization to coordinate the business units, the business case writers, and the IT architecture teams to help create the various pieces of what is known as enterprise architecture” [Bonham 2005, p. 117]. Rather remarkably, the IT PMO deals with enterprise architecture, viewed as the combination of enterprise IT architecture (the IT ‘blueprint’: applications and infrastructure diagrams) and business architecture (the business ‘blueprint’: organizational charts, job descriptions, process flows, etc.).

Within the broad perspective on IT portfolio management as sketched above, portfolio management is the jack of all trades. IT governance is in fact equated with IT portfolio management, apparently based on the (often questionable) view that ‘things’ materialize through projects, so ultimately a portfolio of projects is ‘managed’. This amounts to saying that, since financial criteria are ultimately the arbiters of enterprise survival, enterprise management is in fact merely financial management, an opinion that we have criticized in Chapter 5.

Many conditions need to be arranged for making IT portfolio management successful in the broad sense, which by nature comprises the IT governance areas discussed previously. Evidently, IT portfolio management in the narrow sense is relevant, as mentioned above. We feel however, that the notion of IT portfolio management in the broad sense signals the questionable (mechanistic) message that IT success is all about managing a project portfolio with its associated financial criteria, much like an investment portfolio. “The portfolio idea gives management the illusion of being able to plan and decide how to pick or drop the more revenue-generating applications or systems. But that freedom is simply not there” [Ciborra 2001, p. 33]. Cases analyzed by Ciborra corroborate the untenability of this form of governance: “They all seem to be distant from the portfolio approach” [op. cit., p. 34]. In our view, the broad perspective on IT portfolio management draws attention away from what really matters: unified and integrated enterprise and IT operation based on design.

6.6.5 IT Program Management Competence

Implementing projects and programs adequately is obviously essential. A standard project management methodology appears to be highly valued by CIOs and is practiced by more than 80% of the enterprises in a study of 103 enterprises [Ross et al. 2006, p. 102]. This points to the third and final core competence of the IT governance competence. Much has been published about managing projects and programs adequately [e.g. Wijnen and Kor 1996].

Despite the difference between projects and programs, one generally refers to IT program management. The importance of a coherent and consistent project portfolio emphasized earlier evidently translates into the coherent and consistent execution of projects. We define IT program management as the coordination and supervising activities concerning the definition of enterprise IT project and program plans and the subsequent execution of these projects and programs according to the respective plans. The IT program management function is sometimes performed by the ‘Enterprise Program Management Office’ [Visitacion 2004, Maizlish and Handler 2005]. This office is involved in the entire process from the initial project and program definition to ultimate implementation, including the associated reporting and progress evaluation. The project portfolio management function is often part of the enterprise program management office. The Enterprise Program Management Office can serve as a center of excellence for knowledge, practices and standards for portfolio management and project management [Maizlish and Handler 2005]. Alternatively, those writers advocating a broad perspective on IT portfolio management, as described previously, consider project management as part of the overall IT portfolio management function [Bonham 2005, Kaplan 2005]. Somewhat confusingly, the ‘enterprise’ label is used to indicate that the comprehensive focus concerns IT projects and programs enterprise-wide.

6.6.6 Design Domains and IT Architecture

Chapter 4 referred to system design in a general sense. It was shown that architecture (design principles and standards) pertains to one or more system design domains and addresses one or more areas of concern. An architecture framework was identified symbolically as a triplet $<S,D,A>$, where S stands for the system type or system class (here IT systems), D for design domains and A for areas of concern. The areas of concern for IT systems are comparable with those that generally hold for technical systems. One might consider reliability, maintainability, safety or user friendliness, etc. As an illustration, figure 6.10 shows a number of design domains (*D*) considered relevant for the design of the enterprise IT system, as defined in paragraph 6.6.2: the unified whole of IT elements (components or IT subsystems) for the provisioning of IT services to the enterprise.

The lower layer in figure 6.10 shows design domains relating to the infrastructural foundation. In the middle layer, design domains are shown that are considered relevant from the data communication perspective. Finally, the design domains in the upper layer have to do with interaction of the enterprise IT system with its environment. Next to obvious design domains such as applications and interfaces, we have added the 'collaboration' design domain in view of the 'computer-supported collaborative work' theme, which concerns IT support for various forms of group dynamics [Galliers and Baets 1998]. Seeing enterprises as social entities with collaborating human actors, this design domain seems relevant for the enterprise IT system. Within the computer-supported collaborative work approach, IT support is directed to aspects like information sharing, learning and decision support.

The data management design domain forms a point of discussion. One might argue that activities regarding the quality and validity of data must be the responsibility of the business itself. When discussing enterprise governance in the next chapter, we will argue that data management is an informational design domain. Hence, architecture concerning data management falls under information architecture, rather than IT architecture. Historically however, due to the absence of enterprise governance, data management has been an area of attention for IT architects, rather than enterprise architects.

As Chapter 4 outlined, architecturing is the activity that defines architecture: design principles and standards pertinent to the system design domains. Architecture is published according to the structure mentioned in paragraph 6.6.3. Understandably, many design principles have a specialist, hence somewhat esoteric character. Table 6.2 shows a number of more directly understandable examples of IT architecture principles. In the case study presented in Chapter 8 we will present architecture examples for all the design domains shown in figure 6.10.

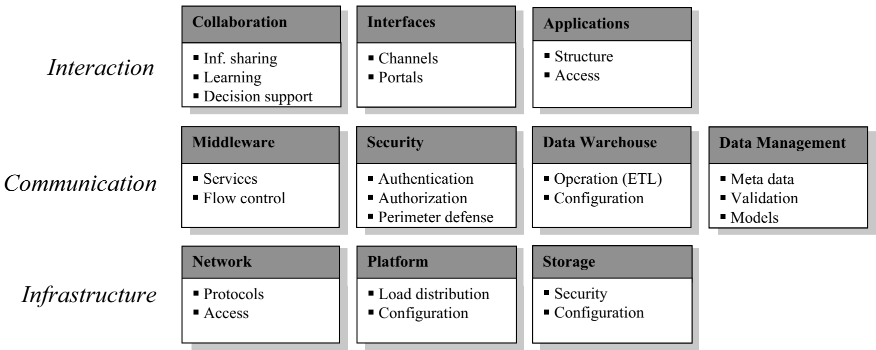


Fig. 6.10. IT system design domains

Table 6.2. Examples of IT architecture.

IT architecture
E-business solutions must be access-channel independent
Operational data must be separated from informational data
Integration services may not contain business logic
IT service consumption must be independent from its implementation
System access must be based on authentication and role-based authorization
Data content and presentation must be separated
All message definitions must have a documented content
Asynchronous design must be considered before synchronous design
Each portlet may correspond to one service only
Systems must enable remote management and control

Architecture is used to guide individual IT system design. Hence, from the overall enterprise perspective, it guides the design of the enterprise IT system, for which the design domains are shown in figure 6.10. As mentioned in paragraph 4.2.2, the notion of architecture is often used in a descriptive sense: the visualization of designs. Visualizing designs is evidently relevant for showing how the different components, networks and subsystems work together. Various ways of visualizing designs are used, depending on the specific design view. A formal methodology that keeps track of the logical relationships between the different design views is presented in [Lankhorst et al. 2005].

6.6.7 The Collaborative, Iterative and Concurrent Character of Activities

As we have mentioned previously, often a linear sequence is assumed within the realm of strategic planning: from (1) the definition of strategic initiatives, (2) the formulation of projects to realize the initiatives, (3) the implementation of projects, and finally (4) the actual operationalization, whereby that what was implemented is utilized in the delivery of enterprise products and services. This picture was discussed extensively and coupled to the structural, management-oriented IT governance approach. We have argued that this mechanistic, linear, and top-down portrayal of activities is naïve, since reality teaches that developments progress dynamically and unpredictably, whereby activities are conducted rather in a iterative and concurrent manner [Ciborra 2002]. Herein lies the essence of competence-thinking: dynamics and uncertainty hardly make it useful and effective to define activities beforehand and in a sequential manner. The multiple topics that play a concurrent role in defining the IT strategy, as expressed in figure 6.9, also provided grounds for arguing the competence-based view (cf. paragraph 6.6.2). Adequate competencies of an enterprise function form the foundation for the capacity to cope – within certain boundaries – with dynamics and uncertainty, as argued in Chapter 2, and to determine when and how activities are conducted.

This capacity is essential for the complex, and to a considerable extent unpredictable, character of the process of strategy development to the ultimate implementation of projects for operationalizing strategic choices.

Some proponents of the broad view on IT portfolio management also recognize the nonlinear character of activities: “They appear as a waterfall approach. However, there is a high degree of iteration that takes place between these stages [of building a portfolio] and in practice these processes are not linear and sequential. They are collaborative and spiral. This cyclical process provides feedback loops for continuous assessment, validation and improvement” [Maizlish and Handler 2005, p. 184]. Figure 6.11 aims to illustrate the iterative and concurrent character of activities. An example might serve as an illustration.

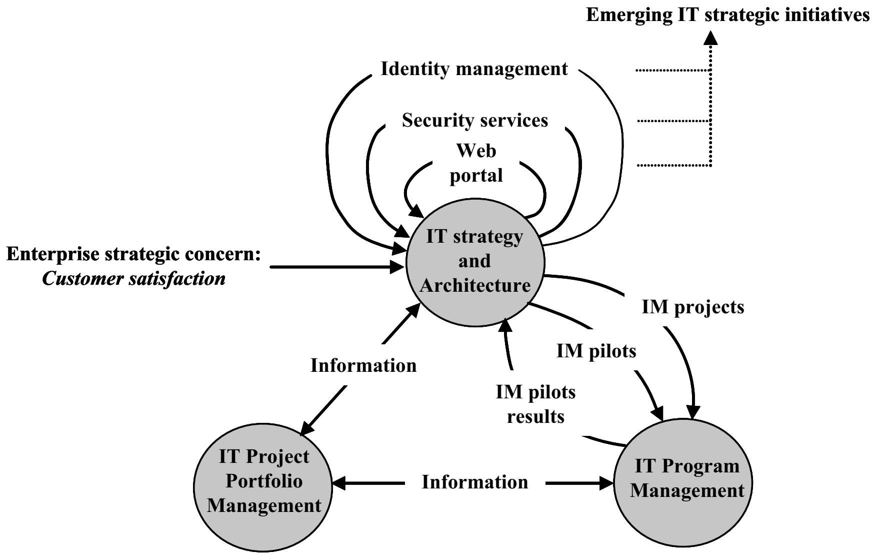


Fig. 6.11. The iterative and concurrent nature of activities

Suppose an enterprise strategic initiative has to do with establishing higher customer satisfaction. Understandably, customer satisfaction is contingent upon many factors, such as the quality of products and services, the operational integrity of their delivery, the information supply or the behavior of employees towards customers. From an enterprise-wide perspective the strategic initiative thus has many areas of attention that must be addressed in a unified manner. Again, this points to the design of the enterprise as a whole. Otherwise said, the relative vague notion of higher customer satisfaction must be clarified and operationalized by the enterprise design competence. This competence is part of the enterprise governance competence to be discussed in Chapter 7.

Within enterprise design, the design of IT systems is also addressed. In view of the strategic intention mentioned, many possible IT areas of attention play a role. One might consider IT systems supporting employee collaboration, thereby enhancing the effectiveness of operational processes. Multi-channel access might also enhance operational effectiveness. Additionally, improved information supply to customers might be considered, for example through an interactive web portal. Clearly, also within the IT domain, the notion of higher customer satisfaction remains vague, since it is not immediately evident through which design, and ultimately through which projects, the strategic objective will be addressed from within the IT domain. IT design thus depends on the design of the enterprise as a whole. So, iteratively, and concurrently with the business developments, it must be determined how (through which design) the strategic objective of higher customer satisfaction will be realized.

Let's assume that an interactive web portal is envisaged for easier communication with customers. Subsequent analysis reveals that a number of elements of the IT commodity infrastructure and services are relevant for this IT strategic initiative, for example security services. Indeed, security risks increase since customers gain access to the enterprise network in a faster, simpler, and more elaborate way. The general, still relatively imprecise, notion about the development of IT security services will thus become part of the IT strategic agenda, and the associated program will be listed in the IT project portfolio. In the course of the analysis insight grows that the security services should have a broader scope since other parties should have easy access to the enterprise network, such as employees, business partners and suppliers. For all these different parties their identity must be managed, both administratively and operationally. So, as an important first security service, identity management will be developed. Different access rules will apply and should be developed for the different access categories. These insights grow through interactive dialog with the business. Gradually, iteratively, and concurrently, the contours of the (high-level) design of identity management as the first IT security service emerges, as well as the associated projects to operationalize the service. These projects will be listed in the IT project portfolio. Further, through interactive dialog, business needs are determined, such as the initial focus of the program that defines which party (customers, employees, business partners, suppliers) is first targeted to gain access. These needs, as well as the (high-level) design, determine the priority of project execution (notably, not some financial ranking order). Evidently, architecture for the design of security services must be available or should be defined concurrently. Close relationships should exist between the IT strategy and architecture competence and the program management competence for defining the precise arrangement and execution of projects. Pilot projects might possibly be necessary to investigate design issues. The outcome of these pilots thus determines the definite design of security services, as figure 6.11 shows. These pilot projects are also part of the project portfolio.

As illustrated, it is through collaborative, interactive, iterative and concurrent relationships and activities that the general (and understandably imprecise) strategic choices are ultimately made precise and are operationalized through design and the associated projects that implement the design under architecture guidance. For that process, with its emerging results, the three competencies form the foundation. Clearly, some decision-making should occasionally occur. However, the primary issue concerns the substance of decision-making. The example illustrates that substance is created in an emergent manner.

Paragraph 6.6.1 mentioned that our discussion focuses on the organizational competencies and their activities, not on the specific skills and knowledge that are evidently relevant for executing these activities, such as specialist knowledge pertinent to the design of IT systems or the execution of projects and their management. So, within the illustrated process, with its emerging result, certain formal, structured techniques should be used. The formal design methodology outlined in the next chapter, based on viewing the enterprise as a system, is an example of such formal, structured technique. Likewise, structured techniques might be used for gaining insight into enterprise improvement areas. Areas for improvement can be identified based on the quality and relative importance of current operational processes. However, separated from a formal design competence, such methods merely identify *what* must be addressed. Within the design competence however, insight emerges iteratively as to *how* improvements should be realized.

6.6.8 IT Governance Processes and Formal Meetings

Processes

Our discussion in the previous paragraphs has argued that the processes and activities concerning IT strategy and architecture development, IT system design, and the definition of projects to implement the design, are concurrent and iterative, and have all the characteristics of the generative thinking and learning perspective on strategy development as discussed in paragraph 3.2.2. These processes are far from planned and sequential. Depicting the concurrent and iterative IT governance processes (executed by the IT governance competence), with its emerging characteristics, is thus inherently difficult. Nonetheless, figure 6.12 aims to illustrate important activity domains and their relationships.

With reference to the topics discussed previously, figure 6.12 can be explained briefly as follows. Left are the activities that concern: (1) IT strategy and architecture development, (2) the development of IT commodity infrastructure and services, and (3) high-level design definition and verification. These activities are driven by all the topics shown in figure 6.9. The totality of activities defines programs and (pilot) projects in the manner described before, such as related to IT commodity infrastructure and services. Business-specific IT projects follow from the enterprise governance competence discussed in the next chapter.

Subsequently, activities regarding IT project management are initiated, as well as those for managing the portfolio of IT projects. From an overall level, IT project management (or program management as it is generally called) controls the execution of projects. For the sake of simplicity, we might consider the activity area for realizing strategic initiatives as the IT development and operational function.

The definition of IT (pilot) projects initiates the (detailed) function and construction design (investment approval might be part of this initiation). Conversely, in the course of design, the definition of additional projects might become apparent.

Function and construction design uses the applicable IT architecture. Exception handling deals with the requests and decisions about architecture deviations. Ultimately, the process of architecture compliance (possibly with approved deviations) leads to the issue of a building permit. As we have seen, next to these activities, architecture management deals with architecture review, approval and publication, as well as with architecture maintenance: updating the set of principles and standards to address new insights and developments. Finally, prior to taking the IT system into operation, the issuing of an operating permit (by the operational function) helps to verify that various aspects for ensuring proper operational conditions are addressed, such as the arrangement of adequate testing, the availability of skilled resources, and equipment and site preparation. These latter issues are considered as IT management, rather than IT governance aspects.

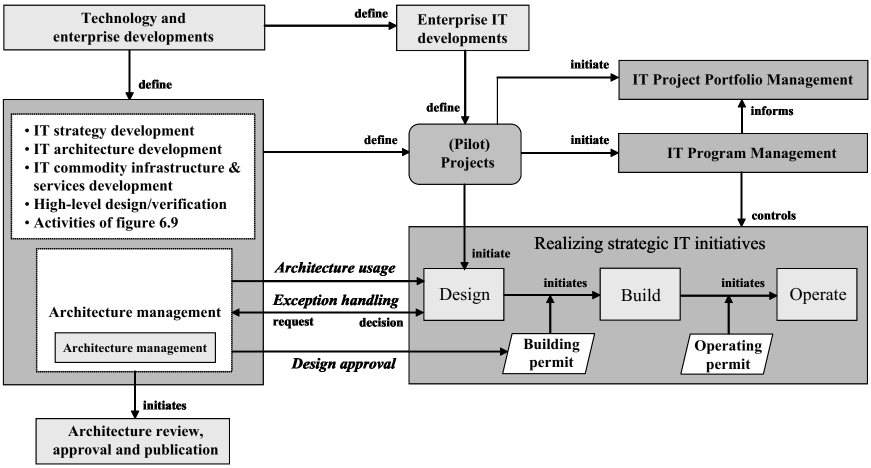


Fig. 6.12. Main activity domains and their relationships

In summary, the IT governance processes concern:

- Definition of IT system areas of concern
- Definition of IT system design domains
- IT strategy development
- Assessing technology developments
- Definition, review, approval and publication of IT architecture pertinent to IT system design domains, and addressing areas of concern and their strategic objectives
- Ensuring architecture compliance
- Management of architecture exceptions
- High-level IT system design and assessment
- IT life-cycle management
- Definition of IT commodity infrastructure and services
- Management of central IT CI&S funding

- Definition of IT project and portfolio management categories
- Definition of program and project methodology and standards for initial program and project descriptions and reporting
- IT project portfolio management
- IT program and project management
- Post-project evaluation
- Formal periodic IT architecture review and update
- Maintaining collaborative and productive relationships with the enterprise governance core competencies
- Carrying out these activities concurrently, iteratively and perpetually.

Formal Meetings

The emphasized competence-based approach to IT governance stems from the argued generative thinking and learning perspective on strategy development and implementation. Concurrent, iterative and parallel activities manifest themselves in an emerging fashion, as illustrated previously. Within this pattern of activities, many 'ongoing' decisions are made by the actors involved, which is the essence of the organismic perspective.

Understandably, certain approaches and decisions have to be formalized, hence, formal decisions have to be made at various moments. These decisions concern the topics discussed previously and are associated with the nature of the three IT governance core competencies. Put another way, the three core competencies largely define the issues to be decided upon, pertinent to architecture, the handling of architecture exceptions and building permits, the carrying out of life-cycle management, the arrangement of financial means, and so on. In view of the inherent character of the various topics, one can easily envisage the various meetings where formal decisions can take place. As an illustration, figure 6.13 shows some

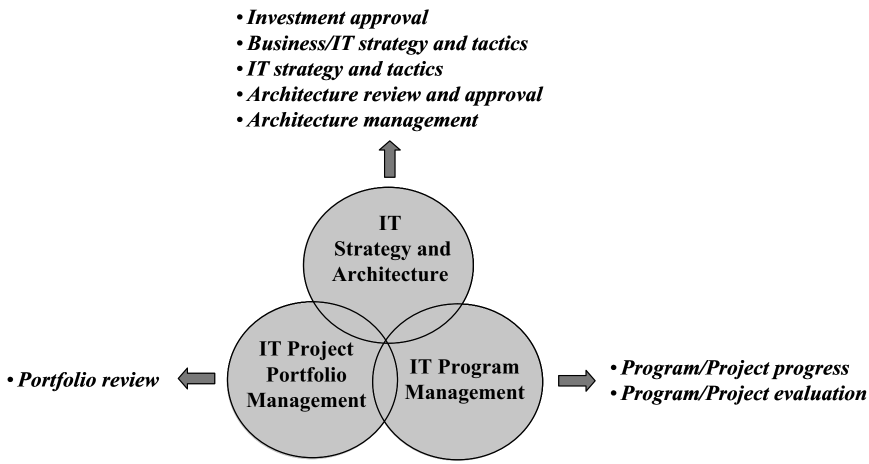


Fig. 6.13. Some formal IT governance meetings

formal meetings associated with the IT governance core competencies. We will not elaborate on these meetings since their purpose can be appreciated from the discussion so far.

With some indicative characteristics, the meetings can be summarized as:

- IT design approval and architecture exception handling
    - Chaired by: the person in charge of the IT strategy and architecture core competence
    - Frequency: weekly
    - Participants: staff of the IT strategy and architecture competence, project leader of the project under consideration, (possibly) a senior enterprise architect representing the 'business side' (see chapter 7).
- Architecture review and approval
    - Chaired by: The person in charge of the IT strategy and architecture core competence
    - Frequency: Ad hoc
    - Participants: Staff of the IT strategy and architecture competence, senior enterprise architects, possibly other stakeholders, such as representatives from the IT service delivery organization using the architecture in building and running IT systems.
- IT strategy and tactics
    - Chaired by: CIO (Chief Information Officer)
    - Frequency: Monthly
    - Participants: Management of the IT governance core competencies, management of the enterprise governance core competencies (see Chapter 7), management of support competencies (see below), management of the IT service delivery organization
- Business and IT strategy and tactics
    - Chaired by: CEO
    - Frequency: Quarterly
    - Participants: Business executive management, CIO, management of the IT service delivery organization.
- Project progress
    - Chaired by: Person in charge of the program management core competence
    - Frequency: Bi-weekly
    - Participants: Staff of the program management competence, project leaders on a case-to-case basis.
- Project evaluation
    - Chaired by: The person in charge of the program management competence
    - Frequency: Ad hoc
    - Participants: Depends on the nature of the evaluation.

- Portfolio review
  - Chaired by: The person in charge of the portfolio management competence
  - Frequency: Monthly
  - Participants: Management of the other IT governance core competencies, management of the enterprise portfolio management core competence (see Chapter 7), management of the financial support competence (see below).
- Investment approval
  - Chaired by: CEO or CIO, depending on the investment level
  - Frequency: Follows regular pattern of the enterprise
  - Participants: Depends on the nature of the investment proposal.

Evidently, the precise nature of these meetings is contingent upon the specifics of the enterprise in question. Further, other meetings than those related to the core competencies will play a role within the realm of IT governance. These have to do with competencies that support the governance core competencies. A few typical support competencies will be discussed briefly below.

6.6.9 Support Competencies

In order to convey the essential message about IT governance, the previous paragraphs concentrated on the three core competencies. A number of additional support competencies can be mentioned that are generally considered to be part of the IT governance domain. These competencies will be reiterated briefly.

Finance and Accounting

For a number of reasons it is beneficial to have a financial and accounting competence within the domain of IT governance, such as pertinent to:

- Defining categories, principles and standards pertinent to IT financial conduct and reporting
- Ensuring uniform reporting about IT financial issues across the enterprise for mutual comparison and consolidation
- Providing financial information to aid the IT governance core competencies and support competencies
- Assisting in the preparation of investment proposals
- Providing IT governance-related financial information.

Human Resources Management and Training

The existing staff functions in these areas can possibly be utilized, such as for personnel management, recruiting and training. Special attention from within the IT governance domain might be warranted in view of:

- Assisting in defining job profiles and personal competencies of staff
- Recruiting and selection of required staff
- Defining the functional (job-rating) levels and associated remuneration
- Assisting in arranging necessary training internally and externally.

Procurement and Vendor Management

Given its operational character, it might be debated whether the procurement function should be part of the IT governance domain. Once the standards for IT hardware and software are defined, procurement should proceed in accordance with these standards. IT procurement is often part of the internal IT service delivery organization.

Similar considerations might apply in the case of vendor management, specifically in the case of operationally-oriented contract and service-level management. Nonetheless, from the perspective of IT governance, vendor management might be considered as a support competence because of:

- Creating a center of knowledge and expertise concerning IT contracts and licenses, also from a legal perspective
- Having a unified source of vendor sales and performance information
- Ensuring uniform reporting about vendors according to centrally-defined categories
- Defining criteria for vendor selection and procurement
- Aiding the IT governance core competencies (and support competencies) pertinent to vendor-related IT life-cycle issues.

6.7 Organizing: Central Governance

The IT governance competence outlined previously must be positioned centrally. This is an inherent consequence of the nature of IT governance: the guiding authority is not targeted at only a part of the enterprise, but at the enterprise as a whole. Such a central function is often labeled as ‘Corporate Information Office’, or ‘Office of the CIO’ (Chief Information Officer). Below, we will offer some additional arguments supporting the central position of IT governance.

6.7.1 Demand-Supply Interface

Enterprises are generally comprised of many business or functional units responsible for performing certain enterprise activities. Within the traditional view, governance is frequently based on business unit optimization under the assumption that such an optimization would also lead to optimization of the enterprise as a whole. Hence, unit-level optimization, which then evidently extends to autonomy regarding the development of IT functionality based on business unit interests.

Such a decentralized approach indeed creates a strong focus on business unit objectives and interests, but has many undesired and detrimental consequences. First, within many enterprises, the autonomy of business units in terms of IT developments has created an enormous diversity in demand for IT functionality, as well as an enormous diversity in IT supply, in answering demand. The 'demand/supply interface' became complex and diffuse: many entities creating demand, and many entities providing supply. From the overall enterprise perspective, such an interface is likely to create numerous divergent, redundant, incoherent, and even conflicting IT developments. This not only increases cost for operation and new developments, but system interoperability is also hampered. Indeed, that is what many enterprises experience.

The focus on business or functional units is associated mostly with a vertical, hierarchical orientation. Organizational 'silos' and their autonomy thus also became technology silos. However, products and services are the outcome of processes, not the outcome of the vertical hierarchy. But vertical silos make establishing a horizontal, end-to-end, process orientation cumbersome: many adaptations (couplings, transformations, workarounds) are required for arranging a minimal level of process integration. This has created an enormous IT complexity and associated cost level. Frequently the operational IT costs amount to more than 80% of the total IT costs. One might argue however that IT complexity is not the *cause* of organizational complexity, but the *result* thereof. Indeed, "Costs grew out of control not because of the IT department, but in spite of the IT department" [Kaplan 2005, p. 34]. In summary, the developments portrayed above have led to:

- Large technology diversity and redundancy, with opportunity-driven extensions
- Many, non-integrated applications, hosted both centrally and decentrally
- Duplication of data, central and decentral, with gradually degrading integrity
- Numerous unstructured (point-to-point) connections between systems.

Such a situation entails serious consequences for the enterprise as a whole:

- Continuously growing, and barely manageable complexity and costs
- Inability to integrate different interfaces, data and (operational) processes pertinent to customers, suppliers, and business partners
- Disconnected customer and operational data, creating ineffective customer relationship management and operational decision-making
- Changes creating an avalanche of subsequent effects
- Questionable scalability, making it difficult to accommodate business growth
- Serious limitations regarding enterprise agility
- Disproportionate amounts of human and financial resources must be allocated continuously for keeping the complex IT environment operational, and accommodating new business needs.

It needs little arguing that outsourcing IT services under these conditions is very problematic [Beulen et al. 1994, Zee 1999]. Undoubtedly, the aforementioned IT complexity has to do with the historic developments of information technology itself to some extent. However we submit that the core reason lies with the management philosophy that advocates optimization of, and autonomy for, decentral business units. Lack of effective central IT governance is the inevitable consequence.

6.7.2 The Necessary Shift to Central Governance

As mentioned, the inherent nature and tasks of the IT governance core competencies necessitate the positioning of IT governance as a central organizational capacity, as shown in figure 6.14. The necessity of central governance has been argued in paragraph 3.1.5. This necessity holds similarly for IT governance. Local autonomy can only be exercised within an overall IT governance context [Thompson 2003]. Others have stressed the necessary central character of IT governance comparably [Buchanan 2003, Dragoon 2003]. Growing maturity in the use of architecture is based on a shift from local to overall enterprise optimization [Ross et al. 2006]. Underlying considerations can be summarized as follows: (1) the development of IT architecture that guides IT system development enterprise-wide, (2) the development, continuance and ownership of enterprise-wide IT commodity infrastructure and services, (3) the execution of IT system life-cycle management, (4) performing enterprise-wide IT project portfolio management, (5) the coherent implementation of IT projects, and (6) the necessity of avoiding undesired consequences of the complex and diffuse demand/supply interface. In addition to the latter aspect, the central IT governance competence is likewise essential for reducing the historically grown IT complexity gradually. We will address this topic more specifically in paragraph 6.8.

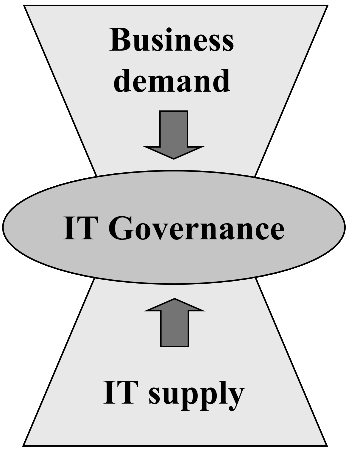


Fig. 6.14. Central IT Governance

As paragraph 6.5.3 emphasized, effective relationships must exist between the central IT governance competence, and those organizational entities engaged in enterprise development. Therefore IT governance must be anchored within enterprise governance. This anchoring can only be effective in our view if the three IT governance core competencies have their complement in comparable enterprise governance core competencies for the development of the enterprise as a whole. So: (1) enterprise strategy and architecture development, (2) enterprise project portfolio management, and (3) enterprise program and project management. These competencies will be addressed in the next chapter.

In summary, the central IT governance position is essential for:

- Development of a unified and integrated enterprise-wide IT strategy in conjunction with the business strategy
- Development and maintenance of IT architecture that guides IT system design enterprise-wide
- Definition and development of IT commodity infrastructure and services
- Life-cycle management for IT systems, whereby specific business applications must also be taken into account
- Enterprise-wide management of the unified and coherent portfolio of IT programs and projects
- Enterprise-wide implementation of the unified and coherent portfolio of programs and projects, and associated reporting
- The ability to reduce the historically grown IT complexity gradually.

6.7.3 Implementing the Three Core Competencies

Implementing the three core competencies of IT governance is generally no easy task. All too often, implementation amounts to an organizational transformation from the situation with a decentral IT governance model, or virtually no IT governance, to the situation with central IT governance. The characteristics of, and necessity for, central IT governance have been outlined previously. Since the transformation towards central governance implies a significant reduction in local (decentral) autonomy, the transformation is often problematic and rife with resistance. All general aspects and approaches of change management thus play a role, of which thorough discussion exceeds our current scope. Multiple change management strategies can be distinguished [Caluwé and Vermaak 2000]. These different strategies, for example, have to do with the linkage with other strategic initiatives, the origin of change and the locus of change forces (top-down or from within the enterprise), the level of participation, or the type of group processes that play a role. A preferred strategy, or combinations of strategies, might be chosen contingent upon the specific situation.

All three core competencies must ultimately be established. Evidently, necessary personal competencies of employees in the various core competencies must also be addressed in the transformation process. Depending upon the actual situation, the route to the arrangement of IT governance can be different. Within our personal experience, the IT strategy and architecture and IT program management core competencies were established first. Attention to project portfolio management was initially given from within the program management competence. Later the separate project portfolio management competence was established. Next to defining IT architecture, an important initial area of attention was the definition and development of IT commodity infrastructure and services.

Sometimes one tries to effectuate IT governance through an initial focus on IT project portfolio management in order to gain insight into: (1) the size of the project portfolio, (2) the financial and other resources involved, (3) the underlying rationale for project definitions, and (4) the contribution of the respective project to business objectives. This might possibly lead to cleansing the portfolio or changing priorities. However, such an approach is problematic and already assumes so much insight into business objectives and the contribution of individual projects, that cleansing is reasonably possible. As we argued previously, such insight does not follow from portfolio management, but from the IT strategy and architecture competence and the design this competence establishes – in the collaborative, iterative manner illustrated previously – in view of business strategic choices. Nonetheless, an initial portfolio management approach might be used to create support for the formal establishment of the three core competencies. Paragraph 6.9.4 discusses IT governance maturity and shows a path to increased maturity.

6.7.4 The (Economic) Importance of IT Architecture and Central Governance

Chapter 4 and this chapter have emphasized architecture as the normative, guiding concept for unified and integrated system design, while addressing certain areas of concern and the associated requirements and objectives. A lack of unity and integration has been argued as the prime reason for failing strategic initiatives, among them the introduction of information technology. Further, paragraph 6.7.1 pointed to the very complex IT environment and its consequences that arose as a result of the absence of any central architectural guidance. So, from the business viewpoint central IT governance is essential for: (1) successful realization of strategic initiatives, (2) reduction of time-to-market of new functionality provided by IT, (3) increasing enterprise flexibility and the ability to change, (4) establishing integrated operation (interoperability and interconnectivity) of IT systems and data sources, and (5) the reduction of IT complexity and costs. Hence, one would submit that the economic importance of these points can hardly be overstated. Questioning the relevance of architecture and central governance would thus be remarkable in view of the alternative: not addressing the points mentioned above and continuing facing the detrimental consequences of a lack of governance mentioned previously.

Despite the evident importance, or probably because of it, well-documented economic analysis of the effects of governance are scarce. One might point to the 'National Association of State Chief Information Officers' that reported significant savings as the result of the use of architecture for designing IT systems [Pichereau 2003]. Others have reported comparably about benefits in various areas [Rijsenbrij et al. 2002, Ross et al. 2006]. A source of well-documented cases is the research of the Corporate Executive Board [2001]. The impact of central IT governance was analyzed at seven large (international) companies and a large governmental institution. Significant, partly related, benefits were reported, such as: (1) major productivity improvement for IT development, (2) reduction of time-to-market for new products and services, (3) significant increase in reuse of existing IT solutions, (4) far better project definition, (5) reduction of application maintenance, and (6) higher system availability.

Finally, McKinsey research among 44 European banks showed that it was not the traditionally applied notion about scale which turned out to be the driver for optimally exploiting technology investments, but the close alignment of business and technology development, as argued in paragraph 6.5.2. Centralized governance and a focus on innovation appeared to be key practices [Bommel 2007].

6.8 Reducing IT Legacy Complexity

6.8.1 Defining IT Legacy Complexity

In addition to our previous discussion, the topic of IT legacy complexity, and its reduction, will illustrate the importance of central governance further, as well as illustrating that addressing IT legacy complexity effectively necessitates the embodiment of IT governance within enterprise governance for linking IT legacy complexity issues to business objectives.

In its common denotation, the notion of IT legacy complexity refers to the complexity of historically created IT applications and infrastructure (storage, network, processors, access devices) described previously. We will identify these applications and infrastructure generally as 'legacy systems'. This common denotation might create the impression that IT legacy system development is a thing of the past, that currently cannot take place. However, as we have seen, the historically created IT complexity is first and foremost the result of inadequate governance. Continuation of this type of governance will thus lead to the continuation and further growth of IT complexity. We will therefore interpret the terms 'IT legacy complexity' and 'IT legacy systems' respectively as complexity and systems created by 'legacy-type governance'. Further, in this paragraph we will use the term 'business' as referring to that part of the enterprise not related to IT.

IT legacy complexity manifests itself in different ways and with different consequences. It should be stressed that legacy systems are not necessarily an issue. Nonetheless, they need to be addressed insofar as the complexity created by legacy systems inhibits or limits the delivery of required IT functionality or enterprise strategy execution. The high operational and (functional) maintenance costs of legacy systems can also be an important reason for addressing legacy complexity. How the complexity is addressed is contingent upon various factors. However some general approaches will be mentioned.

Unfortunately, complexity reduction doesn't come easily. External research indicates that attempts to reduce the complexity of legacy systems often fail [CSC 1994, Murphy 2002]. Some core underlying problems pertinent to this failure will be discussed. Finally, the summary reiterates important points that must be addressed to maximize conditions for addressing the complexity of legacy systems successfully, and avoiding such creation in the future. Addressing legacy complexity can be seen as an element of broader IT life-cycle management discussed in paragraph 6.6.2, and shown in figure 6.9.

6.8.2 IT Governance and Legacy Complexity

Paragraph 6.7.1 argued that the IT complexity has been created gradually as a result of local (decentral) IT demand that was answered by similarly focused IT supply. The ever-growing IT complexity manifested unproductive and ineffective governance. This can be identified as a – if not *the* – core problem. The decentralized – business unit and project-focused – structure leads to: (1) designs dedicated strictly to business units and projects, with little consideration for architecture as well as for (non business-specific) IT commodity infrastructure and services, (2) designs that do not focus on the ability to be reused, thereby sentencing the organization to repeated activities and the creation of redundant systems, and (3) ever-increasing application and infrastructure complexity. Research indicates clearly that IT legacy complexity arises from a lack of adequate central governance [CSC 1994].

Evidently, the organizational arrangement (the way of organizing) that ultimately created the IT complexity is unable to reduce it, since that arrangement inherently implied a lack of effective governance. Various sources argue that central IT governance is required for addressing legacy complexity, and even more so, avoiding the creation of said complexity in the future [Leganza 2002, Matern 2003]. This confirms our observations in paragraph 6.7.2.

The ultimate characteristics of the desired IT environment can be described briefly as: (1) *scalable and flexible*, such that the environment can be adapted easily to changing business demand, (2) *integrated*, whereby the environment enables easy connection of various systems to support end-to-end business processes, and (3) *manageable*, providing efficient and effective design, deployment and operation.

Gradually reducing IT complexity is evidently an essential element in achieving the desired situation. As indicated, IT legacy complexity manifests itself in various ways (applications, network, storage, processors, access devices), which leads subsequently to multiple approaches for addressing this complexity. These approaches are necessarily evolutionary, since IT legacy complexity cannot be reduced instantaneously. Inevitably, legacy and new IT systems coexist for some period of time [Murphy 2002]. Reducing IT legacy complexity is further greatly enabled through new methods and technologies that unlock and leverage the existing functionality of legacy applications, as will be discussed in paragraph 7.5.2. The gradual reduction of legacy complexity and the evolutionary transition of legacy applications functionality also requires adequate central IT governance.

6.8.3 Financials: The Legacy Trap

Reducing legacy IT system complexity most likely involves additional costs. However, all too often, reduction of legacy complexity is not viewed as an integral part of time- and budget-restricted business projects, since the additional costs affect the delivery time and financials of those projects negatively, which could very well prevent those projects being funded at all. Modifying the existing systems, rather than replacing them, is also often cheaper in the short term. Evidently, this behavior leads to a covert continuation and extension of the legacy environment, thereby gradually increasing the IT complexity further, as well as increasing the IT operational costs further [Snyder 2002]. Rightly, this approach can be termed the 'legacy trap', since short-term gain is obtained at the price of long-term pain [Mayall 2003]. Moreover, this covert mechanism entails that the issue of reducing legacy complexity shifts from being an element within business project funding, to being an element of IT operational costs, since – from the IT cost perspective – it is here that the gradual extensions of legacy complexity become manifest. Hence, the attention shifts from considerations based on *business strategic* requirements, to considerations based on *IT operational costs*. Within this latter scope, special legacy reduction projects are often initiated autonomously that consequently also require autonomous funding. However, said funding is difficult to justify since the approach is inherently disjoined from the business-driven projects, and therefore virtually always fails [CSC 1994].

Unlike the myth that the reduction of IT legacy complexity is an IT issue, we must therefore stress that the reduction of IT legacy complexity cannot generally be established autonomously within the IT domain. Ultimately, such reduction is driven by, and justified by, business considerations. Hence, it is determined by aspects concerning enterprise design, within which IT design is an integral part.

As the 'legacy trap' indicates, another core reason for central IT governance lies in creating and managing financial arrangements for IT legacy avoidance and reduction. These considerations must also be elements of the IT strategy. Below we will illustrate that these financial arrangements hold likewise for the non business-specific IT infrastructure and services.

6.8.4 Business Considerations

As emphasized, the reduction of IT legacy complexity must be based on business considerations that are reflected ultimately in enterprise design. Thinking in terms of business functions that IT should deliver is essential. The mentioned central IT governance competence, and the enterprise governance competence discussed in the next chapter, enable strong linkage between business and IT strategy development, subsequent business and IT design, and the planning and eventual implementation of the design. In this way, legacy issues are an integral part of business strategic developments. Linking legacy reduction to business strategy and value considerations is crucial, since these considerations basically determine to what extent legacy issues might exist, and in what areas the legacy issues must be addressed. Moreover, legacy reduction might involve business process change. Hence, business considerations determine the type and priorities of legacy complexity reduction initiatives. Experience supports the necessity to link a reduction of legacy system complexity to business considerations [CSC 1994, Ziff Davis Media 2002]. The inability of legacy systems to support business processes or strategic business goals appears as the main reason for addressing this issue.

Based on business considerations, the IT system legacy situation can be assessed by using a grid with two orthogonal dimensions: (1) the business functional fit of the system, expressing the ability of the system to enable strategic business goals, and (2) the technical fit, expressing the level of alignment of the current system technology with the desired technology environment. The desired environment must also be based on business considerations.

Adopting the basic idea of the 'Information Health Grid' representation defined by Weil and Broadbent [1998] as an illustration, figure 6.15 shows the grid with some possible systems that have been rated, whereby the color indicates the system importance for business operations, and the individual area indicates the yearly costs of the system. Ideally, all systems should be positioned in the upper right quadrant. If and when migration of particular systems is warranted depends on various concerns. As indicated, the migration of systems 1 and 2 is based on considerations pertinent to the perceived inability of the systems to deliver the required business functionality. The second system has the additional burden of the low technical fit, which adds to the core problem (the legacy trap) discussed above. Migration of system 3 is based purely on non-functional arguments, such as concerning: (1) technology end-of-life situation, (2) system reliability, or (3) high operational and maintenance costs. Although a business case for such a migration might be envisaged, as indicated previously, attempts to reduce legacy complexity through this approach often fail.

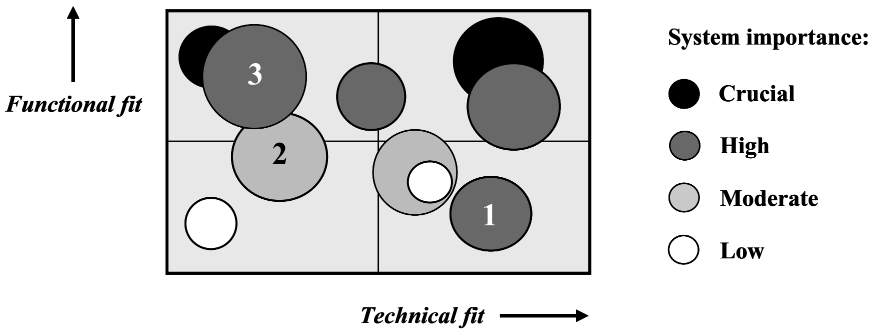


Fig. 6.15. Assessing IT legacy systems [Adapted from Weil and Broadbent 1998]

As far as funding is concerned, three situations play a role:

1. The migration funding can be based totally on business strategic considerations, hence no additional funding outside the business project is required. If activities exceed the mere scope of the specific business unit or project – because certain infrastructural conditions need to be in place beyond the business unit or project scope – then the approach mentioned under point 3 is useful.
2. The operational and maintenance costs of the legacy system justifies migration. Consequently, funding is based on cost-saving proposals.
3. Despite the situations expressed previously, corporate funding might be required to avoid the 'legacy trap'. To cover such situations, financial resources should be created, for example through a 'removal surcharge' or 'corporate tax' mechanism. In that case, every project contributes to the corporate financial resource.

Of all constraints limiting addressing the legacy issue, a lack of funding is the most prevalent and most difficult to overcome [CSC 1994]. A removal surcharge or corporate tax is therefore mentioned in the literature as an effective means to arrange financial resources [Cecere and Leganza 2002, Ramos 2003]. Most likely, hybrid funding will occur: business funding for business-specific developments, and corporate funding for those developments that are non business-specific. The latter aspect has to do with IT commodity infrastructure and services discussed in paragraph 6.6.2. Notably, these considerations point again to the necessity that the central IT governance competence should have financial means to govern IT commodity infrastructure and services developments, as stressed previously.

6.8.5 The Transition to IT Commodity Infrastructure and Services

To a considerable extent, IT legacy complexity is created by local IT system developments that created multiple instances of essentially similar IT functionality with different designs and/or technology. Further, in paragraph 6.6.2 we have argued the importance of IT commodity infrastructure and services, since IT functionality is increasingly not business unit specific, but can be used enterprise-wide. In the next chapter, paragraph 7.5.2 will show that the service-oriented approach for providing legacy systems functionality through services, points to the similar direction. Both aspects, (1) the avoidance of multiple instances of essentially the same functionality, and (2) the provisioning of functionality through commodity infrastructure and services, imply that the reduction of IT legacy complexity is associated with a transition of business unit specific functionality to commodity functionality. This process is shown schematically in figure 6.16. Taking 'business dependency' and the 'potential competitive advantage' as two orthogonal axes, figure 6.16 shows the increasingly enlarging area of commodity IT. As can be

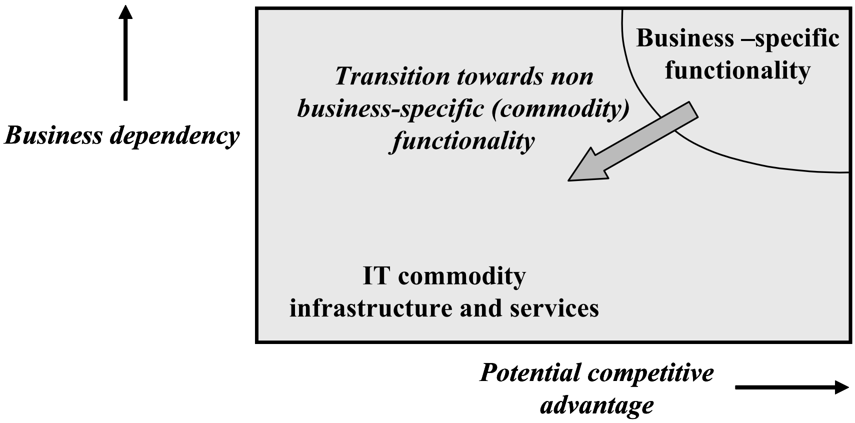


Fig 6.16. Transition towards IT commodity infrastructure and services

seen, the commodity character does not necessarily mean that the business unit dependency is low. Such is similarly the case for commodity services outside the IT domain, like electrical energy. So, most IT infrastructural systems would be positioned in the upper-left area. A system for business intelligence might be positioned lower-right.

Reducing legacy complexity thus entails attention to an important aspect of the overall (central) IT strategy: the definition of the core elements (building blocks) of IT commodity infrastructure and services that need to be developed. Subsequently, an important IT strategic aspect is the linkage between business strategic objectives and core elements of the IT commodity infrastructure and services (IT CI&S). This provides the rationale and justifications for the developments of IT commodity infrastructure and services given the strategic choices and objective pertinent to areas of concern.

6.8.6 Summary: Guiding Principles

In view of our discussion in the above, a number of guiding principles for addressing IT legacy systems are:

- Addressing the complexity associated with IT legacy systems should be based on business considerations pertinent to the current and future value these systems represent. As such, activities for addressing said complexity must be an integral part of enterprise design and subsequent projects' definition and execution.
- Central IT governance for addressing legacy complexity (and for avoiding the creation of such complexity in the future) is essential, and ensures that enterprise and IT strategy development, project planning and project execution are strongly linked and integrated, including the relevant issues regarding legacy systems. Enterprise governance, as introduced in Chapter 1, and

discussed further in the next chapter, is essential for embedding IT developments within overall enterprise developments. This structure enables the integration of important activities such as: (1) enterprise and IT strategy development, (2) enterprise and IT architecture definition and management, (3) enterprise and IT design and the definition of projects to implement design, (4) enterprise and IT project portfolio and program management, and (5) IT systems life-cycle management.

- IT life-cycle management mentioned in paragraph 6.6.3 forms the foundation for assessing the functional and technical fit of applications, as illustrated above. An insight into operational costs (TCO) of applications is also obtained likewise.
- Legacy complexity reduction should be coherent corporate-wide, since the ability to reduce the complexity is often beyond the scope of individual business units and/or projects. Again, this calls for central, integrated governance. A step-wise approach is preferred in order to minimize enterprise risks.
- The development of IT commodity infrastructure and services must be a core area of concurrent attention with complexity reduction initiatives.
- There are multiple approaches for addressing legacy systems. Which of the possible approaches should be selected is contingent upon the specific enterprise requirements and the requirements the new IT environment should address. This must be considered within the integrated enterprise and IT governance structure argued previously.
- The reduction of legacy complexity should be part of the evolution towards a service oriented delivery of IT functionality, discussed in paragraph 7. This enables the delivery of functionality based on a *service*, irrespective of the underlying application, thereby largely simplifying the financial impact of the legacy issues discussed.
- In order to create corporate resources that might additionally be required for reducing legacy complexity, corporate funding must be established. The central IT governance competence should have financial means to govern the development of IT commodity infrastructure and services.
- The ability to make extensions to existing legacy applications must be governed by architecture and possibly by severe (financial) restrictions, such that these extensions are unlikely to be pursued.
- The foregoing activities and areas of attention must be part of the strategic IT outlook, based on enterprise strategic considerations.

6.9 IT Governance Framework and Maturity Levels

Pertinent to IT governance, three frameworks are often mentioned: CobiT, ITIL, and ISO 17799 [Symons 2005]. As when discussing the COSO framework for corporate governance, a framework can be seen as a collection of areas of attention that, when addressed adequately, would yield effective governance. The ITIL

(IT Infrastructure Library) framework concerns areas of attention for IT service management: the provisioning of IT products and services. Within our view on the notion of governance, the ITIL framework concerns not governance, but IT management. Further, the ISO (International Standards Organization) has a limited focus, directed to security issues. This framework is therefore unsuitable as a basis for IT governance areas of attention. So we will limit ourselves to a short discussion of the CobiT framework for IT governance.

6.9.1 The CobiT Framework

The CobiT (Control Objectives for Information and related Technology) framework was established by the IT Governance Institute, and is directed towards internal *control*. The first version was published in 1996. CobiT version 4.0 has now been published [IT Governance Institute 2005]. Underlying the framework is the basic conviction – comparable with the often voiced corporate governance vision – that an internal system for control and risk management is essential for successful business support by IT. This vision has been debated previously. Five areas of attention are identified [op. cit., p. 7]:

- *Strategic alignment* focuses on ensuring the linkage of business and IT plans; on defining, maintaining and validating the IT value proposition; and on aligning IT operations and enterprise operations.
- *Value delivery* is about executing the value proposition throughout the delivery cycle, ensuring that IT delivers the promised benefits against the strategy, concentrating on optimizing costs and providing the intrinsic value of IT.
- *Resource management* is about the optimal investment in, and proper management of, critical IT resources: applications, information, infrastructure and people. Key issues relate to the optimization of knowledge and infrastructure.
- *Risk management* requires risk awareness by senior corporate officers, a clear understanding of the enterprise's appetite for risk, understanding compliance requirements, transparency about significant risks to the enterprise, and embedding risk management responsibilities into the organization.
- *Performance management* tracks and monitors strategy implementation, project completion, resource usage, process performance and service delivery, using, for example, balanced score cards that translate strategy into action to achieve goals, measurable beyond conventional accounting.

The framework intends to contribute to these areas of attention, whereby it is claimed that the framework ensures that business and IT alignment is established, that the contributions of IT are maximized, IT resources are utilized effectively, and that IT risks are managed adequately.

The core of the framework is formed by four phases in a cycle as shown in figure 6.17. The cycle's starting point is the 'plan and organize' phase, ending with the 'monitor and evaluate' phase. This latter phase provides information to go through the cycle, or parts of it, again. A number of high-level tasks are identified for each of the phases (34 in total). In the framework's nomenclature, these tasks are labeled as 'processes'. Subsequently so-called 'detailed control objectives' are formulated for each of the 34 high-level tasks. Initially, the framework had an almost unworkable number of 318 detailed control objectives. In version 4.0 this number is reduced to a still considerable number of 214 detailed control objectives.

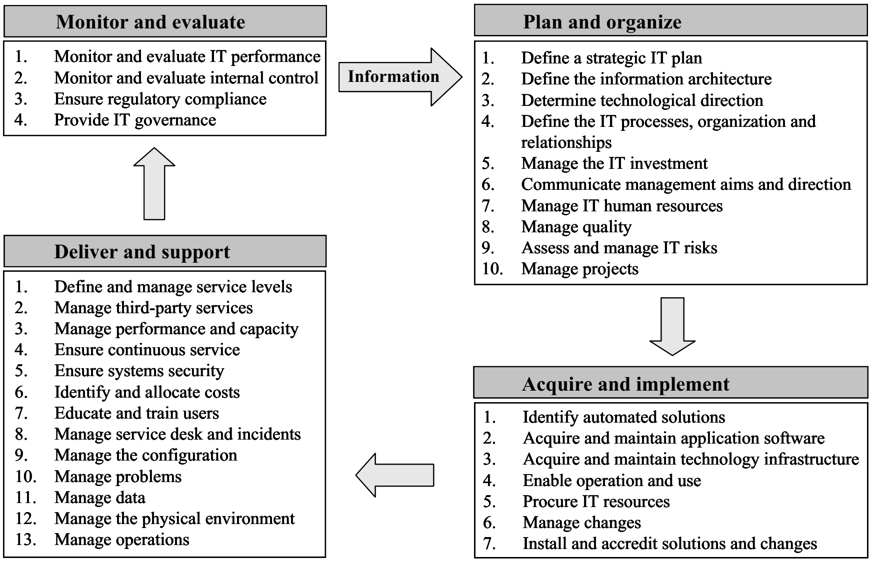


Fig. 6.17. The four phases of the CobiT framework

Despite the fact that the 'detailed control objectives' label is used, the control objectives nonetheless have a general character. For example, the first high-level task, 'define a strategic IT plan' (first phase), has six detailed control objectives. Somewhat circularly, the fourth detailed control objective reads: "Create a strategic plan that defines, in cooperation with the relevant stakeholders, how IT will contribute to the enterprise's strategic objectives (goals) and related costs and risks. It includes how IT will support IT-enabled investment programs and operational service delivery. It defines how the objectives will be met and measured and will receive formal sign-off from stakeholders. The IT strategic plan should cover investment/operational budget, funding sources, sourcing strategy, acquisition strategy, and legal and regulatory requirements. The strategic plan should be sufficiently detailed to allow the definition of tactical IT plans" [op. cit., p. 30].

Apart from the general character of the 'detailed control objective' and the absence of any indication about how all that should happen, the mechanistic character of the top-down, planned approach might also be noticed. We will comment further on the CobiT framework after discussing IT governance maturity levels.

6.9.2 CMM Maturity Levels

Maturity levels are about certain gradations of increasing professionalism ('capability') regarding executing certain tasks or processes. Thinking about maturity or capability levels for identifying levels of professionalism probably first emerged within the quality philosophy. Philip Crosby identified five levels of increasing professionalism regarding quality improvement of products and services [1980]. A similar approach was introduced for improving the quality of software. At the request of the American Air Force, in the mid-1980s the Software Engineering Institute (SEI) of the Carnegie Mellon University developed the 'Capability Maturity Model' (CMM) for software development. Suppliers of software could be assessed through this model. Likewise, as with quality improvements, the CMM distinguishes five levels [Boar 1999, p. 55]:

1. *Initial*. At this level, no structured processes exist. Activities are merely ad-hoc and disordered.
2. *Repeatable*. Basic processes are defined. There is a planned, processual approach that is repeatable in principle.
3. *Defined*. All processes are defined and integrated. Additionally, activities and their related information are documented formally.
4. *Managed*. Next to documentation, (quantitative) indicators are defined and measured for process control.
5. *Optimized*. At the final level, attention goes additionally to avoiding process disruptions. Hence this level is about continuous improvement

The general character of the five maturity levels enables this ranking order to be used within various disciplines. The IT Governance Institute also uses this model to determine the level of IT governance professionalism, with one exception. Prior to the 'initial' level of the CMM, a zero-level labeled as 'nonexistent' is added, characterized by the total absence of any processual approach and awareness thereof. Others have introduced similar levels [Benson et al. 2004]. Below we will show our own perspective on IT governance maturity levels.

6.9.3 Is the CobiT Framework Adequate?

The mechanistic, linear, top-down, and planned approach to IT governance, directed towards control and risk management, has been commented on previously. This approach seems typical for IT Governance Institute publications, and thus seems typical for the CobiT framework. The characteristics of this framework compare with those of the COSO framework for corporate governance discussed in the previous chapter. The focus on control and risk management, and its considerable number of 'detailed control objectives' makes the CobiT framework inherently bureaucratic. Applying the CMM expresses the same flavor. Concern seems to go more towards *form*, rather than *content*. Such an approach is comparable with the ISO 9000 approach for quality improvement. Similarly typical is the planning-oriented, procedure-oriented methodology, directed towards adhering to stipulated procedures and rules under the assumption that quality is thereby guaranteed. This hardly appears to be the case, and is even counterproductive [Seddon 2000]. Earlier, we argued by way of comparison that the control-oriented, planning-oriented, procedure-oriented approach to IT governance will not enhance the quality of IT arrangements because of a lack of attention paid to organizational competencies.

In our view, the positioning of four sequential phases containing high-level tasks leads to inadequate attention for, and distinction between, a number of essential aspects.

First, given the mechanistic character, directed towards control and risk management, the framework does not devote attention to the conditions for effective governance, the environmental dynamics, and the emergent, incremental character of IT (and enterprise) developments as illustrated previously. Relevant competencies are thus not addressed, or only inadequately.

Second, the framework is positioned as a governance framework. However, in view of the distinction between IT governance and IT management, the framework identifies a number of high-level tasks that in fact fall under IT management. For these IT management tasks, the ITIL framework seems more suitable. Lack of a clear distinction between IT governance and IT management thus contributes to a lack of clear delineation of necessary IT governance competencies. In connection with this: it remains unclear which organizational competencies are responsible for carrying out the four phases of the framework itself.

Third, inadequate distinction seems to be made between IT strategy development, its implementation and the operation of IT. For example, the first phase mentions aspects that have to do with implementation (manage projects) and operation (manage human resources), while in the next phase topics are mentioned that are part of strategy development. So, we fail to see how one can identify IT solutions effectively (second phase), or can ensure the security of IT systems (third phase), if these issues are not already addressed at the strategic level (first phase). Lack of clarity also leads to inadequate distinction between IT system development and IT system operation.

Fourth, the focus on design has been emphasized repeatedly. It seems obvious that within the CobiT framework there is no, or hardly any, attention devoted to the unified and integrated design of IT systems and the competencies which bring that about. Many high-level tasks and detailed control objectives – such as objectives that have to do with functionality, reliability, continuity and security of IT systems for example – can only be addressed properly through design.

Finally, we might point to the fact that the four phases do not distinguish – and because of a lack of attention for organizational competencies, cannot distinguish – between the organizational competencies on the one hand, and the products of these competencies on the other. Put another way, no distinction is made between the IT function (organization), and the output (products) of the IT function. A significant number of high-level tasks are identified, but competencies (IT functions) that should perform the tasks are not identified. Our approach to IT governance maturity sketched in the next paragraph aims to provide such a distinction. It is precisely the distinction between organizational competencies on the one hand, and their objectives (products and services) on the other, which makes it possible to establish IT governance gradually, starting with arranging the essential core competencies described in this chapter. IT governance objectives can be achieved gradually through these competencies. Put another way, it is the competencies themselves that provide the very foundation for professionalizing IT governance further (which will aid in further professionalizing IT management functions). It is precisely these competencies that assess and analyze frameworks such as this one, and possibly use some of their elements.

In conclusion, the summary of the limitations of the mechanistic IT governance approach given in paragraph 6.5.1 thus also applies to the CobiT framework. One might thus question how the framework ensures that business and IT alignment is established, that the contributions of IT are maximized, IT resources are utilized effectively, and that IT risks are managed adequately. At best, the framework is a checklist of possible areas of attention.

6.9.4 Our Own Perspective on IT Governance Maturity

As sketched, within our line of thinking we are reluctant to adopt the CobiT-suggested approach to IT governance and the associated maturity levels. As emphasized, IT governance primarily concerns organizational core competencies that carry out the activities that have been discussed previously and are summarized in paragraph 6.6.8. These core competencies have to be arranged. Evidently, from the initial organizational governance set-up, there will generally be an increasing level of organizational maturity as the result of increasing professionalism and experienced gained. As mentioned in the introductory part of paragraph 6.6, it is the IT governance competence itself that provides the very foundation for further professionalizing the IT governance competencies.

The output of the IT governance competence has to do with the activities referred to earlier and discussed in the previous paragraphs. Increasing organizational maturity is most likely associated with increasing output maturity: it is through this output, and its utilization, that increased maturity becomes manifest.

So we can define two orthogonal axes of a maturity grid as shown in figure 6.18: (1) IT governance organizational maturity, and (2) IT governance output maturity. The latter concerns the effect of IT governance. Notably, the CMM categories mentioned earlier merely address the organizational aspect, and only from the process perspective. Others have indicated maturity levels that do pay attention to the governance output [Berg and Steenbergen 2006, Ross et al. 2006]. We prefer the levels discussed below, and shown in figure 6.18, since they can be related to the topics discussed in the previous paragraphs.

How progress in maturity actually occurs is contingent upon various enterprise factors, such as the importance of IT for enterprise performance, enterprise culture, management style and support, pressing issues that might necessitate governance, level of business and IT social linkage, or personnel competencies. Nonetheless, as an illustration we have indicated some maturity levels that enable the indication of maturity progress. Although the maturity levels are discrete, an increase in maturity evidently takes place in a continuum, whereby not necessarily all aspects associated with a certain level must be satisfied prior to addressing some higher-level activity.

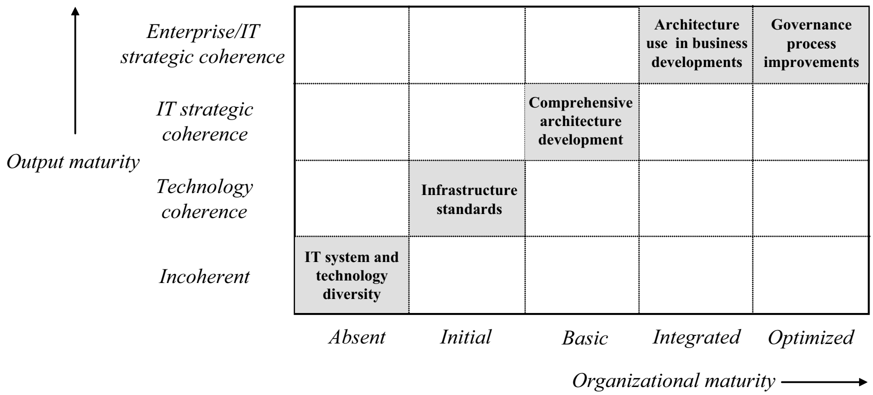


Fig. 6.18. IT governance maturity grid

Organizational Maturity

This concerns the maturity of the IT governance core competencies, their integration, the associated processes, as well as concerning the personal competencies of the governance employees. We have defined five levels, labeled as follows:

- *Absent*: no organizational IT governance competence exists.
- *Initial*: Some governance is exercised. Initial governance is mostly manifest through attention for some architecture (e.g. related to infrastructure). Attention for rationalizing the portfolio of IT projects also manifests an initial focus on IT governance.
- *Basic*: all governance core competencies are arranged and their associated processes established. Roles and tasks are outlined, and personal employee competencies are defined. All core competencies use concepts, knowledge and methodologies that are relevant within their respective activity domain:

architecture theory and utilization, portfolio management and program management. Architecture is used in IT projects.

- *Integrated*: the IT governance core competencies are fully integrated and constitute the IT governance competence. This competence is fully integrated in the enterprise and IT (strategic) development processes. Architecture compliance and exception handling processes are an integral part of IT system development. Formal attention from the IT governance competence for IT commodity infrastructure and services development and life-cycle management is acknowledged and accepted. IT CI&S budget is centralized, and ownership rests with the IT governance competence. All IT projects are assessed by the program management competence, and project progress is supervised.
- *Optimized*: indicators and metrics have been defined that enable governance competence optimization. One might consider indicators pertinent to staffing, training, architecture exceptions, exception handling, project success rate and so on. Periodic architecture review and updating takes place, as well as post-project evaluation.

Output Maturity

Maturity in this case concerns the depth, reach and impact of IT governance. We have identified four levels:

- *Incoherent*: large IT system and technology diversity exists due to the absence of governance or very low-level maturity.
- *Technology coherence*: infrastructure and application standards are defined and used.
- *IT strategic coherence*: IT system design domains are defined. Their related architecture is defined and published. There is a coherent development of IT commodity infrastructure and services. The portfolio of IT projects reflects overall enterprise IT system design and IT strategy. Project management and reporting standards are developed and published.
- *Enterprise/IT strategic coherence*: Enterprise and IT strategy are fully integrated and developed concurrently. Technology assessment is translated into possible enterprise developments. Architecture development is linked to enterprise strategic choices, and objectives pertinent to areas of concern. Enterprise and IT design are fully integrated. IT architecture is used as an enterprise enabler. IT projects are part of the overall enterprise project portfolio. Business and IT projects are managed concurrently.

As can be appreciated, the details that illustrate the characteristics of the various maturity levels are a summary of the topics discussed in the previous paragraphs. They aim to illustrate a practical path towards increased IT governance maturity, as shown schematically in figure 6.18.

7 Enterprise Governance

After a short reiteration of the need for enterprise governance argued in previous chapters, and the necessity for a competence-based, design-focused approach, core aspects of the enterprise engineering theory and methodology will be presented. This is essential 'tooling' within the enterprise governance competence for unified and integrated design of enterprises. Two foundational topics of the enterprise engineering approach are introduced: enterprise ontology and enterprise architecture. Within the enterprise ontology approach we will focus on essential transactions and their associated processes. In relation to processes, the notion of business rules is discussed and distinguished from enterprise architecture. Special attention will be given to enterprise architecture and enterprise design domains. Four main enterprise design domains are discussed: business, organization, information and (information) technology. Within these four main design domains, examples of (sub)design domains and architecture are presented. The enterprise governance core competencies will be discussed subsequently. They are comparable in nature with the IT governance core competencies, and can be considered as their complement. The importance of the enterprise governance core competencies will be illustrated, and levels of enterprise governance maturity are introduced. It will be shown that the service-oriented architecture theme that is gaining increasing attention, necessitates enterprise governance, and fits within the argued competence-based governance approach. Finally, we will introduce personal competencies on which the enterprise organizational core competencies rest. The competencies of the enterprise architect are our primary concern.

7.1 Introduction

7.1.1 Why Enterprise Governance?

In the previous chapters about corporate and IT governance, the notion of governance was addressed from a specific viewpoint, roughly identifiable as safeguarding the interests of shareholders, and establishing successful and cost-effective use of IT respectively, while enabling future enterprise change and adaptation. We argued that addressing both governance themes successfully leads inevitably to attention for the overarching enterprise governance theme: the development and arrangement of the enterprise as a whole. Underlying considerations can be reiterated as follows:

- Financial reporting following from compliance requirements leads inevitably to an enterprise-wide focus since financial data is contained in enterprise-wide IT systems, while events that might have a financial impact occur in enterprise-wide processes, as well as in operational and informational systems.

Moreover, financial reporting must be based on the same underlying data that is used for managing the enterprise and realizing enterprise performance.
- The internal control aspect of compliance necessitates a focus on processes and their execution, and within these processes, a focus on tasks, authorizations and responsibilities. Hence, internal control necessitates an enterprise-wide attention to operational, support, information and documentation processes.
- Compliance (the adherence to rules and legislation concerning corporate governance) is based on design principles (architecture) that already play a role because of other areas of attention concerning the design of the enterprise. Compliance is thus addressed concurrently.
- The broad perspective on corporate governance contends that shareholders are best served by an adequate strategy and its implementation. Hence, attention must be given to enterprise strategy development, and the arrangement of the enterprise – with business, organizational, information and technology aspects – that encompasses the enterprise in all its facets, such that the strategy is operationalized successfully.
- Successful introduction of IT depends on unity and integration between IT systems and the enterprise context in which they operate. IT systems and their functionalities must thus be considered in unity with the enterprise context. Issues concerning alleged IT underperformance cannot be resolved within the IT domain: the level of analysis needs to be 'higher'.
- In view of corporate governance, information systems have an essential function regarding gathering, documenting, and handling (financial) data for governing the enterprise and rendering accountability. This implies a strong relationship between corporate governance and IT governance, which requires the overarching enterprise governance competence to compose the relationship.
- Emerging, incremental IT developments progress with the dynamics that enterprises experience. As such, activities for IT developments have a collaborative, iterative, and concurrent character, associated with enterprise developments. For that, enterprise governance is essential as the complement of IT governance. Business and IT alignment can thus only be achieved within the overall enterprise governance context.
- The percentage of successful strategic initiatives is low: the majority fail. Organizational sciences teaches that failing is not so much the inevitable result of an inherently poor strategy, but the avoidable consequence of a poor enterprise arrangement, with inadequate unity and integration. Avoiding failure necessitates focusing on the enterprise as a whole.

Further, enterprise governance is important in view of the challenges facing the enterprise, briefly reiterated below.

7.1.2 Enterprise Challenges

The modern enterprise context has been portrayed in Chapters 2 and 3. Various developments, among them those where IT plays a significant part, have led to a very dynamic context. Among other things, this formed one reason to strongly recommend the organismic way of organizing and the competence-based approach to governance. Next to dynamics, a typical characteristic of the modern enterprise is its 'extendedness'. As we have sketched, various associated trends can be noticed: the diffusion of enterprise boundaries, the offering of complementary services to basic products, the entering of new business domains, and the creation of networks of collaborating enterprises. All that points to a large variety of (1) networks with interacting actors (employees, customers, business partners, and suppliers), (2) means of network access, as well as pointing to (3) considerable extendedness of end-to-end customer and operational processes. Disruptions no longer have a local effect, but are likely to affect the whole end-to-end chain. Adding to this is the requirement for increased flexibility and the ability to change quickly, as well as the requirement to comply with corporate governance rules and legislation. Enterprises thus face considerable challenges.

The developments sketched in Chapter 3 have been summarized in a number of paradigm shifts (cf. paragraph 3.4). In view of the 'position' and 'perspective' strategic viewpoints, these paradigm shifts have to do to a considerable extent with changes in 'perspective' (cf. paragraph 3.2.3). Hence they have to do with a different way of working, and different norms and values. Put another way, changes have to do with a different arrangement (design) of the enterprise. Traditional ways of organizing – the legacy of the industrial revolution – do not fit very well with what the paradigm shifts indicate. The necessary changes in perspective also make enterprises open to significant challenges. In summary, important challenges concern the realization of:

- Unified and integrated customer, operational and informational processes
- Unification and integration over a far larger extendedness (networked enterprise)
- Flexibility and the ability to change
- New forms of dealing with customers (relationship-based)
- New organizational arrangements, partly enabled, as well as required by IT developments, partly driven by the necessity for the organismic way of organizing and the associated different employment of people
- Successful, cost-effective utilization of (information) technology
- Compliance with rules and legislation
- Corporate and IT governance within an overarching context.

7.1.3 Enterprise Governance: Competence and Design Focus

As we have mentioned in Chapter 1, the enterprise governance theme is of more recent origin. We saw that the theme originated within the corporate governance literature, based on the insight that failing strategic developments and implementtations form a higher risk for shareholders than financial misconduct. Hence, the strategic and operational performance of the enterprise should be included in the governance perspective. Next to the traditional focus on 'compliance', governance must also consider 'performance'. Enterprise governance is then seen as the combination of corporate governance (focused on *compliance*) and 'business governance' (focused on *performance*) [IFAC 2004]. Within this view, the notion of 'business governance' is not operationalized. Enterprise governance is considered as "the set of responsibilities and practices exercised by the board and executive management with the goal of providing strategic direction, ensuring that objectives are achieved, ascertaining that risks are managed appropriately and verifying that the organization's resources are used responsibly" [IFAC 2004, p. 10]. The realization of performance is supposed to come from forecasting, budgeting, planning, decision-making, and risk management. Enterprise governance is viewed as an 'accountability structure', dealing with compliance, performance and responsibility [Fahy et al. 2005].

Notably, this approach to enterprise governance is typically mechanistic as described in Chapter 2: structural, top-down, management-oriented, planning-oriented, and control-oriented. This approach is evidently very similar to the typical corporate and IT governance approaches based on mechanistic thinking.

Our fundamental objections to the mechanistic governance approach have been outlined in Chapter 2. Subsequent chapters corroborated our alternative perspective further. The following points reiterate our position against the approach to enterprise governance portrayed above:

- No attention for strategic transition barriers that impede the implementation of strategic initiatives
- Denial of the dynamic and complex, hence uncertain enterprise context, making the mechanistic approach an anachronism, and requiring the organismic way of organizing
- The inability to accommodate strategic learning and emerging strategy developments
- No attention for the primary reason for failing strategic initiatives: lack of unified and integrated enterprise design
- Inability to establish business and IT alignment, both from the 'state' and the 'process' perspective
- Inability to realize unity between enterprise performance and compliance
- Inability to bring corporate and IT governance into a unified perspective
- No attention for the (social) contextual conditions and foundations for effective governance.

Paragraph 1.4.2 introduced the notion of an organizational competence as an integrated whole of enterprise skills, knowledge and technology. Similarly as with IT governance, for enterprise governance the competence-based approach will also be argued for addressing the drawbacks of the mechanistic approach discussed previously and summarized above. In accordance with the emphasized competence-based approach to governance, we reiterate the definition of enterprise governance given in Chapter 1:

Enterprise governance is the organizational competence for continuously exercising guiding authority over enterprise strategy and architecture development, and the subsequent design, implementation, and operation of the enterprise.

Essential facets of the enterprise governance competence are discussed later. An important knowledge and skills area of the enterprise governance competence is that of enterprise engineering. This discipline will be introduced below and discussed further in subsequent sections.

7.1.4 Enterprise Engineering: Answering the Need for a New Approach

Given the high strategic failure rate mentioned earlier (cf. paragraph 3.2.4) there does not seem to be a high likelihood that the challenges mentioned in paragraph 7.1.2 can be met easily. A lack of enterprise unity and integration was mentioned as the primary reason for failure, while seriously enough, it is precisely these aspects which gain importance. Unity and integration are thus necessary, though difficult to realize, conditions for operationalizing strategic initiatives successfully. This begs the question as to how success can be established. Put another way, which theory and underlying methodology offers an effective approach for implementing strategic initiatives successfully? For reasons outlined in paragraph 1.1.3, we contend that the emerging discipline of enterprise engineering offers a fruitful first start. The aforementioned paragraph defined enterprise engineering as a domain of knowledge, concepts, theory and associated methodology for the design of enterprises.

As mentioned in the introductory chapter, various publications have addressed the importance of design in relation to enterprises [Hammer and Champy 1993, Johansson et al. 1993, Martin 1995, Nadler and Tushman 1997]. However, inadequate attention appears to be paid to a formal theory and associated methodology for design. We indicated in paragraph 1.1.1 that a major problem facing modern science is the development of such a theory for addressing organized complexity. As we have seen, enterprises are systems that are highly organized and very complex. Enterprise engineering aims to comprehend this complexity and thereby reduce it, and can be seen as a developing discipline – knowledge domain, theory and associated methodology – for analyzing, designing and implementing an enterprise as a *system*. The notions of the enterprise as a system, the functional and constructional perspective, and the areas of concern, were discussed in Chapter 4. Enterprise management is often only interested in the functional perspective and the objectives pertinent to areas of concern: *what* the enterprise should realize is the focus of attention, not *how* that should be accomplished. As Ciborra observes, “The management agenda is largely irrelevant for action since it does not deal with the key transaction between having a nice vision and producing that vision”

[2001, p. 34]. This disparity is not without danger, since the required unity and integration first and foremost necessitates the constructional perspective that concerns said key transaction. Enterprise engineering intends to address the functional and constructional perspective in a formal, methodological way.

As outlined in paragraph 1.1.3, the enterprise engineering approach is underpinned by two fundamental concepts:

- *Enterprise Ontology*, whereby the complexity of an enterprise is captured and understood by focusing on the implementation-independent essence of an enterprise. In doing so, the difficulty of comprehending the structural-functionalistic aspects of an enterprise is greatly reduced.
- *Enterprise Architecture*, reduces the complexity of enterprises by addressing strategic objectives and areas of concern, and converting them into a coherent and consistent set of enterprise design principles and standards, thereby ensuring a unified and integrated design in which the strategic objectives and areas of concern are operationalized.

In the following paragraphs we will first introduce the concept of enterprise ontology briefly. We will then devote ample attention to the concept of enterprise architecture. The case study in the next chapter will demonstrate further the practical use of the enterprise ontology and enterprise architecture concepts. The case study also illustrates that requirements following from corporate governance and IT governance considerations are addressed concurrently from within the overall enterprise governance perspective.

7.2 Enterprise Ontology

Enterprises manifest themselves in various ways. The question of what an enterprise *is* will thus provoke different answers, depending on the perspective chosen. Morgan has described various images of enterprises, such as enterprises as machines, organisms, cultures, political systems, or even psychic prisons [2006]. These images have merit, since they express how enterprises can be experienced. Nonetheless, within the enterprise ontology perspective, the question of what an enterprise *is*, is addressed in a specific way. The notion of 'ontology' was introduced in Chapter 4 in conjunction with system thinking. Unlike the teleological perspective that considers the purpose or function of a system, the ontological system perspective has to do with what the system *is*, thus considers the *construction* of the system. Hence the term 'enterprise ontology' refers to the construction of the enterprise, albeit in a specific meaning. The enterprise ontology approach aims to comprehend and design the enterprise in its essential form, totally independent of, and abstracted from, its actual or possible implementation [Dietz 2006]. The focus is on the essence of enterprise operation. So the ontological model of a classic bookstore and that of one selling books through the Internet is similar. Likewise, cashing money through an automatic teller machine, or via a bank employee, gives the same underlying ontological model. Evidently, the actual implementation is different, which we will discuss later. For an elaborate discussion on enterprise ontology and the associated methodology we refer to [Dietz 2006]. We will limit ourselves to explaining the essentials in order to appreciate the importance of this formal approach in comparison with other methods (such as traditional business process modeling), as well as to sketch the linkage with enterprise architecture.

7.2.1 Theory

Communication for Action

Chapter 3 defined enterprises as goal-directed social entities that are designed as deliberately-structured and coordinated activity systems. Certain interaction patterns necessarily exist between human actors for realizing the enterprise purpose and function. So in line with our observations in paragraph 2.4, enterprise performance is ultimately the result of social interaction between human actors who enter into, and comply with, commitments. Appreciably, the interaction patterns between human actors are based on coordination activities, which are based in turn on mutual communication. Since we have argued that reality is socially constructed, the communicative acts have a shared meaning through social interaction that leads likewise to an adequate level of commitment to honor the communicative acts. These notions form the basis for the so-called speech/act theory, or the language/action perspective on the design of cooperative work [Winograd and Flores 1987]. Thus language is seen "as the primary dimension of human cooperative activity" [Winograd 1988]. Within this perspective, the focus is on communicative patterns that constitute the mutual coordination, since people act through language. Under the 'conversations for action' label, four basic conversation activities are defined that relate to coordination [Winograd 1988]: (1) actor A making a *request* to actor B, (2) actor B *accepts* the request, (3) actor B *reports* that the request is fulfilled, and finally (4) actor A *declares* that the fulfillment is satisfactory. These four communicative acts are used below, partly with different labels. Ultimately, enterprise processes concern the parallel and sequential fulfillment of commitments. The enterprise is then seen as a "network of commitments" [Winograd and Flores 1987, p. 150].

Basic Transaction Pattern

Individuals within enterprises fulfill actor roles, whereby basically two types of activities are performed: (1) production activities and (2) coordination activities. Production activities can yield a material or immaterial result. Material production has to do with manufacturing, storage or the transport of goods for example. Immaterial production concerns decision-making, granting something, sentencing a person by a judge, appointing a person in a function and so on. Coordination

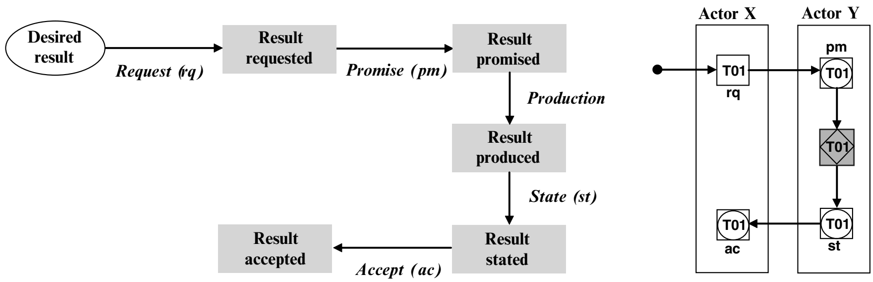


Fig. 7.1. Basic transaction pattern

activities concern the communicative actions mentioned above pertinent to entering into commitments about production activities. Coordination activities are therefore always linked to production activities.

In accordance with the pattern mentioned above, four basic coordination activities can be identified: the *request* (to realize or produce something), the *promise* (to honor the request), the *statement* (that the requested is produced), and the *acceptance* (of the produced item) [Dietz 2006]. These communicative actions can be explicit or implicit. For example, the delivery of ordered goods can be seen as the implicit statement about their production. The coordination and production activities are the basic elements of a *transaction*. A transaction pattern is thus a series of activities performed by two actor roles, as shown in figure 7.1.

The transaction pattern reads as follows. A certain actor (initiator) has a need for a specific result. This result might concern obtaining a material item for example, or getting approval for something. Figure 7.1-left shows that the basic transaction pattern consists of the four coordinative actions mentioned earlier – request, promise, state, and accept – and one production action. Both types of actions might involve multiple activities. Four *coordination facts* and one *production fact* are thus associated with the basic transaction pattern, shown in the rectangles in figure 7.1-left. The formal way of modeling the transaction pattern is shown in figure 7.1-right [Dietz 2006]. Actor X is the initiator of transaction T01, and actor Y is the producer. The transaction pattern has three aspects:

- *Actor role*. The actor role is identified with a rectangle having the name of the actor role. The actor role either performs only coordination activities, or also production activities. The activity aspect of the actor role is symbolized by a square. Actors constitute coordination facts and production facts. Associated with an actor role is the *authority* to perform the related activities. Rather than referring to an actor, the notion of actor role conveys the message that one actor might perform more than one actor role, or that an actor role is performed collectively by more than one person.
- *Coordination activities*. These activities are symbolized by a circle. Since an actor role is evidently involved, the circle is enclosed by the square. Coordination activities have to do with the *responsibility* an actor role has.

- *Production activities*. These concern actually producing the requested result, and are symbolized by a diamond. Likewise, the diamond is enclosed by a square, symbolizing the actor role engaged in production. Carrying out production activities presumes the *competence* of the actor to carry out the activities adequately, and to realize the production fact.

The transaction pattern shows three phases: (1) the order phase, defined by the 'request' and 'promise' coordination activities, (2) the production phase where the material or immaterial production takes place, and (3) the result phase, defined by the 'state' and 'accept' coordination activities. Below we will discuss deviations from the normal transaction pattern, which take place in either the order or result phase.

Figure 7.2-left gives the concise notation for the transaction pattern. In accordance with the notation convention mentioned earlier, the circle indicates the coordination activities of the transaction, and the diamond the production activities. Actor (role) X initiates the transaction. The little black square indicates the actor (role) performing the production activities.

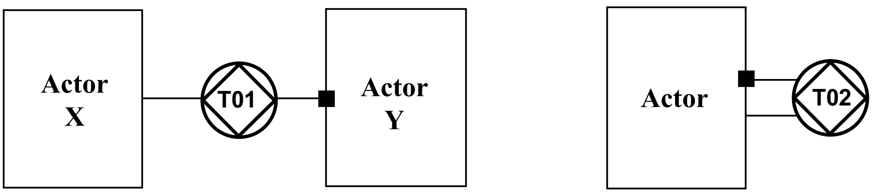


Fig. 7.2. Concise notation of a transaction

A special case of a transaction pattern is the situation where actor (role) X and actor (role) Y are the same. In that case one refers to self-activation, whereby an actor role carries out production activities autonomously. Such self-activation might occur for example if an actor role is responsible for maintaining an adequate stock level of material supplies. The self-activating transaction notation is shown in figure 7.2-right.

Deviations from the Normal Transaction Pattern

The transaction pattern depicted above presumes the normal execution of a transaction. However a request can be denied, or the produced can be refused. Including these options makes the pattern more extensive, but the basic notion remains the same, as figure 7.3 shows. The explanation of figure 7.3 is as follows. The producing actor receiving the request from the client can (ultimately) either accept the request by promising (pm) the requested production, or decline (dc) to produce what is requested. For example, car rental might be declined for not presenting a valid driver's license. The considerations pertinent to these two options are symbolized by the black dot. Now, the client who made the initial request can refrain from further action and stop (sp), or maintain the request. Ultimately, either the promise (pm) or stop (sp) state will end the order phase.

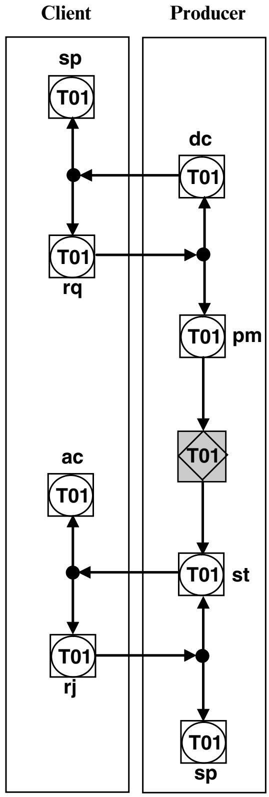


Fig. 7.3. Transaction pattern with decline and reject actions

A mirrored situation occurs when the production fact is stated (st) by the producer. Then, the client might accept (ac) or reject (rj) the result produced. In the latter case, the producer might agree with the acceptance and stop (sp), or try to gain acceptance. Within our car rental example, rejection of the result produced might be caused by the car's untidiness. In the end, the result phase ends with either the acceptance or the stop state.

Finally, cancellation patterns must be mentioned, since all coordination actions can be revoked. Also these patterns can be modeled formally [Dietz 2006].

Figure 7.4 shows the complete transaction pattern, including the cancellations. The client who did the initial request might afterwards regret the request and cancel it (cl/rq). Since the request must have occurred, the dotted arrow indicates the conditional link, as well as indicating some elapsed time between the request and the cancellation. If the producer allows the cancellation the client stops (sp) further action pertinent to this transaction. Subsequently, another transaction could be initiated. However, the producer might refuse the cancellation, for example because production has already commenced. Formally then, the request state remains in force.

A comparable pattern follows when the producer cancels the promise (cl/pm), such as due to an out of stock situation discovered later. If the client agrees, then the situation becomes similar to the decline state (dc) discussed earlier (cf. figure 7.3). Since the client allows the promised cancellation, this would logically lead to the stopping of further action (sp) with respect to this transaction. The client might initiate another transaction subsequently. Refusing the cancellation by the client implies that the promise state remains the case, with which the producer has to comply.

If the producer cancels the production statement (cl/st) in view of perceived inadequacies, the client is likely to allow the cancellation, in which case a new production activity is initiated. Should the client be willing to accept the product, then the cancellation is refused and evidently followed by the formal acceptance action.

Finally, after the transaction has been completed, the client might feel unhappy about the product and regret its acceptance. This might lead to canceling the acceptance act (cl/ac). When the producer allows the cancellation, the situation becomes analogous to the reject state (rj) discussed above (cf. figure 7.3). This would then lead logically to stopping (sp) further action on the part of the producer. Should the producer refuse the cancellation, then the accepted condition remains the case.

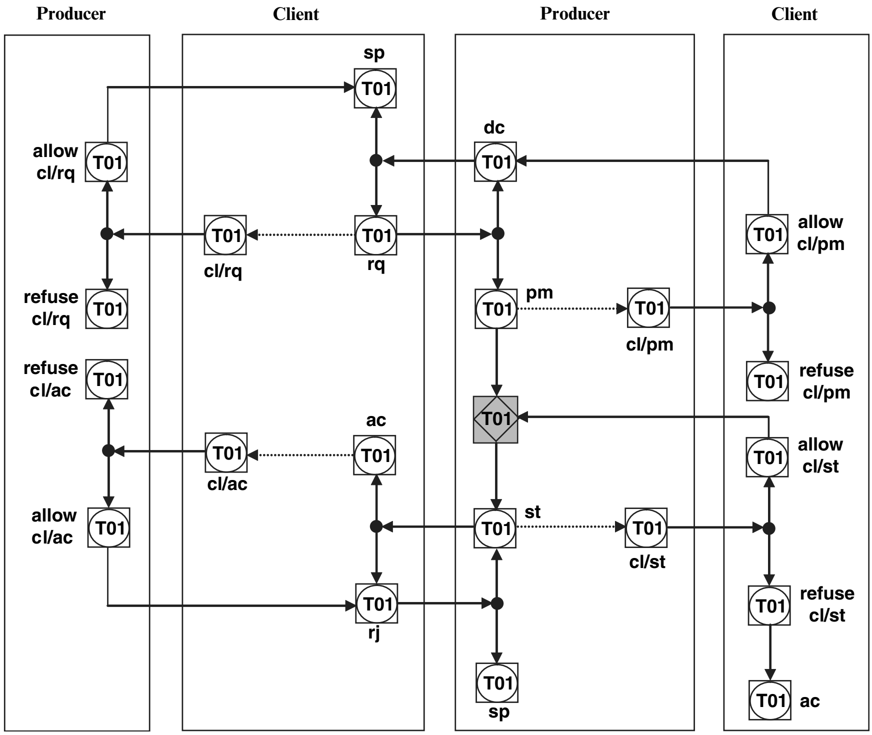


Fig. 7.4. Transaction pattern including cancellations

Enterprise State, Event and Transition

A large number of transactions play a role within an enterprise, such as purchasing, payment, the physical or legal transfer of goods, decision-making, authorizing and so on. For all transactions, the four coordination activities (including possible deviations from the normal pattern) and the production activity play a role. Hence, the totality of transactions creates *coordination facts* and *production facts*. In view of our later discussions, we introduce the following concepts:

- *Enterprise state*: the totality of coordination and production facts at (or created up to) a certain moment in time
- *State space*: the totality of lawful states the enterprise can be in
- *Transition*: a change in the enterprise state caused by a new coordination or production fact
- *Event*: the occurrence of a transition at a certain moment in time
- *Act*: the creation of a coordination or production fact, hence the causing of an event and transition.

It is important, such as from the corporate governance perspective, that coordination facts and production facts become explicit and cannot be annihilated. Revoking a coordination activity does not mean that the coordination fact associated with coordination activities never existed. It means that a new coordination fact is created that cancels out the previous one. Although created facts come into being 'forever' – because they *have* occurred – in practice enterprises keep track of facts only for a limited period of time, such as defined by legal requirements. Clearly, such a formal approach to coordination and production facts provides a guarantee not to be undervalued that, for example, financial transactions are transparent, and reflect the actual state of affairs.

Ontological, Infological and Datalogical Level

Activities in enterprises can be categorized into three basic levels [Dietz 2006]. First, there are coordination and production activities that concern the realization of new, original material or immaterial production facts, such as related to producing a car or passing a sentence. Such activities relate to the primary function of an enterprise: its business. Put another way, these activities have to do with the very essence of the enterprise 'being'. For that reason, one refers to the so-called 'ontological' level. An important second level, subordinated to the first one, is that of activities concerning collecting and providing information for carrying out the coordination and production activities at the ontological level. Hence, one refers to the 'infological level', dealing with addressing and handling the content of information. Finally, the third level is about activities that support the infological level, and concerns the form of information (data). This so-called datalogical (or documental) level has to do with the transmission, transformation, or storage of data for example (not necessarily electronically). In summary, we have the following three levels:

- *Ontological level*: concerns activities pertinent to creating new, original production facts and the associated coordination facts.
- *Infological level*: concerns activities that have to do with the content of information, such as searching, computing, calculating, verifying, analyzing or assessing information.
- *Datalogical level*: concerns activities dealing with manipulating the form of data.

The Three Basic Activity Levels in Perspective

As we have seen, transactions are about the realization of a requested result. It is plausible that a result can be requested at each of the three basic activity levels. So in order to realize the requested production at the ontological level, some informational product might be requested (infological level), which in turn might be requested to have a certain form (datalogical level). A simple example may illustrate the formal distinction between the three activity levels and their respective production facts. Suppose a real estate agency receives a request to assess the economic value of a house. Producing this economic value creates an ontological production fact. For carrying out the value assessment, various information must be gathered, such as recent sales prices in the local area. Formally we might envision the actor role engaged in value assessment requesting the desired information. Its production creates an infological production fact. Finally, it might be requested that the information or the final value assessment is presented in a formal document. Such a document is the production fact at the datalogical level.

Notably, in this example three categories of activities were sketched, carried out by three actor roles, that acted on the ontological, infological and datalogical level respectively. As mentioned previously, these different actor roles do not necessarily imply different human actors. Different actor roles might be performed by one human actor. However it is important to distinguish the various actor roles, for example in view of the overall organizational efficiency and effectiveness, and the associated competencies, authorizations, and responsibilities.

To complicate matters somewhat, activities at the infological and datalogical level might themselves subsequently involve infological and datalogical aspects. In the example given, this might be information concerning the gathering of local sales data, or information for producing the assessment document. The form in which this information is presented implies subsequent datalogical aspects.

Within the enterprise ontological perspective, the three basic activity levels are considered with reference to the business (the function) of the enterprise. One might question whether the three basic activity levels discussed previously are manifest in every enterprise. What if providing information or making documents *is* the very business of an enterprise? Since the ontological level addresses the very essence of an enterprise, the provisioning of information (e.g. a requested telephone number or weather information), or the production of an information 'carrier' (booklet, brochure, CD etc.), must be considered as ontological production facts: these are the services and products the particular enterprise produces. Infological level aspects in this case concern information for producing the requested

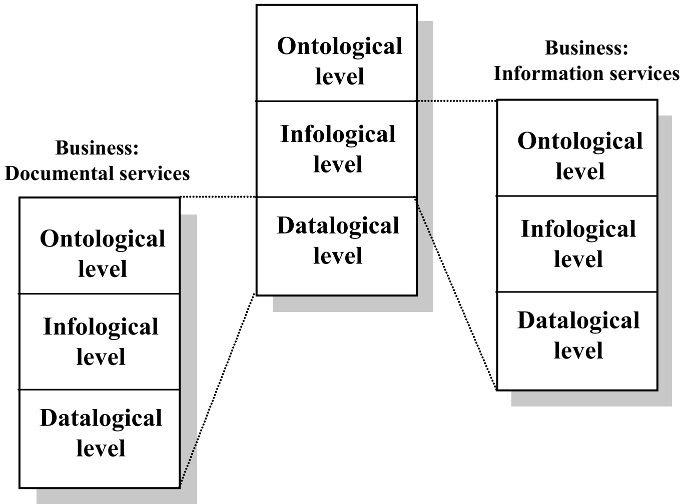


Fig. 7.5. Three activity levels in perspective

information or information ‘carrier’. Understandably, this holds similarly for the datalogical level. So all three basic activity levels are manifest in every enterprise, or units thereof, whereby their precise meaning is contingent upon the (ontological) nature of the enterprise.

The observations given above are represented in figure 7.5. For the enterprise in the center, infological services are required that are provided by another enterprise (or unit within the first enterprise). As shown, for providing these services, the enterprise involved has its own three-tier structure: it is in the business of providing information services. Similarly, for the enterprise providing the datalogical services – seen from the viewpoint of the center enterprise – the provisioning of these services (say printing services) is the very business. Again, the enterprise in the business of documental services also has its three-tier activity structure.

The Role of Information Technology

In view of our discussion in the previous chapter, information technology can aid greatly in performing activities at the datalogical and infological level. This also holds for the provisioning of information for handling the coordination facts at the ontological level, such as information about operating rules that stipulate under which conditions a request can be promised. We will talk about operating rules when discussing the enterprise aspect models. Further, one might even consider an IT system producing an ontological production fact, for example, producing an automatic stock replenishment order for maintaining the required stock level. However it is important to consider the formal transaction pattern: authorizations and responsibilities must be considered explicitly, since a human actor is responsible for defining the conditions under which automatic stock replenishment operates. Despite automation, human actors must ultimately render account for enterprise behavior.

The Structural-Functionalistic Foundation: Enterprise Atoms and Molecules

In paragraph 2.5.3 we have emphasized the importance of the structural-functionalistic foundation of an enterprise. For adequate enterprise performance, this foundation is necessary, but not sufficient. That conviction formed the basis for arguing the organismic way of organizing in Chapter 2. This aspect will be addressed when discussing enterprise architecture. However, the theory briefly outlined above takes the structural-functionalistic system view mentioned in paragraph 4.1.3, and provides the concepts that define the structural-functionalistic enterprise foundation precisely in a coherent and consistent manner. Within this foundation, coordination acts can be seen as the 'atoms' of an enterprise, because they are the units of action pertinent to exactly one commitment concerning exactly one production fact [Dietz 2003]. Coordination and production actions constitute the transaction. So, transactions can be viewed as the 'molecules ' of an enterprise, because they are composed of the coordination atoms and the units of action that produce exactly one production fact [op. cit.].

Most likely, enterprise products or services are provided through multiple transactions and their associated actor roles. One might envision the totality of transactions as the enterprise 'skeleton'. Within this picture we define:

- *Enterprise process*: the collection of causally related transactions.

Figure 7.6 shows a collection of causally related transactions symbolically that jointly compose the transaction that ultimately provides the requested end-result. As we will show later, such a process can be modeled formally, using the basic transaction pattern model. Additionally, we will illustrate that transactions can be

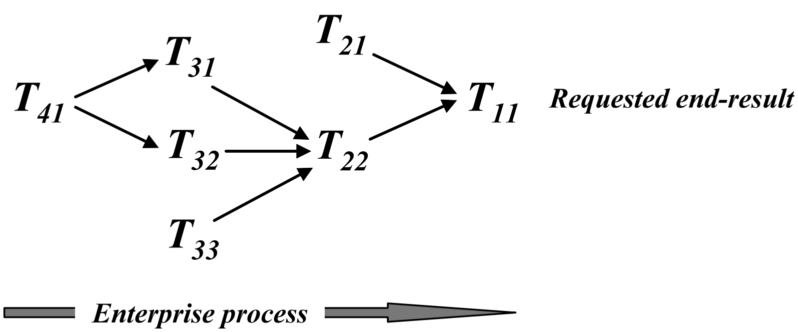


Fig. 7.6. An enterprise process as causally related transactions

decomposed into subsequent transactions (as figure 7.6 depicts symbolically) that are required to produce the requested end-result. Put another way, the process can be modeled up to any basic transaction for which the production activity does not warrant further detailing.

7.2.2 Methodology

As the name indicates, the theory and methodology of enterprise ontology focuses on the essence of an enterprise, fully independent of its actual or possible implementation. Thus the methodology focuses on the ontological level of the enterprise. Hence, the basic approach is to analyze enterprise activities pertinent to the ontological, infological and datalogical level, and to concentrate (initially) on the ontological activities only. Appreciably, this will reduce the complexity greatly, hence reducing the difficulty of comprehending enterprises. The design of the enterprise at the ontological level is based on the DEMO[1] methodology [Dietz 2006]. A number of enterprise aspect models are used within this methodology, which are mentioned in figure 7.7, and will be described briefly below.

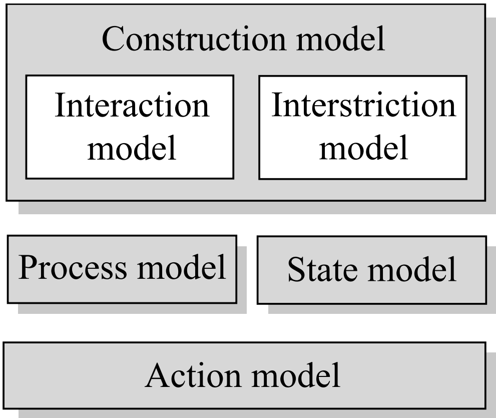


Fig. 7.7. Enterprise aspect models

Construction Model

Two models make up the construction model: the interaction model and interstriction model.

Interaction Model

The interaction model specifies the enterprise transactions (without the details of the transaction pattern) and the associated actor roles. In light of the transaction pattern described earlier, executing a transaction implies carrying out coordination

[1] Design and Engineering Methodology for Organizations

and production activities. Within the interaction model, the result of every transaction is specified precisely. Put another way, the production fact created is precisely specified and summarized in a transaction-result table. The precise information pertinent to production facts is thus likewise defined. This is important in view of establishing business and IT alignment, as well as for the state model discussed below. As an illustration, figure 7.8 shows the interaction model of an enterprise, or part thereof, called 'Firm'. Three transactions play a role. In accordance with the notation mentioned earlier, the circle indicates the coordination activities of the transaction, and the diamond the production activities. The external actor 'client' initiates transaction T01 for obtaining something (for example placing an order in a restaurant, or requesting a house value assessment), which is handled by an actor labeled as the 'order handler' (for example the restaurant waiter, or the secretarial/ administrative function of the real estate agency). Subsequently, transaction T03 is required to fulfill the order, hence actually producing what was ordered. This production is done by an actor labeled as 'producer' (for example the restaurant's chef, or the value assessor). Finally, transaction T02 concerns payment.

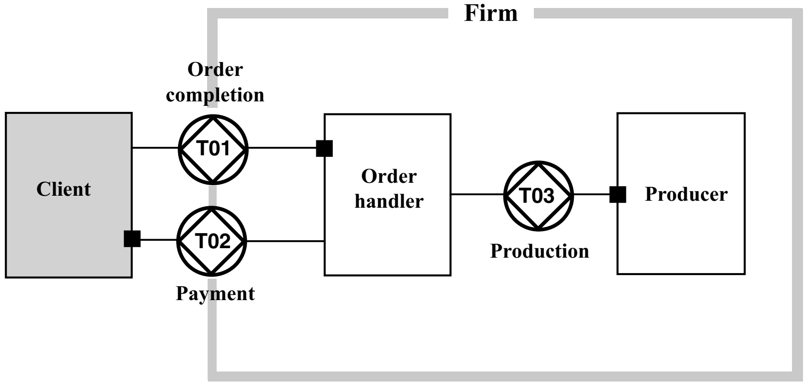


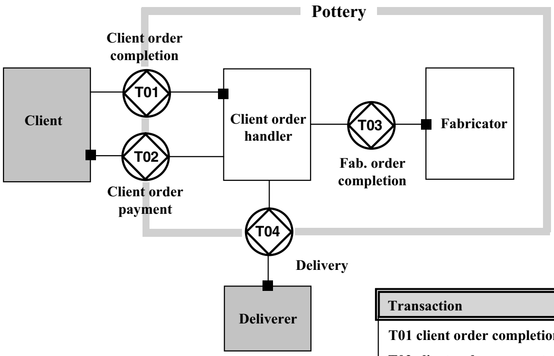
Fig. 7.8. Interaction model Firm (1)

The actor roles 'order handler' and 'producer' are called *elementary actor* roles, since they execute one transaction type. Put another way, an elementary actor produces one production fact. When more transactions are executed, the actor role is identified as a *composite actor* role, symbolized in grey. Because we generally have no information about the nature of external actors, they are symbolized as composite actors.

Notably, the diagram of figure 7.8 applies to many situations. The ontological nature of the diagram can be appreciated: the kind of transactions that take place at the essential enterprise level is totally abstracted from possible implementations. Unlike the impression given above, the aspect of time, or the sequence of transactions, is also not an issue factually in the model of figure 7.8. So the execution of T03 could succeed T02 (payment first), but the reverse is also possible (payment after order completion). In all cases, the interaction model remains the same. Differences are manifest in the process model discussed below.

Possible extensions – additional transactions – can be included relatively easily. Consider a firm making pottery based on a client order. Goods are made to order, so the client order (*CO*) leads to a fabrication order (*FO*) issued by the client order handler (figure 7.9). Hence, this actor initiates transaction T03 to the actor labeled 'fabricator' for producing the requested pottery. As a service to clients, the pottery might decide to deliver the client's order to the client's address through a delivery service. Hence, an extra transaction is created between the order handler and a new actor, the deliverer (T04). If delivery is done by internal staff, the associated actor role resides within the firm. When delivery is outsourced the transaction takes place with an external actor role. The latter situation is depicted in figure 7.9.

The results of all transactions are summarized in the so-called transaction-result table, which is also shown in figure 7.9. As indicated previously, the interaction model does not specify the order of transactions totally. Payment (T02) could take place prior to fabrication (T03), or after delivery (T04).

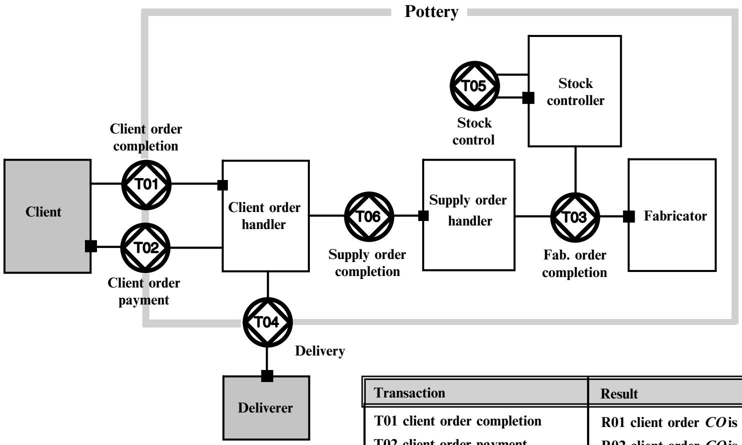


Transaction	Result
T01 client order completion	R01 client order *CO* is completed
T02 client order payment	R02 client order *CO* is paid
T03 fabrication order completion	R03 fabrication order *FO* is completed
T04 client order delivery	R04 client order *CO* is delivered

Fig. 7.9. Interaction model (Pottery 1) and the transaction-result table

As a further illustration how this way of essential enterprise modeling allows the incorporation of additional transactions relatively easily, consider the interaction model of figure 7.10.

In order to enhance client satisfaction, the Pottery decides to maintain a certain stock level of frequently ordered items. A client order (*CO*) is now followed up by a supply order (*SO*) through transaction T06, that can be completed by direct provisioning from existing stock, or could lead to a fabrication order (*FO*) in the case of an out-of-stock condition (T03). Periodically (with period *T*), the actor responsible for maintaining the required stock level also issues fabrication orders to the fabricator. Note that transaction T05 is self-activating by the stock controller. This new interaction model will be explained further when discussing the associated process model.



Transaction	Result
T01 client order completion	R01 client order *CO* is completed
T02 client order payment	R02 client order *CO* is paid
T03 fabrication order completion	R03 fabrication order *FO* is completed
T04 client order delivery	R04 client order *CO* is delivered
T05 stock control	R05 stock control for period *T* is done
T06 supply order completion	R06 supply order *SO* is completed

Fig. 7.10. Interaction model (Pottery 2) and transaction-result table

Infological and Datalogical Transactions

In the previous paragraph we spoke about possible transactions at the *infological* and *datalogical* level. These transactions are not generally part of the interaction model since they do not concern the essence of the enterprise operation (ontological level). If so desired, such transactions can be included easily, but must be distinguished clearly from the ontological transactions. The following example serves as an illustration.

Referring to our example in the previous paragraph about the request for the assessment of the economic value of a house, the 'Firm' in figure 7.8 can be seen as the real estate agency with the order handler as the secretarial/administrative function, and the producer as the assessor: the actor role doing the actual assessment. So, the infological transaction mentioned in the example can be modeled between the assessor and the external actor role providing the cadastral information. Similarly, the datalogical transaction can be modeled between the secretarial/administrative actor role and the external actor role providing the required documental form. Figure 7.11 shows the two extra transactions. These transactions must be distinguished clearly from the ontological transaction T01, T02 and T03.

We might observe that the non-ontological transactions T04 and T05 do indeed not add value regarding understanding the essential operation of the real estate agency. Traditional flow-chart models of enterprise processes however, often include infological and datalogical process steps, thereby diffusing the perspective on essential enterprise activities.

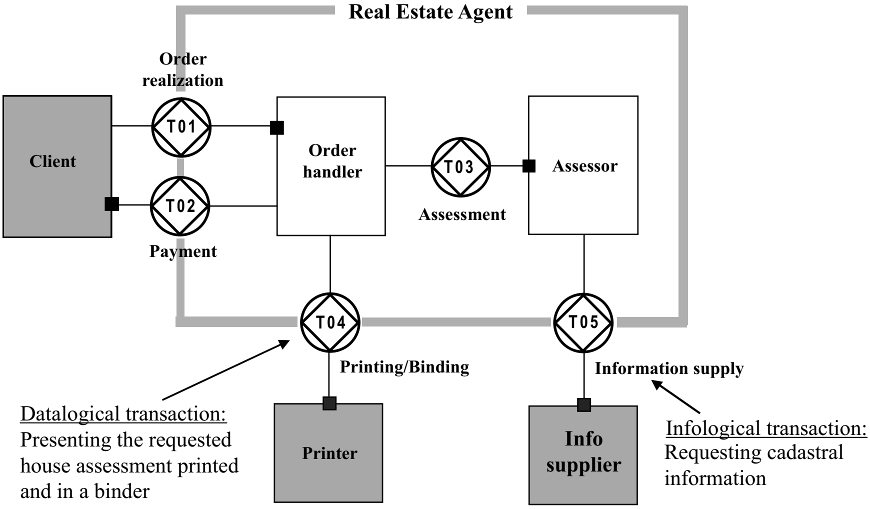


Fig. 7.11. Infological and datalogical transactions

Interstriction Model

Transactional relationships between actors are about coordination and production activities. Understandably, coordination and production information is associated with these activities. So, the interaction models described earlier can also be interpreted as a model showing the information links, whereby the circle of the transaction symbol signifies coordination information, and the diamond the production information. Further, links to external information sources can be added to the interaction model. In the example of the real estate agency, an external information source might be housing data. When these data links are added, the interaction model (with the transaction symbol interpreted as coordination and production information links) one refers to the so-called *interstriction model* [Dietz 2006]. The term 'interstriction' is coined since the information links restrict the nature of the interaction to the information exchanged. Whereas the interaction model shows active relationships between actors, the interstriction model shows the passive information links between actors, and between actors and external information sources. As an illustration, figure 7.12 shows the interstiction model of the Pottery of figure 7.10.

The dotted lines in figure 7.12 show the information links. Data associated with the transactions are contained in *coordination banks* (circle) and *production banks* (diamond) respectively. Within the interstriction model, the transaction symbol is interpreted as the combination of the coordination and production bank associated with a certain transaction. So, for transaction T01 the coordination information – the communicative facts request, promise, state and accept (and possible deviations from the normal pattern) – are contained in the coordination bank CB01, like 'client order *CO* is requested' etc. Likewise, the production fact (the result) is stored in the production bank PB01 (cf. figure 7.13). These production data are mentioned in the transaction-result table shown in figure 7.10.

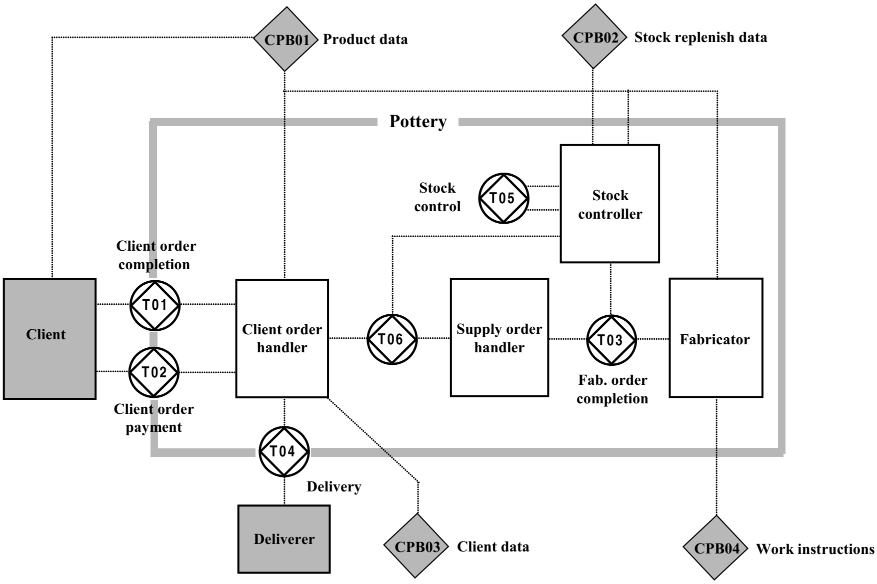


Fig. 7.12. Interstriction model of Pottery (2)

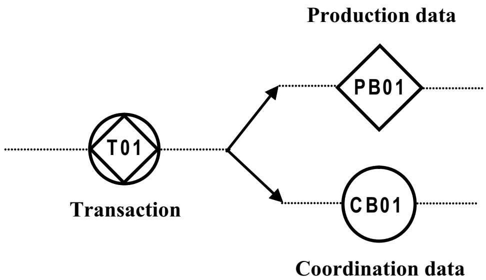


Fig. 7.13. Coordination and production banks

Data used in executing the transactions comes from sources external to the part of Pottery under consideration. That is, the transactions T01 through T06 do not produce that data. So data concerning pottery products, stock level replenishment, clients or work instructions, are produced through transactions outside Pottery. Since we do not generally know whether or not the production of said data is the result of only one transaction, the external production banks are considered composite production banks (CPB), identified as a grey diamond.

Process Model

Basic Pattern

In order to outline the essentials of the process model, we will concern ourselves with the basic transaction pattern shown in figure 7.1, without incorporating the possible deviations from the normal pattern as shown in figure 7.4. For every transaction, the process model specifies the transaction pattern, whereby dependencies between the elements of the various transaction patterns (coordination and production activities) are explicitly modeled. It is emphasized that the explicit definition of coordination and production facts enables a precise description of the required information. This differs significantly from many other ways of modeling processes, since these other ways do not, for example, address all coordination actions explicitly. Figure 7.14 gives a possible process model associated with the interaction model of figure 7.8. Unlike the interaction model, the sequence of actions is identified in the process model. Completion of T01 necessitates the transaction T02 and T03. Hence there are action links between T01/pm and T02/rq and T03/rq. The implied payment request becomes formal when the production of the producer (T03) is accepted by the order handler. This waiting condition is indicated by the dotted arrow. After the payment transaction is completed, transaction T01 is ultimately completed, as is similarly indicated by the waiting condition.

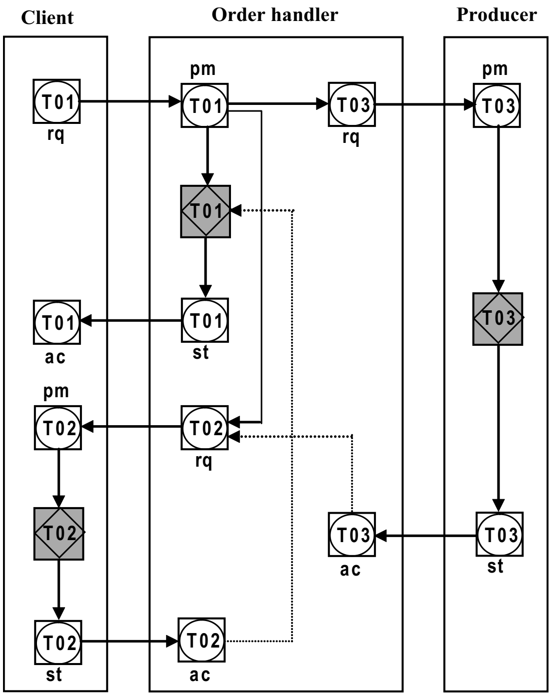


Fig. 7.14. Process model of Firm (1)

Having the same interaction model, the process could also be arranged differently, such that payment takes place after T01 is completed (e.g. paying in a restaurant after eating). In that case, the current waiting conditions disappear, and the execution of T01 has only to wait for T03/ac. After T01/ac the request for payment takes place. Hence, in this case there is a second waiting condition between T01/ac and T02/rq.

Different process arrangements have to do on the one hand with different process design principles (architecture), but on the other they involve different operational execution rules (action rules). Below we will discuss the notion of action rules within the context of the 'business rules' theme. Nonetheless, the process model is also fully abstracted from actual implementation to a large extent, since it is yet to be decided how the coordination and production activities should take place.

Delegation of Coordination Activities

Figure 7.15 shows the process model of the Pottery interaction model depicted in figure 7.10. After explaining this process model, we will show why and how delegation of coordination activates takes place.

The process starts with the client request (T01/rq) for certain pottery. For completing this client order, three follow-up transactions must be initiated: T06 (supply order completion), T04 (delivery), and T02 (payment). When the supply order request is accepted (T06/ac), the required pottery is available and the request for delivery is operationalized. Subsequently, the acceptance of the delivery result will lead to the operationalization of the payment transaction. After this transaction result is accepted (T02/ac), the initial client order transaction is completed, hence, its production result is realized.

Should the stock level be insufficient to complete the supply order, extra pottery products have to be fabricated through transaction T03 (producing the fabrication order). So, the completion of the supply order, in that case, has to wait for the completion of the fabrication order. The action link between T06/pm and T03/rq is thus optional, as is indicated by the range *0...1*: either no (*0*) request or a (*1*) request to produce a fabrication order. Evidently, the waiting condition between T03/ac and the production of T06 has the same optional character.

Periodic self-initiated stock control determines whether fabrication of extra pottery products is required in order to maintain the required minimum stock level. Similarly, the action link between T05/pm and T03/rq is optional. Similarly, the range *0...k* indicates that no request is necessary (*0*) or that up to *k* pottery products have to be fabricated, with *k* the minimum stock level for the given pottery product type. Completion of the stock control transaction has to wait for T03/ac (under the similar optional character).

It is important to stress that all coordination actions are modeled explicitly in the process model. This creates a significant advantage compared with other ways of modeling, for example in the case of task delegation. Frequently, coordination activities are performed by actors not being the actor that should logically do that. For example, the acceptance of a produced fact can be performed by a different actor than the one initiating the transaction. So, the acceptance of purchased goods might not be done by the purchaser, but is (implicitly) delegated to an actor role within a warehouse receiving the goods. In the process shown in figure 7.15, the desired pottery realized through transaction T06 is brought to the client's premises by the deliverer. Particularly noteworthy are the delegations of coordination activities that are thereby necessarily introduced. First, the statement T01/st that the desired production has been realized is now done by the deliverer. Hence, the order taker has (implicitly) delegated this task to the deliverer. This holds similarly for the payment request T02/rq and the acceptance of payment T02/ac. Although the order handler requested goods delivery (T04/rq), hence should accept the result, the actual acceptance of the delivery (T04/ac) is delegated to the client receiving the goods. Notably, this formal modeling forces acknowledgement of delegation, hence forces addressing how delegation should be handled. This is important in view of defining responsibilities and accountabilities (compliance), as well as for defining the conditions under which delegation can take place. We might observe that addressing task delegation explicitly is mostly not an area of attention in traditional process modeling approaches.

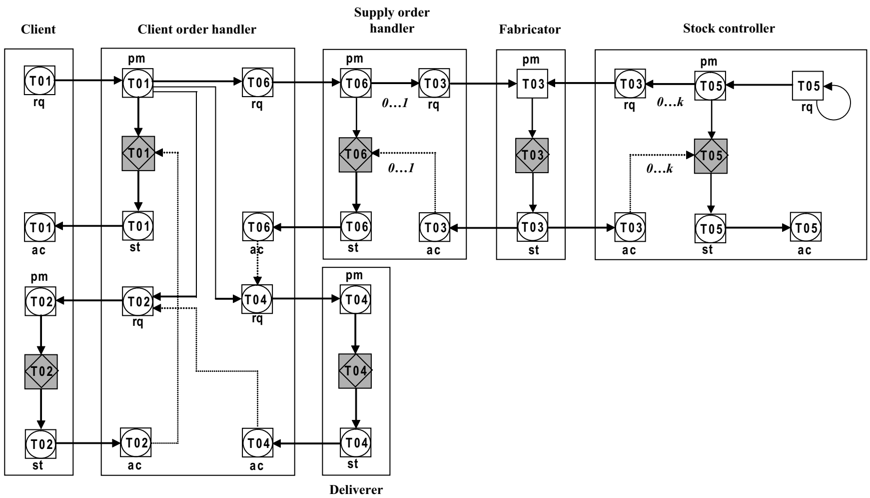


Fig. 7.15. Process model associated with Pottery (2)

Transaction Composition/Decomposition

As previous examples show, the realization of a production fact might necessitate the execution of various underlying transactions. This was symbolized in figure 7.6. So, the production of a car necessitates various additional transactions that realize additional production facts: the parts. Analogous to the composition of a car by its parts, we might envisage the ultimate production as the composition of underlying transactions producing the parts, or conversely, we might decompose the ultimate production into underlying transactions. As a further illustration, suppose that in the interaction model of figure 7.8, the realization of production fact associated with transaction T03 necessitates the initiation of transactions T04 and T05. Subsequently, the interaction model of figure 7.8 changes into that of figure 7.16, whereby it is assumed that T04 is executed by an external party, that is, an external supplier producing the T04 product or service. Successful completion of T03 is thus contingent upon the successful completion of transactions T04 and T05. These latter two transactions are contained in T03 and are initiated by the producer actor role.

Figure 7.17 shows the process model associated with the interaction model of figure 7.16.

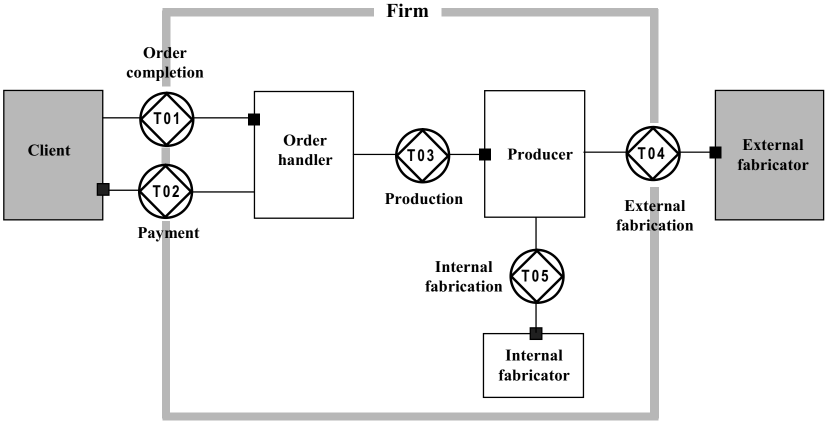


Fig. 7.16. Interaction model Firm (2)

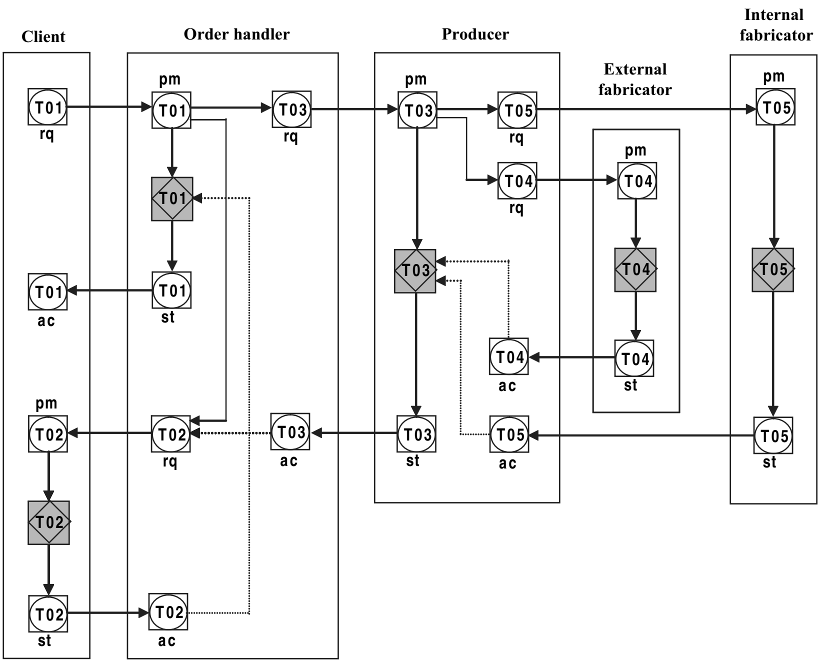


Fig. 7.17. Process model of Firm (2)

Clearly, the model shows that the realization of the T03 production fact depends on the successful realization (acceptance) of the production facts associated with T04 and T05. Put another way, it depends on the completion of T04 and T05, which is expressed by the waiting conditions between the production realization of T03 and the two acceptance conditions T04/ac and T05/ac. The example shows that process models can be extended up to any desired level of detail. The end-level of process detailing is reached when production activities of a transaction have to do with 'atomic' tasks that make further detailing impossible or unfruitful.

State Model

The *enterprise state* was defined as the totality of coordination and production facts at (or created up to) a certain moment in time. The totality of lawful states the enterprise can be in was identified as the *state space*. Within the enterprise ontology methodology, the state model is restricted to the production facts of the state space, since production has to do with the very purpose of the enterprise and its possible transactions. Production is about the realization of a material or immaterial fact, such as preparing a meal or assessing the value of a house. These facts concern so-called 'objects'. Facts say something about objects: that a meal is prepared, or that an assessment is completed. Objects are concrete or abstract things like the ones mentioned, and are an element of the respective object class. The state model specifies the state space of production facts by depicting the production facts pertinent to objects in the object class, and by showing the logical relationships between the object classes. So the model shows what possible production facts are associated with the respective objects. This type of modeling is the domain of specialists. The theory and graphical notation of 'object-role modeling' is used within the DEMO methodology [Dietz 2006, Halpin and Morgan 2008]. Since these modeling techniques require extensive explication, we will satisfy ourselves with merely indicating the essence of the state model.

With reference to the interaction model (figure 7.10) and process model (figure 7.15) of Pottery 2, relevant object classes are 'Client order', 'Product', 'Supply order' and 'Fabrication order'. Since a client is a person, there is an external 'Person' object class shown in grey. Various logical relationships can be identified between the object classes. These relationships can be interpreted as follows. The client *C* is an element of the 'Person' object class, while the client order *CO* is an element of the 'Client order' object class. The horizontal bar above the *CO*-box indicates uniqueness of the client order: a client may have more than one order, but a given order defines the associated client uniquely: the client of client order *CO* is client *C*. Further, the black dot indicates the mandatory nature of the relationship: a client order must be associated with a client and so on. Similarly, products might be part of multiple orders, but a client order (*CO*), supply order (*SO*), or fabrication order (*FO*) defines the products associated with these orders uniquely. So for example, supply order *SO* concerns product *P*. The internal object classes depicted in figure 7.18 show the results associated with them. These results

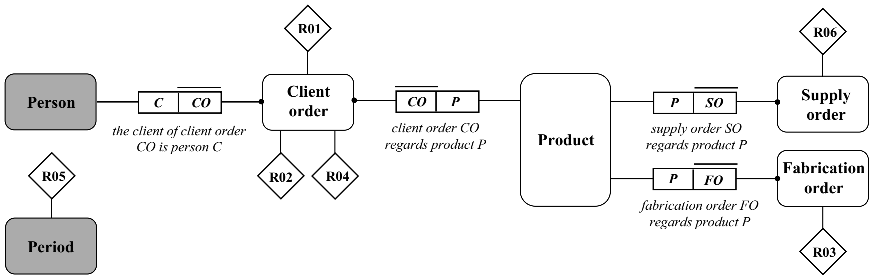


Fig. 7.18. State model of Pottery (2)

are mentioned in the transaction result table of figure 7.10. Finally, result R05 has to do with periodic stock control. The external object class contains the period *T* for which stock control takes place.

As can be appreciated, the enterprise data dictionary can be defined precisely (including data ownership) through the state model and linked to transactions.

Action Model

Transactions are carried out through coordination and production activities. These latter activities are guided by work instructions, such as for servicing a car, preparing a meal or assessing the value of a house. The action model is not concerned with production work instructions, but only with the handling of coordination facts. Coordination activities address the occurrence of a coordination fact, are performed by an actor role, and are guided by so-called *action rules*. So generally, there are action rules for the occurrence of a request, promise or decline, statement, and acceptance or reject, as well as for the associated cancellations (cf. figure 7.4). We will consider the standard transaction pattern.

The action rules are often of the if-then-else structure, as figure 7.19 illustrates. For example, the request for a car rental might be guided by the action rule ‘if the driver has valid credentials (age, license) the requested car may be rented, otherwise

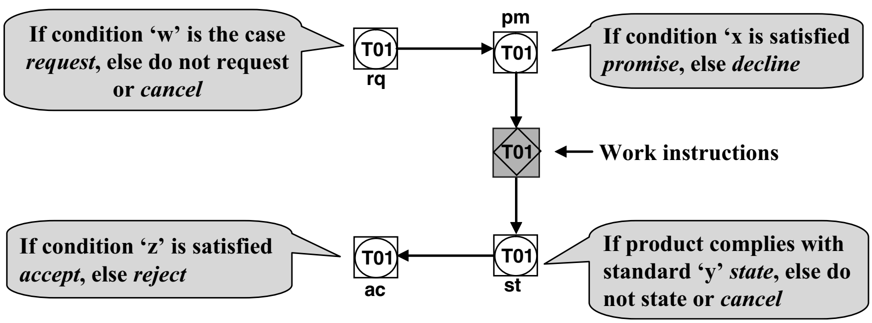


Fig. 7.19. Action model components

decline'. The subsequent promised state will be guided by further action rules, such as filling in certain forms. On presenting the car (production fact stated) the associated actions rule might require a car walk-around to assess the car's condition, which is signified subsequently by the customer's acceptance. The totality of action rules for guiding the coordination activities of the various transactions is called the *action model*. This model is important since the action rules define the process execution. Because of the explicit definition of the coordination activities, the precise definition of the required information is also established.

We might observe that the action model seems to enforce the handling of coordination facts – hence process execution in this respect – in a predefined way. Is that not akin to creating the enterprise as a machine? Fortunately, that should not necessarily be the case. Acknowledging the importance of the structural-functionalistic enterprise foundation mentioned previously, the possible machine character evidently depends on the specific nature of the action rules, and on the level of compliance required. This issue will be addressed further when discussing the difference between action rules and business rules.

7.2.3 Business Rules

The Concept

One might notice a growing interest in the notion of 'business rules'. In this context, the term 'business' must be understood in the same sense as we have used the term 'enterprise'. In this paragraph we will follow the customary nomenclature. Noteworthy publications have been issued by the Business Rules Group [Hall et al. 2005]. Business policies and business rules are viewed as directives, and their conceptual difference is defined as follows [op. cit., p. 20]:

- *Business policy*: a non-actionable directive whose purpose is to govern or guide the enterprise.
- *Business rule*: provides a specific actionable guidance to implement business policies. These latter policies are thus the basis for business rules.

The term 'non-actionable' means that the formulation of a business policy is such that conditions under which the policy can be effectuated remain unclear. So the statement that 'purchased goods may be returned' is considered a business policy (a general directive), but the specific statement that 'purchased goods may be returned up to 30 days after purchase' is viewed as a business rule. The specific character of business rules allows that some of these rules can be automated, that is, their execution can be enforced by an IT system.

Business policies and business rules are seen as means to aid in operationalizing strategic choices. A strategic choice to increase 'repeat business' is supported by a business rule stating 'call first-time customers personally' [op. cit., p. 15].

Business Rules Versus Action Rules

In paragraph 7.2.1 we introduced the notions of enterprise *state* and *process*. A new enterprise state is the result of events occurring in processes. Processes manifest the sequence of events. Not all states or process executions are evidently possible or desired. Renting a car to someone without a driving license must be avoided. Hence we might conceive laws that define the conditions for ensuring that the enterprise manifests only lawful states and that processes are executed in the desired order. These laws can be defined as follows:

- *State law*: specifying operational decision-making rules, such that the enterprise can only obtain lawful states
- *Process law*: specifying operational decision-making rules, such that enterprise events occur in the desired sequence.

A state law can be formulated by expressing the allowed state or, operationally oriented, as a decision-making rule. For example, a state law like 'The hotel may only accommodate non-smokers' can be complied with through an operational rule law stating that 'Rooms may only be rented to non-smokers'. Table 7.1 gives some examples of state and process laws.

Table 7.1. Examples of state and process laws

State laws	Process laws
Meals may not contain expired ingredients	Delivery of goods only after payment
Women more than six months pregnant may not travel on aircraft	Goods may be returned up to 30 days after purchase
Orders may not contain more than 20 items	Credit card acceptance must await positive validation
Car rental for in-country use only	Car renters must provide a valid driving license
Students are entitled to 25% discount	Lunch can be served between 11 AM and 2 PM

In view of our earlier remarks about business rules, we propose the following:

- *Business rules* are the state and process laws of an enterprise.

Within the perspective of the Business Rules Group, business rules are not necessarily 'mechanistic dictates' that must be adhered to under all circumstances. Some varying level of enforcement – or conversely level of freedom in applying a specific business rule – is considered. The Business Rules Group identifies six levels of enforcement, of which in our view, two are special cases of the second and third level mentioned below. Four principally different levels of enforcement can thus be identified [Hall et al. 2005, p. 17]:

- *Strictly enforced*: the rule must be adhered to and violation is penalized
- *Pre-authorization override*: prior approval is obtained for deviation from a rule
- *Post-justification override*: after the fact justification for rule deviation is provided, which does not necessarily mean that the justification is accepted. Deviation might have consequences
- *Guideline*: a rule is a suggested course of action.

Within the organismic perspective on organizing, strongly advocated in Chapter 2 and corroborated in later chapters, the self-organizing capacity is a central notion, since employee-initiated behavior is seen as crucial for enterprise success. Evidently, this viewpoint entails refraining from imposing detailed rules that would make self-organization impossible. Nonetheless, some regulation is required, not only for safety or legal reasons, but also for guiding self-organization into the desired direction. So, in complying with state and process laws – the business rules – two fundamentally different approaches are possible. First, one might opt for the mechanistic approach outlined in Chapter 2, under the assumption that the more employees behave according to predefined rules, the better the enterprise performs. Second, within the organismic perspective, compliance with rules is subject to employee judgment, and relies on their competence, except in those cases where rules must (generally) be strictly adhered to.

The action model discussed in the previous paragraph is based on the execution of coordination activities according to predefined action rules. These can be viewed as detailed business rules that must (generally) be followed. Hence, we might say that:

- An *action rule* is an imperative business rule.

Sometimes, imperative business rules are enforced as action rules in an IT system that does not allow rule deviation. In such a case, the enforced business rule is an aspect of design, since the design ensures rule enforcement.

Business Rules Versus Enterprise Architecture

In the steady state of an enterprise, two core aspects can be identified:

- *Enterprise design*: the way various elements of an enterprise and their mutual relationships are arranged
- *Enterprise operation*: the actual execution of activities (manifest in enterprise states and state transitions) that bring forward the enterprise products and services.

This distinction forms the basis for distinguishing business rules from enterprise architecture. Recalling our discussion in the previous section, business rules concern the *operation* of an enterprise, whereas enterprise architecture concerns the *design* of an enterprise.

Evidently, the design of an enterprise must enable the desired operation, hence must enable the execution of business rules. Put another way, the ability to execute business rules is a design requirement. Although business rules and enterprise architecture are conceptually different, they will generally have the same underlying strategic choices or concerns as a reference. So, a strategic choice to enhance customer satisfaction might lead to enterprise architecture (design principles) for easy customer interaction (e.g. through a web portal), as well as possibly leading to a business rule allowing purchased goods to be returned (for which the web portal enables easy interaction). The difference between business rules and enterprise architecture is shown schematically in figure 7.20.

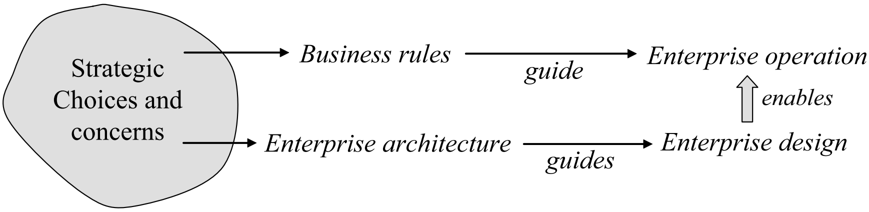


Fig. 7.20. Conceptual difference between business rules and enterprise architecture

Notably, enterprise operation is more than what is addressed in business rules. In fact, business rules only address the coordination activities of a transaction. Production activities are evidently part of enterprise operation. These activities are guided by work instructions, such as for changing a tire or building an aircraft (cf. figure 7.19).

Following the business rules group, we have positioned the notion of 'business policy' as a non-actionable directive, on which the specific actionable directive (business rule) is based. Hence, business policies also refer to enterprise operational aspects. Sometimes the notion of business policy is used in a strategic sense, like 'We will provide meaningful work for our employees'. We consider this a strategic area of concern, which, as we will show later, is addressed through defining enterprise architecture. Such a strategic concern must also be visible in the definition of business rules, for example, 'Employees may use their own judgment in dealing with customer complaints'.

When discussing the notion of architecture from a general system perspective in Chapter 4, architecture was defined as a coherent and consistent set of principles and standards that guide system design. Coherence and consistency have been emphasized as important conditions for creating unity and integration. Specifically with respect to enterprises, paragraph 3.2.4 argued that lack of unity and integration is the prime reason for failing strategic initiatives. Since business rules guide the operation of an enterprise, the requirement for coherence and consistency likewise pertains to the set of business rules. Successful enterprise operation is not to be expected when business rules are mutually conflicting. The difference between enterprise architecture and business rules can thus be identified additionally through the following definitions:

- *Enterprise architecture*: a coherent and consistent set of principles and standards that guides enterprise design.
- *Business rules*: a coherent and consistent set of actionable directives (manifest in state and process laws) that guides the enterprise operation.

The notion of enterprise architecture will be discussed further below. The relatively close relationship between business rules and enterprise architecture makes it fruitful that the enterprise architect involved with defining enterprise architecture, is also involved in defining the set of business rules.

7.2.4 Enterprise Design Process and the Role of Architecture

Normative Design Guidance

The models illustrated briefly previously enable comprehension of the essence of an enterprise at the ontological level, being the 'highest' level of enterprise design, totally abstracted from the actual or possible implementation. Ultimately, implementation must evidently take place. With reference to what has been said in Chapter 4 about architecture in general, enterprise architecture concerns the function and construction design of the enterprise. Further, chapter 4 considered 'designing' as the totality of activities from defining system requirements (in this case the enterprise) up to implementation. As we will outline below, enterprise design has to do with the business, organizational, informational and technological arrangements that ultimately determine the actual manifestation of the enterprise. Enterprise architecture, which we will discuss thoroughly in the next paragraph, gives the normative guidance for the design process, as figure 7.21 indicates.

Figure 7.21 was discussed in paragraph 4.2.6, when outlining the generic system development process. In the case of an enterprise, the using system can be seen as the specific enterprise environment to which the enterprise delivers its products and services.

Functional requirements have to do with the desired interaction of the enterprise with its environment. For example the ability of customers to return goods within 30 days after purchase, is a functional requirement. An enterprise constructional requirement might be that enterprise arrangements must be such that employee self-efficacy is enhanced. The conceptual difference between requirements and architecture was outlined in paragraph 4.2.6. We will show that constructional requirements are generally addressed through construction architecture.

Various authors have mentioned principles for guiding enterprise arrangements and behavior [Nolan and Croson 1995]. Others have used the term 'maxims' for providing such guidance [Weil and Broadbent 1998]. Although the principles and

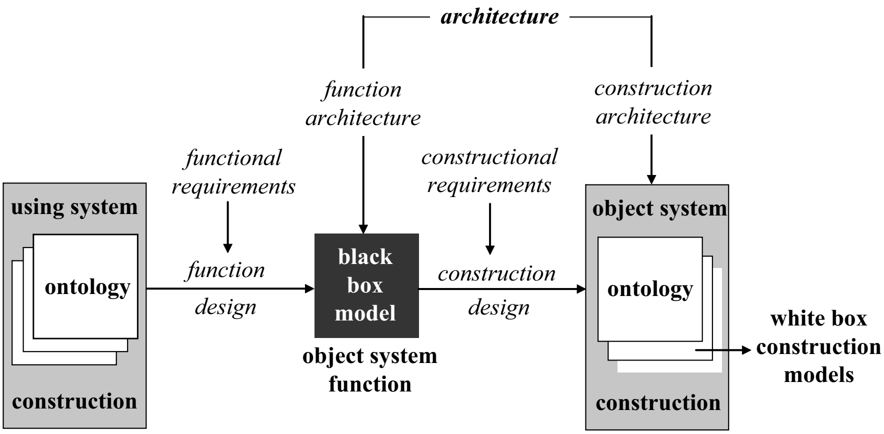


Fig. 7.21. Design process and architecture [Dietz 2006]

maxims mentioned do not show a clear distinction between aspects like strategic concerns, enterprise behavior or enterprise design, the common underlying message is important: the necessity of using the principles-based approach for guiding future enterprise arrangements.

Enterprise Differences Through Architecture

As we explained in Chapter 4, architecture is not only relevant for ensuring unity and integration, but also for addressing the objectives pertinent to areas of concern. For example, about establishing certain types of employee behavior. At the ontological level, the concern goes to transactions and the associated patterns. This is what we have labeled earlier as the structural-functionalistic foundation. Nonetheless, the social nature of enterprises has been emphasized, since only human actors enter into commitments and comply with them. This notion is not only important in view of the fact the humans are ultimately responsible for satisfying commitments (and cannot attribute failures passively to technology systems), but is even more important since human actors (employees) are the crucial core for enterprise success, as argued in Chapter 2. Therefore the organismic way of organizing was emphasized. Appreciably, this other form of organizing is not manifest at the ontological enterprise level. Two identical transactions at the ontological level can be experienced totally differently because of employee behavior associated with the transactions. As we have outlined in Chapter 3, employee behavior is determined by the context – the behavioral context – in which the employees function [Ghoshal and Bartlett 1997, Hoogervorst 1998]. The desired behavioral context is evidently determined by enterprise design. As we will illustrate later, enterprise architecture plays a crucial role in this respect: the design of the enterprise must be such that desired employee behavior is enabled and invoked. We submit that this constitutes a fruitful area for further research that enables further convergence between information systems science and organizational sciences.

Referring to the general definition of architecture given in Chapter 4, we define enterprise architecture as:

- *Enterprise architecture*: a coherent and consistent set of principles and standards that guides enterprise design [Hoogervorst 2004a, 2004b, Hoogervorst and Dietz 2005].

Comparably as in paragraph 4.2.9 the framework $<S,D,A>$ for enterprise architecture has to do with (1) the system S (the enterprise), (2) the design domains D (which we will illustrate below), and (3) the areas of concern A (of which examples will be given).

The Communicative Bridge Between the Functional and Constructional Perspective

Next to the normative guidance of enterprise design, enterprise architecture (and architecture in general) fulfills an important communicative function. Ross et al. refer to enterprise architecture as an “organizational compass” that directs the company towards its desired arrangement [2006, p. 141]. Paragraph 4.2.1 referred to the functional, requirements-oriented, black-box system perspective in contrast with the constructional, realization-oriented, white-box perspective. This distinction can be related to controlling the system (using its function), and designing the system respectively. This distinction holds similarly for an enterprise. The functional perspective has to do with the behavior (performance) of the enterprise in view of requirements pertinent to its primary function and objectives related to areas of concern, whereas the constructional perspective concerns the realization or change (design or redesign) of the enterprise. All too often, enterprise management attention is limited to the functional perspective: *what* the enterprise should realize is the focus, whereby attention for *how* the requirements must be realized is virtually absent. The core reason for strategic failures mentioned in paragraph 3.2.4 confirms this observation.

Understandably, two fundamentally different conceptual categories are associated with the functional and constructional perspective. Within the functional perspective, requirements pertinent to, for example, customer satisfaction, throughput time, flexibility or economics, play a role. Different conceptual categories are of concern within the constructional perspective, such as processes, the use of resources, the organizational culture, information supply etc. One might argue that the different conceptual categories, associated with the different perspectives, are incommensurable: they have no common basis for comparison. Indeed, what would be the common basis for comparing enterprise flexibility with its culture? However in this respect enterprise architecture serves an important bridging role: various principles and standards for design (constructional perspective) can be linked to, reasoned from, and justified by, requirements from within the functional perspective. Consider the (still vague) strategic objectives concerning higher customer satisfaction and easy and effective customer interaction. Architecture principles that guide the design of customer interface processes and cross-functional multi-channel access devices for example, can thus be shown to aid in satisfying the strategic objectives and make them concrete. Figure 7.22 shows this communicative bridging function

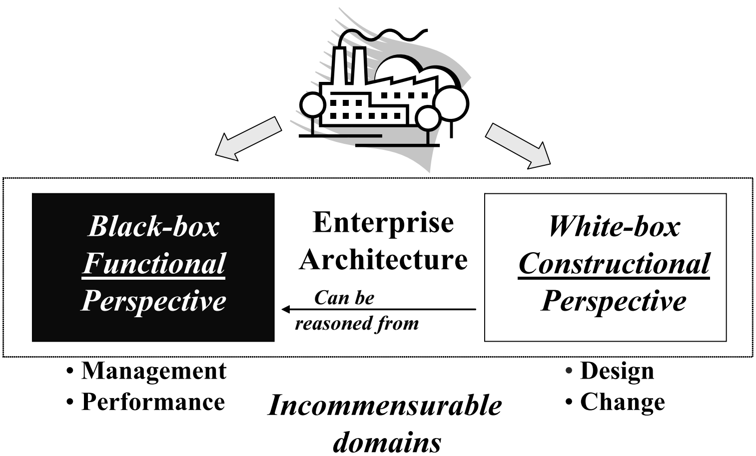


Fig. 7.22. Enterprise architecture as a communicative bridge between the functional and constructional perspective

of enterprise architecture schematically. By using a practical case, Chapter 8 will exemplify further the enterprise design process and the role of architecture.

Linking architecture principles to strategic objectives has been practiced successfully by various organizations. As one large organization reports: "If managers resist complying with architecture we simply point out that this means that they are not supporting [our] strategy. That changes the conversation" [Ross et al. 2006, p. 131]. Research among 103 enterprises showed that high-performing enterprises had significantly higher involvement of senior management for enterprise architecture initiatives [op. cit.].

7.2.5 Benefits of the Enterprise Engineering Approach

Important benefits of the enterprise engineering approach can be summarized as follows:

- Formal approach for addressing 'organized complexity' and the realization of a unified and integrated design
- Analysis and design at the ontological level offers rapid insight into, and understanding about, the essential – implementation-independent – enterprise operation. This facilitates the discourse about essential enterprise aspects significantly, such as in the case of enterprise change, cooperation, merger or acquisition [Mulder 2006, Op 't Land 2008].
- The transaction-based design approach leads to a logical identification of actor roles, independent of current, or yet to be defined, functional structures.
- Explicit identification of coordination actions and production actions pertinent to a transaction, whereby the associated action rules and required information provide the formal – design-oriented – foundation for business and IT alignment.
- Aspects models, such as process models, can be derived relatively easily from the essential enterprise construction model. The formal identification of all coordination actions makes responsibilities clear, which is generally not the case with other types of business process modeling.
- Mapping transaction and actor roles onto existing enterprise functional areas and supporting IT applications provides a valuable insight into the effectiveness and efficiency of current enterprise arrangements, in view of the essential enterprise operation.
- A methodology-based approach is offered to address strategic initiatives and areas of concern through architecture, such that a unified and integrated design is established from the ontological model up to the ultimate constructional model that is implemented.
- Enterprise architecture enforces and facilitates the normative dialog about enterprise design. Further, enterprise architecture provides an important communicative bridge between the functional and constructional perspective,

and enables the ability to reason and justify architectural principles and standards from functional requirements.

- Enterprise architecture guides enterprise design and thereby determines how the enterprise is 'experienced' by stakeholders. Identical enterprises on the ontological level derive their experienced differences through different implementations determined by architecture.
- The enterprise engineering approach addresses both the structural-functionalistic and interpretative system views.
- Enterprise architecture enables the unification of the structural-functionalistic view with the view of an enterprise as a social system, as outlined in previous chapters, whereby enterprise architecture directed to the organismic way of organizing expresses the conviction that employees are the crucial core for enterprise success.
- The enterprise engineering approach enables addressing the notion of business rules in a formal way. While delineating the difference with enterprise architecture, jointly addressing both concepts from the same underlying methodology greatly supports mutual coherence and consistency.

7.3 Enterprise Architecture and Design Domains

7.3.1 Different Perspectives on Enterprise Architecture

The term enterprise architecture does not yet have a universally accepted meaning. As in the case of IT architecture, there is the *descriptive* versus the *prescriptive* (normative) use of the notion of architecture, as discussed in paragraph 4.2.2. Within the descriptive view, enterprise architecture is, for example, seen as the combination of business architecture (e.g. organization charts, job descriptions, process flow diagrams) and IT architecture (e.g. application and infrastructure diagrams) [Bonham 2005]. The label 'enterprise architecture' is used sometimes with no apparent definition [Finkelstein 2006], or is used as a short way of identifying enterprise-wide IT architecture [Perks and Beveridge 2003]. For others, rather broadly, "Enterprise architecture describes the structure of a company in terms of means of production, customer service, strategy and objectives, and the use of information and information technology" [Benson et al. 2004, p. 277]. But also, "Enterprise architecture guides the construction and development of business organizations and business processes, and the construction and development of supporting information systems" [ibid.]. This prescriptive view of enterprise architecture is also used by Wagter et al. [2005]. Others state comparably that "Enterprise architecture is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the company's operating model" [Ross et al. 2006, p. 9]. The term 'logic' in this definition might suggest a prescriptive connotation. However, usage of the term 'enterprise architecture core diagram' suggests otherwise, although it is recognized that "Enterprise architecture is often represented in principles, policies and technology choices" [op. cit., p. 50]. Both the descriptive and prescriptive perspectives appear to be used simultaneously. Explicitly using both views on architecture is shown in the definition of enterprise architecture as "a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems and infrastructure" [Lankhorst et al. 2005, p. 3]. Notably, methods are also seen as part of enterprise architecture. Despite the focus on design, somewhat confusingly, enterprise architecture is also linked to operational aspects: "Enterprise architecture is typically used as an instrument in managing a company's daily operations and future development" [op. cit., p. 11].

In view of our argued normative, prescriptive perspective on architecture outlined in Chapter 4, we reiterate our definition given earlier: *enterprise architecture is a coherent and consistent set of principles and standards that guides enterprise design*. Representing certain aspects of enterprise design is evidently important. Seeing a model as "an unambiguous abstract conception of some parts or aspects of the real world" [Lankhorst et al. 2005, p. 117], then different aspects of enterprise reality (its design) can be represented through models. Some of these models were presented in the previous paragraphs, based on the DEMO methodology. These models can be complemented with representations for providing a desired overview, for example by showing the linkage between transactions and actor roles on the one hand, and the enterprise functional areas where the transactions take place and IT applications are used, on the other. Other ways of creating models – which are presented in a descriptive sense as views on enterprise architecture – are given by Lankhorst et al. [2005]. A specific enterprise architecture modeling language has been developed for that purpose.

In this paragraph we will be concerned with establishing enterprise architecture – principles and standards – that guide enterprise design. As argued extensively in earlier chapters, and reiterated in the introductory paragraphs of this chapter, a comprehensive enterprise perspective is required to address issues that cannot be resolved from a 'lower' level of analysis. In the case of resolving IT issues, Ross et al. observe rightly that "The level of analysis was all wrong. The focus needs to be higher – on *enterprise architecture*" (italics in the original) [2006, p. viii].

7.3.2 Architecturing

Pertinent to system design, the concepts of 'areas of concern' and 'design domains' have been introduced in Chapter 4. For an enterprise as a system, these concepts apply likewise for defining architecture. Figure 7.23 shows the reference context for architecturing in the case of an enterprise. Referring to our discussion about strategy development, areas of concern and their associated objectives have to do with strategic choices. Put another way, insight emerges through strategy development about areas of concern and related objectives. Strategic choices can be distinguished into choices pertinent to 'position' and 'perspective' (cf. paragraph

3.2.3). Fundamental convictions the enterprise has will evidently determine the nature of the areas of concern. For example, the organismic way of organizing introduced in Chapter 2 will introduce areas of concern not addressed within the mechanistic view, such as ‘flexibility’ or ‘employee self-efficacy’. The topics discussed in the chapter about corporate governance also indicate important areas of concern, such as concerning compliance. Strategy development might lead further to changing certain aspects of the primary system function or objectives concerning the areas of concern. New areas of concern might also be defined. For example, a theme like societal responsible business conduct (‘people, profit, planet’) is likely to introduce new areas of concern considered relevant in view of this theme. Comparably with what was said in Chapter 4 from the general system perspective, areas of concern and the related objectives define enterprise performance requirements that must be met by enterprise behavior. Figure 7.23 mentions a number of relevant areas of concern.

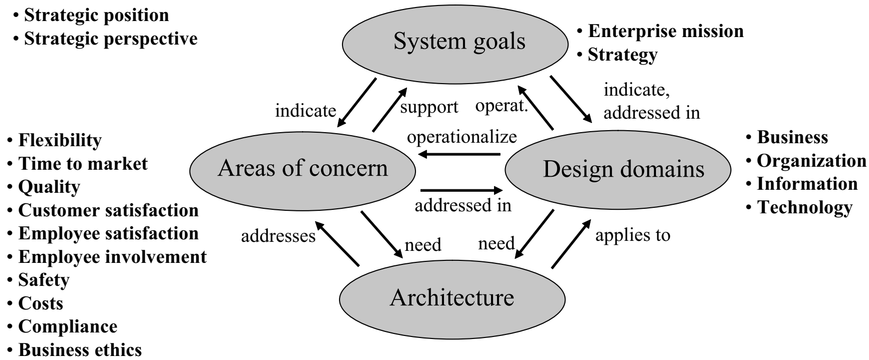


Fig. 7.23. Reference context for architecturing

In theory, an area of concern could more or less indicate design domains where the concern should be addressed. So, a concern regarding the provisioning of meaningful work refers to employees, the arrangement of processes in which they operate (business rules), and various regulative arrangements under which employees function, such as employee evaluation and remuneration systems. These are more or less obvious design domains associated with the concern for employees. Generally however, areas of concern do not indicate the design domains where they should be addressed directly. For example, it does not immediately seem obvious how concerns like ‘flexibility’, or ‘safety’ are to be addressed. Similarly to the general systems perspective in Chapter 4, it must be established through which design domains, and the associated architecture, the concern is taken into account. As we have stressed, an enterprise is a complex, heterogeneous, socio-technical system. So, defining areas of concern and design domains is not a simple analytical or algorithmic process. Above all, the definition process is iterative: high-level enterprise intentions are operationalized iteratively through defining areas of concern, and the design domains where they should be addressed, including the architecture that addresses the concerns. Defining design domains and architecture requires broad business, organizational, and to a certain extent, technological knowledge of the enterprise architect. Experience plays an important role. As emphasized earlier, architecturing is a heuristic, participative process [Maier and Rechtin 2002]. We will refer to the personal competencies of the enterprise architect later. As an illustration, a number of enterprise design domains are indicated below.

7.3.3 Main Enterprise Design Domains

Figure 7.24 shows four main enterprise design domains. Associated with these domains are thus four architectures. Put another way, enterprise architecture comprises four sub-architectures. The four domains will be introduced briefly below, and explored more deeply later, whereby more specific design domains, as well as examples of architecture, will be given for each main design domain. Apart from presenting concrete examples of design domains and architecture, an important purpose of the illustrations is the portrayal of the underlying concepts and line of thought: defining (1) areas of concern, (2) design domains, and (3) and architecture that addresses areas of concern and is applied in the design domains. As we have mentioned, the process is heuristic and participative, whereby new insights might necessitate adaptations. New areas of concern and/or design domains and associated architecture should then be considered. All that fits within the conceptual structure outlined below.

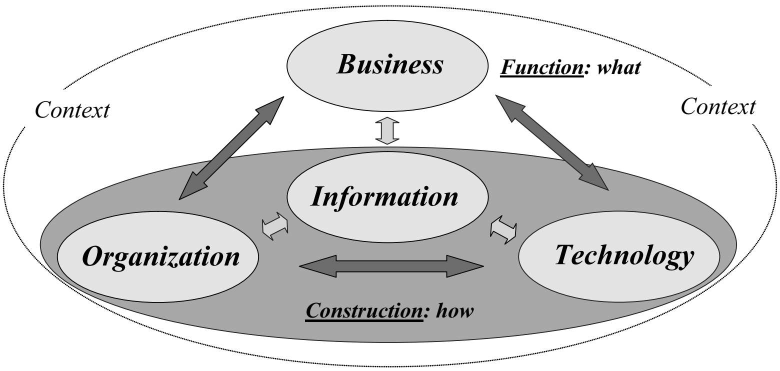


Fig. 7.24. Main enterprise design domains

Business. This domain concerns the enterprise *function*, having to do with topics such as products and services, customers and the interaction/relationship with them, the economic model underlying the business, and the relationships with the environment (sales channels, market, competitors, milieu, stakeholders). The *business architecture* guides the way the business domain is to be exploited and explored. We might consider principles concerning the provisioning of products and services to customers, the market position relative to competitors or the relationship with stakeholders.

Organization. Having established the enterprise function (its business), many degrees of freedom still exist concerning how the products and services are actually brought about, and how the associated activities are actually arranged. The organization domain concerns the internal arrangement of the enterprise, having for example to do with processes, employee behavior, enterprise culture, management/leadership practices, and various structures and systems, such as regarding accounting, purchasing, payment, or employee evaluation. Organization is thus part of the enterprise *construction*. The *organization architecture* guides the organizational arrangement through principles and standards pertinent to topics such as the ones just mentioned. Notably, the traditional vertical, hierarchical, and functional organizational orientation, as compared with the horizontal, process orientation, manifests two essentially different organization architectures. The distinction between mechanistic and organismic way of organizing outlined in Chapter 2 is also evidently associated with a fundamentally different organization architecture.

Information. Information is a crucial factor within both the business and organization design domain. Many informational aspects play a role, such as the structure and quality of information, the management of information (gathering, storage, distribution), and the utilization of information. The information design domain also has to do with the enterprise construction. The *information architecture* guides the way information (or better, 'data') must be used and handled. So principles might concern the handling of customer and supplier data, or the way operational systems update informational systems. Notably, information architecture differs from IT architecture. The latter architecture has its focus on technology.

Technology. Appreciably, technology is essential for business, organizational and informational support, as well as for future enterprise development. Technology is thus an important part of the enterprise construction. Every technology therefore has an associated architecture, guiding its design. For information technology (IT) we thus have *IT architecture*, guiding IT system design, as discussed in Chapter 6.

Lack of unity and integration have been identified in paragraph 3.2.4 as the core reasons for failing enterprise (strategic) change initiatives. Avoiding a lack of unity and integration requires coherence and consistency of architecture within and between the main design domains. For example, a business design based on a high level of flexibility concerning the market and customers seems incoherent and inconsistent with a bureaucratic organizational arrangement. Important relationships thus exist between the four main domains, as figure 7.24 shows. As Martin observes: "The enterprise must be dealt with as a whole – all of its business, social, and technical systems must be dealt with in a holistic and integrated way" [1995, p. 380].

In his analysis about failing strategic initiatives, Christensen introduced the notion of 'value network' [1997]. Essentially, this concerns the way the enterprise operates, such as is determined by enterprise competencies, its culture, and various enterprise structures and systems. So in our terminology, the value network refers to the function and construction of the enterprise. Strategic failures are attributed by Christensen to incoherence and inconsistency of the current value network with that required for the new strategic intentions. In our words, an inappropriate design in view of the strategic intentions. Also within this analysis, lack of coherence and consistency underlies strategic failure. Others have presented examples showing similarly that enterprise incoherence and inconsistency jeopardized enterprise performance [Nadler et al. 1992, Nadler and Tushman 1997].

As mentioned earlier, enterprise architecture plays a crucial role in safeguarding the coherence and consistency of enterprise design. With reference to the pattern shown in figure 7.23, table 7.2 below shows some examples of areas of concern, the main enterprise design domain where the concern is addressed, and the architecture principle that addresses the concern and is applied within the design domain.

Most architecture principles in table 7.2 relate to one area of concern and one design domain. Such one-to-one linkage is not necessarily the case: a principle might be applied in more than one design domain, or could address more than one

Table 7.2. Enterprise architecture examples

Area of concern	Main design domain	Architecture
Customer satisfaction	Business	Products and services must be customizable
	Organization	Management must enable employee self-management
	Information	Complete and up-to-date customer information must be available at all customer contact points
	Organization	Decision-making must take place at the lowest possible level
	Technology	Technology must enhance customer productivity and comfort
Security	Information	Supplier information must be available from one unified source
	Technology (IT)	Network access must be based on authentication and role-based authorization
Safety	Business	The delivery of products and services must be compliant with work-safety regulations
Employee satisfaction	Organization	People employment must focus on employee self-efficacy
Flexibility	Organization	Process flow control must be separated from execution logic Decision-making must take place at the lowest possible level
Compliance	Organization	Procurement and payment processes must have ‘non-repudiation’ protection
Business ethics	Business	Development and delivery of products and services must satisfy applicable safety and health regulations

area of concern. For example, the principle that places decision-making at the lowest possible level for enabling flexibility is also likely to address customer satisfaction. As the table shows, the principle is thus also used for the 'customer satisfaction' area of concern.

From the perspective of the enterprise as a whole, four main design domains are identified: business, organization, information, and technology. Concrete enterprise design requires further detailing of the four main design domains. Examples of further detailing will be given for each of the main design domains, as well as examples of architecture. The examples given in table 7.2 thus relate to more specific design domains within the four main design domains. Further examples for all sub-design-domains will be given in Chapter 8.

Finally, we might appreciate that design principles, such as the examples given in table 7.2, enable the definition of implementation-oriented construction models, based on the ontological models of the enterprise (cf. figure 7.21). So, for example, the ontological models of the Pottery given in figures 7.10, 7.12, 7.15, and 7.18 (including the action model as illustrated by figure 7.19), can be implemented through design principles such as given in table 7.2.

7.3.4 Business Design Domains and Business Architecture

The term 'business' has many meanings. In this chapter we have associated the term with the enterprise function: exploring, exploiting, and developing a certain area of (commercial) endeavor and the (subsequent) delivering of products and services to customers. In other words, executing goal-oriented, purposeful and gainful activities. This is often expressed by the enterprise mission: a relatively timeless expression of the enterprise primary purpose that gives overall meaning and sense-making to enterprise activities. Notably, the term 'business model' is also often used, and with different meanings. On the one hand the term can refer to a conceptual abstraction and representation of reality (descriptive), while on the other it can refer to an example or pattern to be followed, such as e-business model. In the latter case, the model provides guidance for conduct, and is used in a normative (prescriptive) manner. Sometimes the term is used in a narrow sense to identify how revenue is generated. Our view on business architecture includes the normative (prescriptive) notion of the term business model.

In view of the enterprise mission and strategic intentions, we define:

- *Business architecture*: a coherent and consistent set of principles and standards that guide how a chosen area of goal-oriented and gainful (commercial) endeavor must be exploited and explored.

Within a commercial context – the domain of enterprising – one might consider principles regarding generating revenue, or the sales channels to be used. For non-commercial enterprises, business architecture is also comparably relevant. We might consider, for example, principles indicating how the domain of tax collection must be exploited and explored. In short, business architecture guides the arrangement of the enterprise's relationship with its environment.

As mentioned, the enterprise business concerns the enterprise function: delivering products and services to customers. The business perspective has to do with the relationships of the enterprise with its environment. Three environmental categories can be identified, which we have labeled as follows: (1) the 'business environment' defined by the market in which the enterprise operates and the competitors it faces, (2) the 'societal environment' formed by stakeholders and regulatory bodies, although the milieu is also a relevant societal aspect, and (3) the 'functional environment'. This latter category concerns the products and services to be delivered, channels for sales and customer interaction, the revenue generation on which the business is based, and business partners and suppliers. We might say that the topics mentioned indicate areas where activities must be arranged. Put another way, the topics indicate *business design domains* which are shown in figure 7.25 below.

Various focus areas are relevant within the design domains. In terms of the functional environment, we might consider the level of customization/standardization of products and services, the range, quality, pricing, warranty and after sales. The integration between product and service components respectively or between products and services mutually, also play a role. In terms of the 'customers' design domain, relevant focus areas are the relationships with customers and the level of

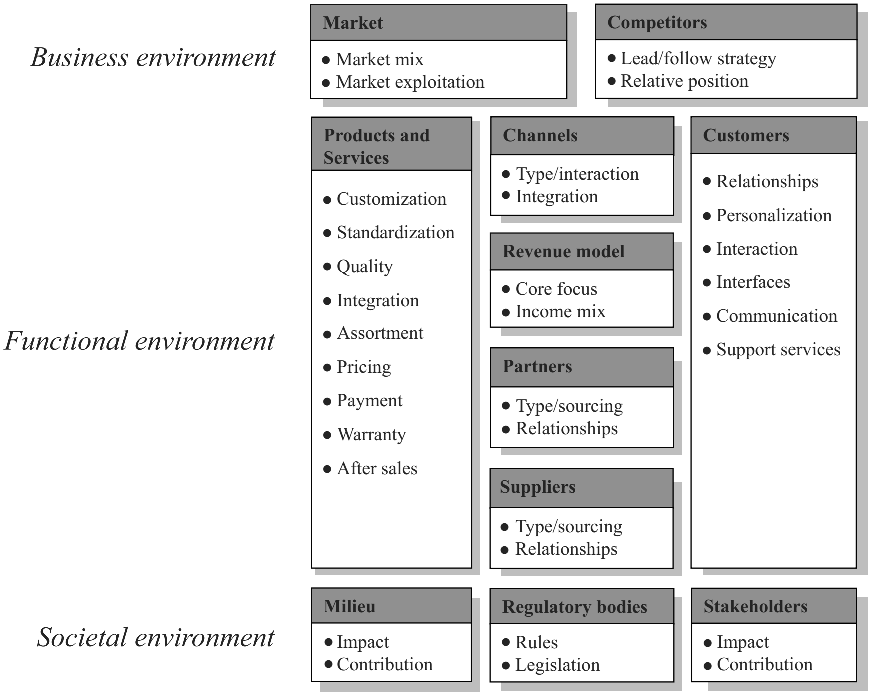


Fig. 7.25. Examples of business design domains

personalization within these relationships, the type of interaction and interfaces, communication with customers, and support services like financial, purchasing, warranty or returned goods services. The 'channels' design domain, for example, has to do with interaction channels (sales, communication) and their integration (transparent use). How income is generated is defined by design principles about revenue generation. Providing core products or services free of charge and gaining income through complementary products, services or activities (such as advertising) indicate design principles for revenue generation. Finally, the type and (sourcing) relationships with business partners and suppliers are important focus areas.

For the business environment design domains, attention goes to topics such as the market mix (e.g. commodities versus specialties, low versus high yield) or the market exploitation (e.g. approaches per geographical area, or per product/ service category). The relative position against competitors and the competitive response (lead/follow) are also relevant areas for consideration. At the lower level the societal environment is shown with design domains pertinent to regulatory bodies and those regarding the impact on, or the contribution to, the milieu and stakeholders.

As figure 7.23 indicates, strategic goals and areas of concern are addressed in design domains, while conversely, the design domains operationalize these strategic goals and areas of concern. It is in the design domains that strategic goals and objectives concerning areas of concern materialize. We might also say that the design domains also serve as a reference for defining strategic choices pertinent to these domains: their explicit definition enables the strategic dialog about them. Architecture needs to be established for all the design domains. Most likely, the number of principles will vary per design domain. The totality of principles and standards make up the business architecture.

In paragraph 4.2.7 we argued that the architecturing process is a heuristic, participative process. Hence, the definition of business architecture will be established in a similar fashion. Further, all principles must have a rationale: the very reason why the principle must be adhered to. The rationale is also likely to be established in a heuristic, participative manner. In the paragraph discussing the enterprise governance competencies, we will discuss the formal way through which principles are published and their rationale is explained. For now, the examples of business architecture presented in table 7.3 serve as an illustration of the type of principles that might play a role. Examples per sub-design-domain are given in Chapter 8.

Obviously business architecture must be coherent and consistent. So business growth based on principles about developing innovative products and services seems incompatible with economic principles that imply a short-term focus on merely exchanging goods for money, with little room for long-term innovative developments.

With reference to the ontological interaction models discussed in paragraph 7.2, the business architecture defines subsequently how the interaction with customers, business partners and suppliers – as defined by the various transactions – must be designed concretely. Put another way, the business architecture enables the further detailing of that part of the interaction model dealing with the external environment, such that implementation can take place. Notably, business architecture addresses aspects that are not within the ontological scope, since that scope is implementation-independent.

Table 7.3. Business architecture examples

Business architecture
Products and services must be designed such that they can be customized
The provisioning products and services must comply with environmental rules and regulations
Commercial activities must be based on following competitors quickly and intelligently
Relationships with customers must be customer-manageable
Revenue generation must be based on lifetime customer value
Products and services must be delivered through direct sales only
Multiple customer interaction channels must operate transparently (inter-functionally)
All interaction channels must have provisions for voice-controlled input
All procurement interactions must be supported by integrated (easy to use) payment services
Interfaces with internal and external suppliers must be identical
Business partners must provide the same 'look and feel' towards customers
Only unified and integrated interaction channels with suppliers may exist
Only markets with Internet density above 80% will be exploited
The delivery of products and services may never compromise safety
Products and services design and delivery must comply with applicable rules and legislation

7.3.5 Organization Design Domains and Organization Architecture

Organizing can be defined as the intentional arrangement of activities, resources and means to create the desired output of purposeful and gainful business activities. This definition would also include the necessary information and technology. Because of the importance of these aspects for the design of the enterprise, we will treat them as separate design domains.

Having defined the business the enterprise wants to be in, and having defined the business architecture guiding how the domain of (commercial) endeavor must be exploited and explored, as stated previously, there are still many degrees of freedom when it comes to the question as to *how* the purposeful and gainful activities must actually be arranged and, specifically, how products and services must be provided. This question, for example, concerns the arrangement of operational processes and their management, as well as the utilization of resources and the employment of human capacities. So the production of a car can take place using a traditional moving-belt production process, but could also be arranged through production teams working autonomously. Well-known are the different organizational set-ups manifest in either the vertical, hierarchy-oriented, or the horizontal, process-oriented way of organizing. The mechanistic versus the organismic organizational arrangements discussed in Chapter 2, also present fundamentally different organization designs. Different organization designs thus have different organization architectures underlying them. Organizing necessarily implies the definition of organization architecture. In view of the above, organization architecture can be defined as:

- *Organization architecture*: a coherent and consistent set of principles and standards guiding how the enterprise must be designed internally for providing the enterprise products and services.

As with the business domain, organization design domains must be established, for which the organization architecture must be defined. Fundamental choices already play a role for establishing the organization design domains. We will base the definition of design domains on the organismic way of organizing argued in Chapter 2. The design domains are shown in figure 7.26.

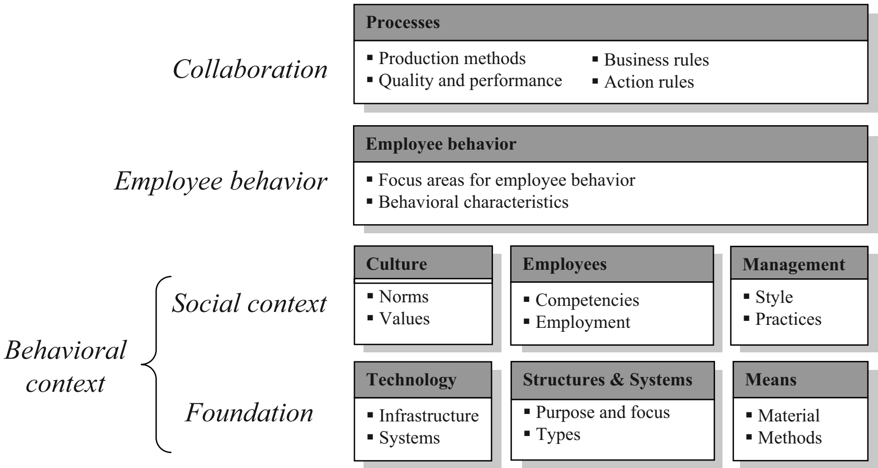


Fig. 7.26. Organization design domain

In view of the importance of employee behavior and the behavioral context that determines behavior, as discussed in paragraph 3.3, the lower two levels of figure 7.26 indicate design domains of the behavioral context. The lower level concerns foundational design domains. First, technology, such as systems and infrastructure (e.g. networks and facilities), must be mentioned. Then come various structures and systems, which are organizational arrangements for accounting, employee evaluation, communication, remuneration, management reporting and so on. Finally, means such as production material and methods are relevant aspects of the behavioral context foundation. An important part of the behavioral context is its social context, formed by the enterprise culture (norms and values held by enterprise members), management (their style and practices), and employees (competencies and way of employment). We argued in paragraph 3.3 that employee behavior is determined by the behavioral context. Three determinants were shown to play a predominant role: enterprise culture, structures and systems, and management practices. As a second-order effect, employees themselves also affect behavior. With reference to our discussion in paragraph 2.2: "People are both products of their contexts and participants in the shaping of those contexts" [Hosking and Morley 1991, p. 7]. Finally, technology and means have an effect on employee behavior insofar as they limit employees to predefined actions, or conversely, enable employee-initiated behavior.

Central to the organismic way of organizing is employee self-organization and self-efficacy. This is reflected in certain characteristics of employee behavior. Hence employee behavior is an essential design domain, as shown in figure 7.26. In view of our earlier remarks, desired characteristics of employee behavior can only be established through a coherent and consistent behavioral context that supports and evokes the desired behavior [Hoogervorst 1998]. Finally, the 'processes' design domain is the one where the collaboration between actors and their behavior becomes manifest.

As is to be expected, the aspects of the design domains discussed so far are manifest directly or indirectly in enterprise processes. The structural-functionalistic foundation of these processes has been discussed previously in paragraph 7.2.2. Production activities and the associated work instructions, as well as the coordination activities with their associated business rules/action rules, form the skeleton of the enterprise. As can be appreciated, the organization design domains shown in figure 7.26 pay attention to enterprise constructional aspects not addressed at the ontological level. These aspects are part of constructional models 'below' the ontological model, as depicted in figure 7.21. Put another way, the organization design domains enable the ontological model to be designed and implemented further in a way that addresses strategic choices and the objectives associated with areas of concern.

Defining the organization architecture means defining design principles and standards for the various organization design domains. The broad perspective on organization design has been stressed by others. For example, Hammer and Champy state that "Reengineering a company's business processes ultimately changes practically everything about the company, because all these aspects – people, jobs, managers, and values – are linked together" [1993, p. 80]. Despite the identification of (1) business processes, (2) jobs and structures, (3) management and measurement systems, and (4) values and beliefs, only some design principles are given for processes [op. cit.].

As mentioned previously, defining architecture is a heuristic, participative process. More detailed design domains possibly turn out to be relevant during the architecturing process. Understandably, the organization architecture will reflect fundamental convictions about the desired way of organizing. These convictions might concern the employment of people (mechanistic versus organismic as outlined in Chapter 2), the use of technology (for example also concerned with up-skilling versus down-skilling of employees), norms and values (culture), and management practices (control versus enablement). The vertical, hierarchical management orientation in contrast with the horizontal, process orientation, also reflects different organizational choices, hence reflects different organization architectures.

Table 7.4. Organization architecture examples

Organization architecture
Processes must be designed outside-in, from the customer perspective
Decision-making must take place at the lowest possible organizational level
Human resource management must be directed to employee ‘empowerment’
Technology must support employees optimally and enhance their competencies
Management must enable employee self-management
Only rules and processes that are essential to enterprise success may be specified
Process control logic must be separated from execution logic
Employee assessment and reward systems must evoke and support desired behavior
Management practices must be consistent with espoused norms and values
Employee behavior must be directed towards enhancing customer satisfaction
Design and deployment of means must be directed towards enhancing employee self-efficacy
Local efficiency must be subordinated under end-to-end process performance
Business/action rules must be consistent with espoused norms and values
Customer interaction processes must have error-correction capabilities
Control of quality should take place at the point of production
Grouping of activities (functional units) must create minimized cross-boundary relationships
Process design must address delegation of coordination activities explicitly

In view of the congruence theorem discussed in paragraph 3.2.4, the coherence and consistency of organization design is essential. Hence organization architecture must be coherent and consistent. By not explicitly addressing architecture, the condition of coherence and consistency is often violated. So one might for example observe that – while a horizontal, process oriented execution of activities is required – management reporting has a vertical, hierarchical orientation, based on functional units. Problematic process execution covering multiple functional units is all too often the inherent consequence, since activities will focus on satisfying the functional reporting. Similarly, individually oriented employee evaluation and rewards do not seem to be coherent and consistent with the requirement for teamwork and quality. Further, take the example of various functional units operating in a process chain for producing an end-product or service jointly. All too often, incoherence and inconsistency arise due to the fact that these functional units are ‘optimized’ based on local economic criteria, not on the effectiveness and efficiency of the end-to-end process, thereby jeopardizing the performance of that process. We heard of an enterprise that embarked on a strategic initiative to improve the quality – hence reduce the failure rate – of its electro-mechanical products. However, payment of repair technicians was (also) based on the number of malfunctions they repaired. Naturally under these conditions repair technicians will not be overly enthusiastic to provide suggestions for improvement. Technicians had no interest in eliminating causes of failure, since it affected their pay directly and negatively. Not surprisingly, the quality initiative subsequently failed. Lack of formal attention to organization architecture is likely to lead to incoherence and inconsistency being covert. Internal organizational conflicts linger on, thereby frustrating effective enterprise operation. Others have remarked similarly that “Nothing is more dangerous than a conflict between a company’s stated mission and the way it is actually run. That breeds rampant cynicism" [Moss Kanter et al. 1997, p. 18]. Table 7.4 gives examples of organization architecture. Additional examples of organization architecture were given in paragraph 5.7.3, when discussing the 'compliance' area of concern. Examples per sub-design-domain are given in Chapter 8.

7.3.6 Information Design Domains and Information Architecture

When discussing information technology in the previous chapter, we mentioned that the term 'information' in fact implies a human actor for whom 'data' has meaning. So many of the topics discussed under the 'information' label should rather have 'data' as the identifying label. In this paragraph we follow the customary approach and use the two labels interchangeably.

We referred to the 'informatization' of enterprises in Chapter 3. Increasingly, 'information' becomes a crucial means to deliver products and services in an effective, efficient and customer-oriented way. In many cases information has become the primary production resource. The digital revolution mentioned in the previous chapter is the prominent example of Alvin Toffler's third wave: after the agricultural era and the industrial era, one can currently refer to the information era. In terms of the paradigm shifts mentioned in paragraph 3.4: work is not merely automated, but above all 'informated' [Zuboff 1989]. We have shown the pervasive influence of information technology in Chapter 6. Information is thus not an aspect of technology, but a core aspect of the very operation of the enterprise as a whole. Since work is 'informated', it is evidently crucial to guide how that should take place, hence it is crucial to establish the information architecture. We define information architecture as:

- *Information architecture*: a coherent and consistent set of principles and standards that guide how information must be used and handled.

Relevant information design domains are depicted in figure 7.27. The lower part of the picture shows domains that have to do with the informational foundation: the basic structure, the knowledge aspect and the quality of information. In the middle part, design domains are shown that concern operational aspects of information: the handling of data. Finally, the upper part of figure 7.27 shows design domains that have to do with the utilization of information, and deals with the exploration, presentation and exploitation of information. Obviously these domains have a clear relationship with the business and organization architecture, as shown in figure 7.24. So, a business design principle stating that revenue generation must be based on lifetime customer value, must be associated with supporting information architecture. For example by requiring that information about lifetime customer value must be available at all customer contact points. Likewise, an organization design principle that places decision-making at the lowest possible organizational level could have an associated information architecture principle stating that information about system and part failure rates must be available for all repair technicians. Table 7.5 shows some information architecture examples. Examples per sub-design-domain are given in Chapter 8.

Information architecture must be clearly distinguished from IT architecture. The latter architecture is a special instance of technology architecture, hence is the focus of the IT architect, whereas information architecture concerns the utilization and handling of information as a primary enterprise production resource. Like business architecture and organization architecture, information architecture is also thus a focus area of the enterprise architect. Referring to our discussion about data management in paragraph 6.6.6, we included this design domain as an information design domain that should (also) concern the enterprise architect.

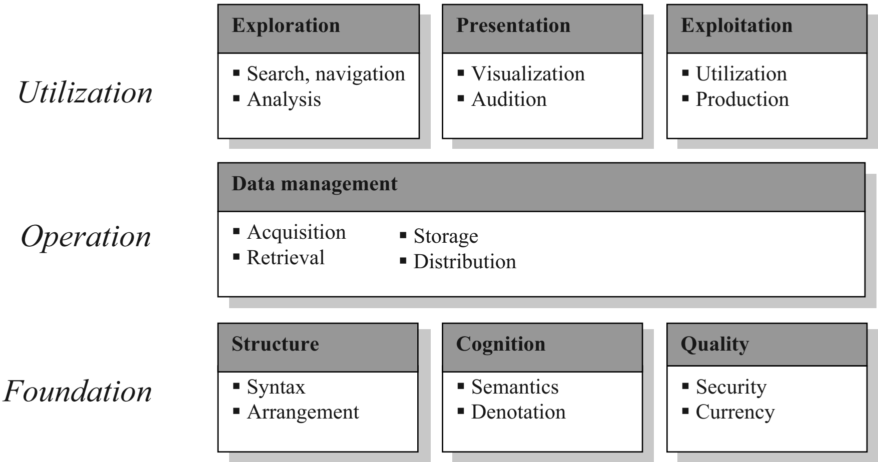


Fig. 7.27. Information design domains

Table 7.5. Information architecture examples

Information architecture
Data from operational systems must update informational systems in real-time
All informational data may have only one authorizing source
Information about lifetime customer value must be available at all customer contact points
Information about enterprise performance must be available at all employee portals
Type and purpose of information must be linked consistently to presentation style and form
Information structure must be based on the XML standard
Supplier data must be available from one unified source
Semantics must be consistent over all processes
Information about system and parts failure rates must be available for repair technicians
Customer data must be customer-manageable
All supplier/parts warranty conditions must be known to maintenance staff
Operational systems must enable easy capturing/storing of learning experiences

7.3.7 Technology Design Domains and Technology Architecture

Business, organization, and information design are enabled to a considerable degree by underlying technology. The dominant position of information technology outlined in the previous chapter is a case in point. Hence, the business, organization and information architectures have strong relationships with the technology architecture. In view of the dominant position of information technology, the associated IT architecture is often the only architecture addressed formally within the technology architecture perspective. This architecture and the associated design domains was discussed in Chapter 6.

The coherent and consistent relationship with the other architectures is emphasized again. Indeed, principles that determine business, organization, and information design have little impact if the underlying technology does not enable these designs. Conversely, as we have argued in the previous chapter: it seems pointless to introduce technology if the business, organization and information design do not match with the technology's functionality. We might recall the example given in paragraph 6.5.2, whereby the introduction of robotics for car production flopped because the cars were not designed for easy robotic assembly. Hence, business architecture (product design principles) was inconsistent with organization architecture (assembly design principles). Similar observations hold for the introduction of information technology. So it seems fruitless to introduce a system for customer relationship management if the enterprise design (e.g. culture, management practices, employee behavior, processes) is not directed towards customer support and satisfaction. Likewise, a system for employee decision support will turn out to be ineffective in a context where decision-making is seen as a management prerogative. Technology introduction can not only be ineffective, such as by merely automating existing processes. but even detrimental. For example, it has been reported that the introduction of a work-routing/scheduling system that issued single chunks of work to be performed by individual employees, in fact destroyed collaboration among employees and reduced the overall organization competence [Bannon 1998].

7.3.8 Two Hypothetical Firms: The Importance of Unity and Integration Illustrated

The importance of unity and integration will be illustrated by contrasting the behavior of two hypothetical firms producing elevators. The first firm named 'Elevation' produces elevators for various purposes, and bases its growth on business strategic choices such as innovation, quality, and customer orientation. When defining its business architecture, many aspects were taken into account. For example, the basis for economic conduct and customer orientation is based on the customer's lifetime value. Innovative products and services must be customizable to satisfy specific customer demand. The firm wants to be a market leader, and customer behavior, as well as competitor developments, are followed closely.

Organization design (organization architecture) is coherent and consistent with business intentions and the associated business architecture. Employees are seen as the crucial core for success. Employee self-management (decision-making, taking initiatives) is fully congruent with the chosen organismic way of organizing, and provides enterprise flexibility and the ability to adapt. Organization architecture is defined that supports and stimulates innovation, quality and customer orientation. Employees are allowed to use part of their time for analyzing possible improvements or new developments. Management stimulates employee involvement and manifests the enterprise objectives in their behavior. The enterprise culture reflects norms and values about quality, safety, service, customer orientation and taking initiative for improvements. Learning (also from mistakes) is actively stimulated. So rewards systems attempt to stimulate cross-functional cooperation, problem-solving, and improvements, which in turn reinforces related norms and values. Management information and accounting systems are arranged such that they report about performance indicators that are congruent with business and organizational objectives. Organizational arrangements are based further on the horizontal, process orientation, whereby the unity and integration of various activities is safeguarded in view of the desired process output. In an extended sense, processes of business partners and suppliers are integrated seamlessly with internal production processes. Quality and timeliness of deliveries are thus enhanced.

In view of the above, not surprisingly, adequate information about customers, elevator performance, competitors, and operational processes is viewed as crucial. All customer information (their level of satisfaction, elevator performance, sales volume, possible future sales etc.) must be available at all customer contact points and for every contact channel. Information about process performance, products and services quality, elevator disruptions, and customer complaints and appraisals, are available consistently for everybody throughout the enterprise. Even information about the precise location of elevators in customer facilities is available. Elevators are connected to the Internet and thus provide data about their operational status to the helpdesk and the maintenance department, so that malfunctions can be corrected expeditiously. Understandably, considerable attention is given to defining information architecture.

Finally, technology plays an important role for elevators themselves, as well as for producing them. Additionally, technology is assessed from the need to support the current enterprise objectives, as well as from its ability to conduct enterprise activities differently, or even to conduct a different enterprise. Hence, technology for product and service innovation, process innovation, or business innovation. Within the process-centric perspective mentioned earlier, IT systems are developed for supporting and stimulating employee collaboration. These IT collaborative services result in important benefits: shorter product and service development time, shorter sales cycles, faster problem-solving, and improved feedback about products and services. All in all, higher productivity and more effective enterprise processes.

As mentioned, technology is also used for product and service innovation. Elevators are provided with intelligence to minimize waiting and transport time for users. New creative directions are not ignored. Experiments are currently conduced to turn elevator walls into displays for showing various images or text (an idea from some employees). One might consider 'space-creating' images, but displays can also be used for advertising, company information or communication. Elevator information can be adjusted to the type of building and persons using it (office, shopping center, senior citizens service apartment etc.), as well as the time of utilization (such as restaurant information during lunch hours, or travel information when office hours end). The traditional elevator is thus complemented with 'elevator services', which constitutes a promising direction that the firm explores and likely will exploit.

The intentionally created unity and integration of business, organization, information, and technological aspects gives 'Elevation' a high level of competitive advantage: it is flexible and agile in terms of new product and service developments, and has the ability to change. In short, 'Elevation' manifests a coherent and consistent enterprise architecture that enables the successful realization of strategic initiatives.

Competitor 'Facelift' increasingly lost market share and needs to change drastically. However its strongly short-term operational and financial focus offers no fruitful context for reflection, let alone a discussion about architecture. The firm is not clear and consistent about its intentions, and jumps from one theme to another. The CEO recently stated: "What this organization needs is a new culture, which my secretary is now typing out". Quality, customer and service orientation are still other themes with poor success. Many aspects in 'Facelift' are conflicting. The help desk, for example, is evaluated by the number of customers 'handled' per hour. Many ineffective, short conversations with customers are the result, and customers are dissatisfied. An IT system for customer relationship management (CRM) is purchased, but the enterprise context in which the system should function has somewhat of a disdain for customers. The introduction of the CRM therefore achieves little success, and marks yet another strategic failure. Product improvements are barely realized. Maintenance technicians are evaluated and paid partly based on the number of product malfunctions they repair. Suggestions for product improvement are thus scarce. Further, the present culture makes an open discussion about failures virtually impossible. The individual, competitive climate is not conducive to collaboration and freely exchanging information.

Data presented in management information and accounting systems does not reflect the verbal intentions about quality, service and customer orientation. Productivity and traditional cost indicators prevail. As one employee expressed: "Quality is king, but productivity is God". So, gradually, the 'unwritten rules of the game' develop and settle in the company's culture. Parts shortages hamper effective production since the purchasing department is managed pertinent to the lowest possible stock level. Management reporting, reward systems, and all kinds of evaluating and decision-making structures keep activities captive within enterprise silos. The sales department, for example, sells anything in order to satisfy its targets, totally ignoring the production capabilities. Similarly, the production department itself is evaluated based on total costs, and is thereby inclined to impede new product developments that might increase production costs. Elevator assembly is all too often disrupted since parts-supplying departments are assessed on their local efficiency, and not on the efficiency and effectiveness of the end-to-end production process. In order to make processes effective, it becomes necessary to address issues outside one's own silo. However, as indicated, silo-oriented financial and budget structures make that virtually impossible. Cross-functional collaboration and seamless processes are thus developed inadequately. New product developments are therefore often frustrated.

The short-term financial focus mentioned earlier does not provide a fertile ground for long-term investment proposals. Technology adaptations therefore occur in a fragmented and ad-hoc manner. The introduction of technology is not placed adequately within the context of a coherent and consistent business, organization, and information perspective. As mentioned previously, the introduction of the CRM system took place without assessing the business, organization and information conditions for making the IT system effective. Expensive technology is thus utilized ineffectively within processes which are far from optimal, leading to increased complexity and costs.

Business at 'Facelift' is thus far from favorable. The board considers a joint venture or even a merger with a competitor in order to face the competition with 'Elevation'. A lack of internal coherence and consistency makes the maneuver's success questionable.

7.4 Enterprise Governance Competencies

7.4.1 The Competence-Oriented Enterprise Governance Approach

When discussing the fundamental difference between the mechanistic and organismic view on governance, the limits of the mechanistic approach have been argued. Subsequent chapters on corporate and IT governance provided further substantiation to question the tenability of the linear, top-down, planned, management, structure and control-oriented approach to governance. Chapter 3 placed the argued organismic way of organizing in the context of enterprise governance, whereby a central governance competence was emphasized (cf. paragraph 3.2.5). This competence is essential for establishing adequate strategic and deployment capabilities: the ability to establish a coherent and consistent set of strategic choices, and the ability to deploy these choices through a unified and integrated design and its implementation. In other words, the enterprise governance competence is crucial for obtaining the upper-right quadrant in figure 7.28. Qualifications for the other quadrants are self-explanatory: the inability to deploy an adequate strategy seems wasteful, while the ability to deploy an inadequate strategy seems barely effective. Remaining in the lower left quadrant with no capabilities in either area leaves little hope. Our considerations for the competence-based approach to enterprise governance were summarized in paragraph 7.1.3.

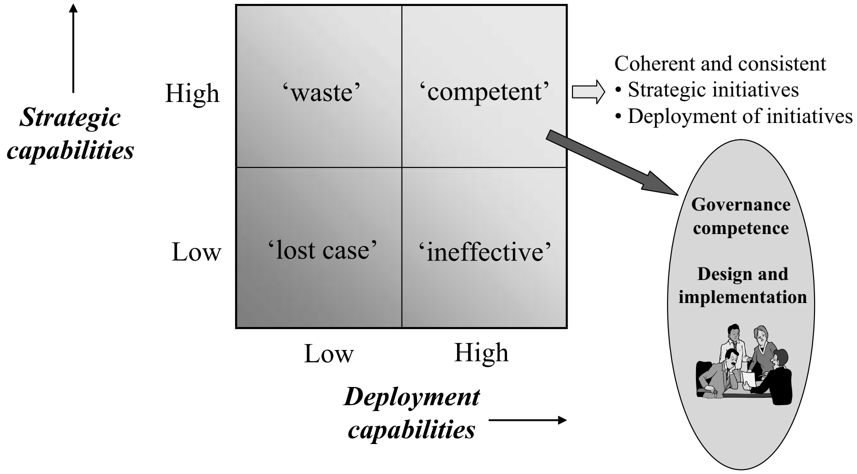


Fig. 7.28. The essential role of the governance competence

Comparably as with IT governance, the driving force behind establishing unity and integration does not come from strategic planning, but from an organizational governance competence, with competent individuals in it. We repeat that it is this organizational competence that interprets and addresses the, partly technology driven, environmental dynamics, and that operationalizes, details and elaborates vague, generally formulated strategic intentions and objectives into possible business, organizational, informational, and technological developments. It is this competence that – in contrast to what the linear, top-down, management and planning-oriented view suggests – initiates enterprise developments bottom-up, which anticipate possible external developments and their associated dynamics (enterprise enablement). It is this competence that constitutes and shapes the strategic (business and IT) dialog and informal social interaction, participation and integration of stakeholders. It is this competence that ensures a unified and integrated design and its implementation. It is this competence finally, that provides the very foundation for further developing and professionalizing the enterprise governance competence itself. This competence, and its core competencies within, will be discussed below.

7.4.2 Core Competencies of Enterprise Governance

Paragraph 1.4.2 introduced the general notion of an enterprise competence: an integrated whole of enterprise skills, knowledge and technology [Hamel and Prahalad 1994]. The 'resource-based' perspective teaches that the required enterprise competencies and their associated resources are obviously contingent on the domain in which the enterprise is active. Nonetheless, a general competence that is relevant for every enterprise is the competence that – in the face of complexity, dynamics and uncertainty – enables the emergence of strategic initiatives and their ultimate operationalization in *unification* and *integration* of enterprise skills, knowledge and technologies. Hence it enables establishing a unified and integrated *design*. Important enterprise design domains have been discussed previously: the business, organization, information, and technology design domains and relevant sub design domains. The integration of enterprise skills, knowledge and technology, as stressed by Hamel and Prahalad, thus receives formal attention through the design process and the design domains in order to actually establish the integration emphasized. Within the enterprise engineering perspective, the concept of enterprise architecture for normative design guidance has been presented as an essential methodology for ensuring coherence and consistence between the various enterprise aspects.

Conceptually, the three enterprise core competencies are comparable with, and are the complement of, the IT governance competencies discussed previously. In view of the definition for enterprise governance given in paragraph 7.1.3, the enterprise governance competence concerns integrated attention for: (1) strategy development (establishing strategic choices, initiatives, areas of concern and their related objectives), (2) the development of enterprise architecture guiding enterprise design, (3) the design of the enterprise, (4) defining the portfolio of subsequent projects, and (5) implementing the projects.

Three core competencies will be discussed that are essential for the overall enterprise governance competence. They have a considerably different character, but are strongly related:

- Enterprise strategy and architecture development *conceptuall, directed to design*
- Enterprise project portfolio management *financial, administrative*
- Enterprise program management *execution, implementation.*

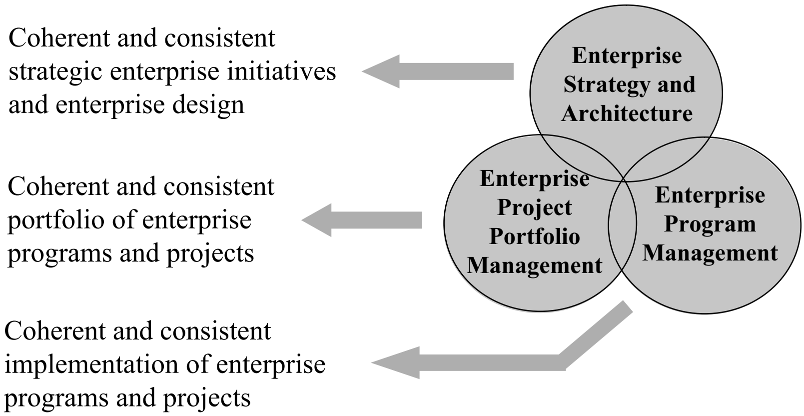


Fig. 7.29. Enterprise governance core competencies

These core competencies cover the enterprise governance domain in a coherent way, and are essential competencies that are not to be outsourced, hence must be retained in-house. The core competence for strategy and architecture development is considered as the primary competence, largely determining the activities of the other competencies. In view of our notion of 'governance' we will not consider competencies that have to do with the enterprise operation (delivering products and services) as part of enterprise governance. However, the enterprise governance competence will affect the enterprise operation. Indeed, the manner by which enterprise products and services are delivered is determined to a considerable extent by enterprise architecture, since architecture determines enterprise design.

The three core competencies are depicted schematically in figure 7.29. In view of the analogy with the IT governance core competencies, we will limit ourselves to a brief discussion.

7.4.3 Enterprise Strategy and Architecture Development, High-Level Design

Strategy has been defined as the totality of choices that provide an overall orientation concerning future enterprise developments (cf. paragraph 3.2.2). For reasons illustrated throughout this book, this totality has a very dynamic character. This is due not only to the emergent, incremental nature of strategy development, but also to the fact that the initial set of choices cannot be complete and exhaustive. Rightly, initial choices are general, whereby – as emphasized earlier – their precise operationalization is not yet clear. So, for example, strategic choices concerning higher customer satisfaction, lower operational costs or compliance, necessitate further analysis to define how, and through which design domains, the initial strategic choices are being addressed. Additional strategic issues will thereby surface, such as concerning human resources management or IT. This process will be further illustrated below. Ultimately, strategic choices will materialize in enterprise design under guidance of the applicable architecture. Examples of design domains and architecture have been given previously.

As we have argued in Chapters 2 and 3, enterprise strategy development is a generative thinking and learning process, rather than a top-down planning process, whereby strategy emerges out of an interplay of various mutually influencing topics. Some important topics are:

- External developments
- Enterprise architecture development
- Areas of concern
- Enterprise commodity infrastructure and services
- Enterprise life-cycle management.

We will discuss these topics briefly to show their influence and contribution to enterprise strategy development.

External Developments

A wide range of developments can be mentioned, such as economic, political, societal, business, legislative or technological developments. Chapter 3 specifically discussed the highly dynamic enterprise context created by business and technology developments. Progress in information technology is a case in point, as addressed in Chapter 6. Chapter 5 discussed external developments from the legislative perspective, particularly regarding corporate governance.

Evidently, many external developments affect the definition of an enterprise strategy. An additional external development having a considerable effect on the topics discussed in this section is the provisioning of services by external service providers for executing internal enterprise processes or parts thereof. Particularly, the developments under the label 'service-oriented architecture' are noteworthy and necessitate more explicit attention for enterprise commodity infrastructure and services and their life-cycle management. We will review the essential aspects of the service-oriented approach briefly in paragraph 7.5 and show that this approach fits neatly within our enterprise governance perspective and its core competencies.

Enterprise Architecture Development and Areas of Concern

These topics require no further elaboration since they have been amply discussed previously. We refer to Chapter 4 for the general discussion about architecture and areas of concern, whose concepts are applied to enterprises in this chapter.

Enterprise Commodity Infrastructure and Services

Many internal enterprise services are not unique for a specific enterprise unit, but can be used enterprise-wide. This compares with the IT commodity infrastructure and services discussed in Chapter 6, which are in fact an important part of the enterprise commodity infrastructure and services. Next to well-known infrastructural arrangements and services, such as concerning electrical energy or IT services, examples of enterprise commodity infrastructure and services can be found in areas such as personnel, communication, finance or education. The enterprise commodity infrastructure and services often have relationships with IT commodity infrastructure and services, for example in the case of e-mail or e-learning. Other examples of commodity services are facility, security, document management or content management services. Comparably as with IT commodity infrastructure and services, one might argue that the enterprise strategy and architecture core competence must be involved in the definition, design, and implementation of enterprise commodity infrastructure and services, not only for avoiding multiple instances of essentially similar infrastructure and services, but also in order to safeguard their integrated operation.

The topic of enterprise commodity infrastructure and services will gain further importance through an increased use of so-called 'enterprise services' that can be provided externally or internally, as mentioned above. A service executes a part (or the totality) of an enterprise process, and can be (re)used enterprise-wide. Hence these services are truly commodity services and must be governed by the central governance competence.

Enterprise Life-Cycle Management

In the widest sense, enterprise life-cycle management concerns the formal process from the development (design), implementation and improvement, up to the possible ultimate replacement or discontinuation of enterprise 'components', such as infrastructure, systems, services or processes. Given the growing importance of enterprise commodity infrastructure and services, they constitute a major area of attention for life-cycle management within the central enterprise governance competence. Specifically the growing interest in the service-oriented approach mentioned above, has placed a focus on the life-cycle management of enterprise processes and the commodity services used by these processes. Understandably, IT life-cycle management is an integral part of enterprise life-cycle management. Life-cycle management of enterprise commodity infrastructure and services is thus a central area of attention of the enterprise strategy and architecture core competence.

Enterprise Strategy Emergence

Multiple aspects – often mutually related in unforeseen ways – determine the emergence of an enterprise strategy. The five topics, discussed above, and their mutual relationships are shown in figure 7.30.

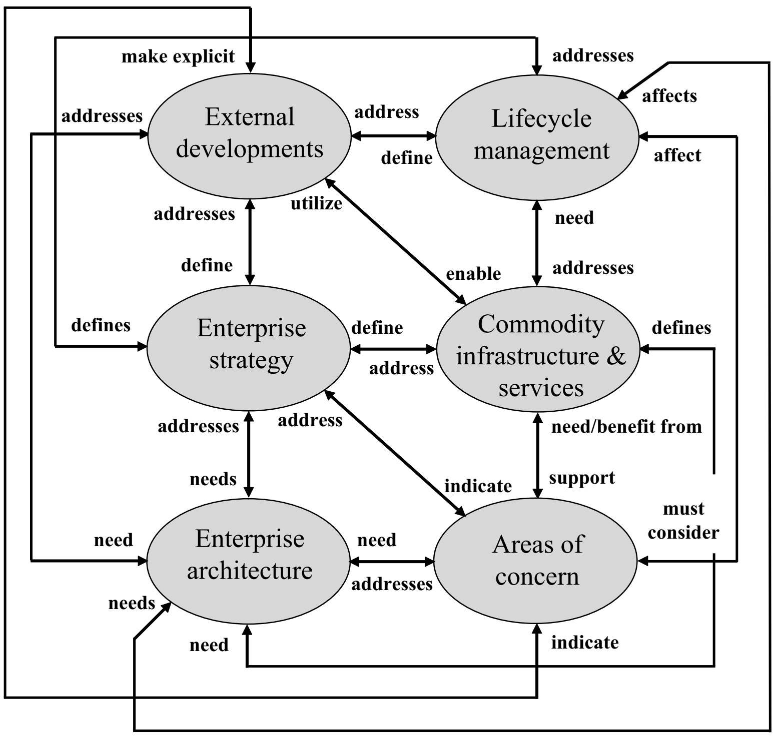


Fig. 7.30. Various topics defining the enterprise strategy

Comparably as in the case of IT strategy, we emphasize that the mutual relationships do not occur in a planned sequential order, hence cannot be addressed that way. The relationships between the various topics are present concurrently, whereby events concerning one topic might affect other topics in an often unpredictable way, which can only be addressed effectively by the governance competence. The importance of the competence-based approach to enterprise governance might be appreciated further by envisaging the occurrence of the various relationships concurrently, or sequentially, over time. Only the enterprise strategy and architecture core competence can address these emerging relationships properly. This core competence, dealing with enterprise strategy and architecture development, is thus the driving force for the process of emerging strategy development, subsequent analysis and synthesis, architecturing, and designing. Such a process is far from linear and sequential, but is instead iterative and concurrent, as will be illustrated in paragraph 7.4.6. The enterprise strategy and architecture core competence comprises the totality of knowledge and skills for carrying out the various activities pertinent to the topics discussed, and for translating the outcome of these activities into a unified and integrated enterprise design. For this design of the enterprise, the enterprise engineering theory and methodology discussed previously is considered the core knowledge and skills area.

7.4.4 Enterprise Architecture Management

In accordance with our discussion in the chapter about IT governance, the result of architecturing (architecture) is only then effective if architecture is used during the design process. An important task within architecture management is therefore the formal publication of architecture. With reference to our general discussion in paragraph 4.2.8, and to the publication format of IT architecture, enterprise architecture can be published according to the following structure:

1. The actual formulation of the architecture principle or standard
2. The rationale for the principle or standard
3. The implications of the principle or standard
4. Possible actions (through formal programs or projects) necessary for effectuating architecture.

This structure can be illustrated as follows. Table 7.4 gives an example of an architecture principle reading: decision-making must take place at the lowest possible organizational level. The rationale for this principle might have to do with areas of concern regarding enterprise flexibility or customer satisfaction. Many implications can be associated with this principle, for example implications regarding employee competencies, the management style, rules about decision-making, information supporting employee decision-making etc. Subsequent activities must thus be undertaken as a result of the principle and its implications. One might consider employee training, changing decision-making rules, or the arrangement of decision support IT systems.

Within our perspective on architecture as a normative concept, architecture has a broad 'legislative' character. Establishing a coherent and consistent set of principles and standards can be cumbersome since stakeholders often have conflicting interests. An 'Architecture Review Board' in which essential stakeholders are represented can aid decision-making in this respect. However in line with earlier remarks, it is architecture that gives the normative design guidance, not the organizational entity deciding about architecture. Architecture management is responsible for the process from initial draft publication, the processing of possible comments and formal approval, up to the definitive publication.

As the example given above illustrates, architecture definition might necessitate carrying out various successive activities of a different nature: initial studies, pilot projects, or formal projects or programs. Thereby, the relationships with the two other core competencies play an important role, as well as the relationships with the IT governance core competencies. Maintaining these relationships is a second important task of architecture management.

Just as with IT architecture, 'compliance' with architecture is also crucial in the case of enterprise architecture. Hence it must be formally declared that the design takes place in conformity with the published architecture. If deemed necessary, the enterprise strategy and architecture core competence can grant (temporal) permission to deviate from the published architecture, and stipulate the conditions under which the permission is granted. Only through this formal approach can architecture survive as a normative, legislative concept. A third important task of architecture management thus concerns architecture compliancy. In view of this, the enterprise strategy and architecture core competence must be involved with (high-level) enterprise design in order to assess, and if necessary, adjust the design.

7.4.5 Enterprise Project Portfolio Management and Program Management

When discussing IT governance, the difference between a project and a program has been outlined. In short, a *project* is a carefully planned and organized set of activities for realizing a specific, one-time objective, whereas a *program* can be viewed as a cluster of projects that must be coordinated in order to contribute to a higher-order (general) strategic goal.

Strategy development and subsequent enterprise design lead ultimately to the definition of projects and programs to implement the design, hence operationalize the strategy. The discussion about enterprise architecture management indicated that to a significant extent, projects and programs are defined by the process of architecturing: they are necessary subsequent activities for making architecture effective. The totality of projects and programs forms the enterprise program and project portfolio. We define the *enterprise program and project portfolio* (mostly identified in brief as the enterprise project portfolio) as the central, unified list of all enterprise programs and projects and their associated core data. Core data, for example, covers reasons for initiating programs and projects, objectives, resources, costs and project execution time. The focus on a project portfolio marks the transition from managing individual projects towards managing a cluster of related, unified projects.

Since the enterprise project portfolio is a comprehensive list of all enterprise projects, it should also contain the IT projects. This is evidently an expression of the integrated and concurrent development of enterprise and IT design. Authors about IT portfolio management have voiced this viewpoint: “Business management should own the IT portfolio” [Maizlish and Handler 2005, p. 80]. As a minimum, co-ownership is suggested [op. cit.]. Within the broad perspective on portfolio management, as discussed in paragraph 6.6.4, a corporate portfolio management office is suggested that likewise exercises a comprehensive focus: “Corporate PMO needs to manage all the projects in the company, whether they are IT related or not” [Bonham 2005, p. 23]. For similar reasons given in the case of IT portfolio management, we do not concur with the broad perspective on portfolio management (cf. paragraph 6.4.4). However, we do support the notion of a comprehensive enterprise portfolio, which is a necessary consequence of the comprehensive enterprise governance notion.

The importance of unity and integration has been emphasized amply as an important objective of enterprise architecture. Evidently, a unified and integrated design must be operationalized through a similarly unified, coherent and consistent set of projects and programs. Precisely therefore, the enterprise strategy and architecture core competence is crucial for defining the projects and programs, since it is the design that is the foundation for a unified, coherent and consistent portfolio of projects and programs.

In view of the above, we define enterprise project portfolio management as the totality of activities for ensuring that the project portfolio is accurate and up to date, such that project management and pertinent evaluation and decision-making is facilitated, for example about resources needed, project execution priorities, project execution risks, project progress, etc.

Implementing projects and programs takes place under enterprise program management guidance. This core competence has been recognized as a critical competence for most enterprises [Ross et al.2006]. Despite the distinction between projects and programs, one refers mostly to enterprise program management. Sometimes this label is used to identify enterprise-wide management of IT programs or projects. The emphasized importance of a unified, coherent and consistent portfolio of programs and projects evidently likewise holds for their execution. We define *enterprise program management* as the coordination of supervising activities concerning the definition of enterprise project and program plans and the subsequent execution these projects and programs according to the respective plans.

Just as with portfolio management, the comprehensive notion of enterprise governance implies that enterprise program management has to deal with all enterprise programs and projects, hence including those for IT.

7.4.6 Enterprise Development: The Role of the Governance Competence Illustrated

Chapter 2 outlined the fundamental difference between the mechanistic and organismic way of organizing, and argued the inadequacy of the mechanistic type of governance. Subsequently, Chapter 3 discussed the modern enterprise context from the business, organization, information and technology perspective. Next to significant dynamics, various paradigm shifts were associated with the modern enterprise context, and necessitated a different strategic 'perspective' (cf. paragraph 3.2.3). All that formed an important foundation for arguing the organismic, competence-based approach to governance, rather than the mechanistic, structure and management-based approach, since the latter approach cannot address the complex process of formulating strategic choices adequately, and cannot adequately address the complex transition from strategic choices and objectives regarding areas of concern, towards their ultimate unified and integrated realization either. We will illustrate the relevance of the competence-based approach by indicating the multiple facets associated with addressing a strategic concern.

As mentioned previously, a linear, sequential order is often assumed: from (1) strategy development, (2) the definition of strategic choices, (3) the definition of projects to realize the strategic choices, (4) the implementation of projects, and finally, (5) the operational utilization of the implementations for delivering products and services. This viewpoint is linked to the mechanistic governance approach, and has been thoroughly criticized previously. We have emphasized that the mechanistic, linear, planning-oriented, management-oriented, top-down portrayal of activities is naïve since reality teaches that activities have an emerging, collaborative, iterative and concurrent character [Ciborra 2001, 2002]. The multiple, often unpredictable relationships between the various topics that determine the enterprise strategy – as sketched in figure 7.30 – support this observation. Herein lies the essence of competence-based thinking: complexity, dynamics, and the associated uncertainty make it pointless to define activities precisely and sequentially in advance. An adequate enterprise governance competence forms the capacity to deal with complexity, dynamics and uncertainty, and to determine which activities, when, how and in what way, are performed. This capacity is essential with the complex, dynamical – hence for a significant part unpredictable – nature of the process of strategy development up until the ultimate implementation of strategic choices. Moreover, innovative ideas emerge mostly from within the enterprise, rather than from the top [Christensen 1997].

Consider the strategic initiative mentioned earlier about enhancing customer satisfaction. Many aspects determine the level of customer satisfaction. Figure 7.31 shows only a part of the possible relationships that affect customer satisfaction. As we have argued in paragraph 3.3, the behavioral context determines employee behavior, which in turn affects process execution, products and service quality, and after-sales activities. Take two aspects of the behavioral context more specifically: employee competencies and their way of employment. These aspects are

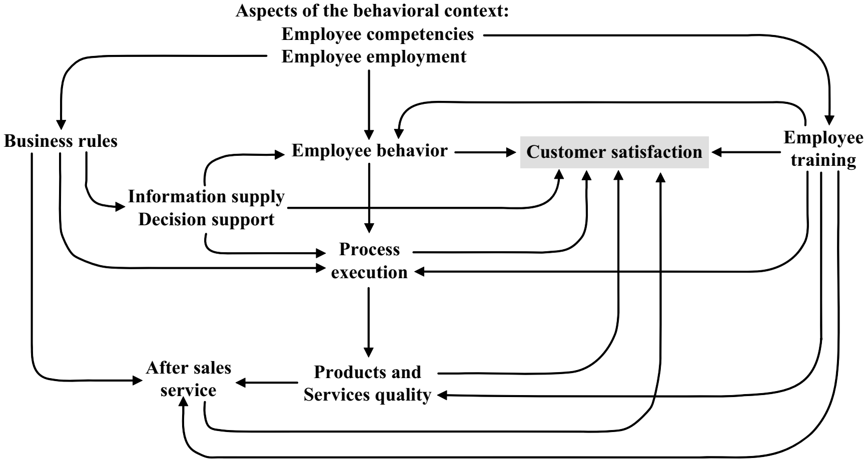


Fig. 7.31. Multiple facts of addressing a strategic concern

focus areas of the 'employees' design domain shown in figure 7.26, for which architecture must be defined, such as the architecture principle stating that decision-making must take place at the lowest possible organizational level. This principle is likely to enhance enterprise flexibility, while customer issues are dealt with more expeditiously. It is expected that customer satisfaction will thus be affected positively. The implications of the architecture principle are multiple, having to do with employee competencies, the employment of employees, the management style, the operational and decision-making rules under which employees work (business rules), and the information supporting employees. This latter aspect entails IT strategic initiatives in various areas, such as concerning systems for decision support. Employee training might be envisaged further to improve their competencies, which is expected to affect process performance, the quality of products and services and after-sales activities positively. This training initiative might lead subsequently to IT strategic initiatives, as in the case of e-learning. Evidently, the architecture principle mentioned affects the employment of employees. Hence business rules must reflect the architecture principle, which in turn affects the informational support and decision support of employees. These latter issues are also likely to lead to IT strategic initiatives. The associated programs and projects are part of the enterprise and IT project portfolio respectively.

So from an enterprise-wide perspective, the strategic initiative concerning customer satisfaction as an area of concern, and the architecture addressing the concern, point to many possible initiatives that must be addressed in a unified and integrated manner. This concerns the design of the enterprise as a whole. Put another way, the relatively vague notion about higher customer satisfaction must be operationalized (made concrete) by the enterprise design competence, including the definition of relevant architecture. Thereby, as illustrated, new strategic initiatives can emerge.

As the example shows, the development of IT systems must also be addressed concurrently. Hence, the enterprise governance core competencies also have emerging, collaborative, iterative and concurrent relationships with the core competencies of the IT governance competence discussed in Chapter 6. Within the IT domain there are likewise multiple areas of attention concerning the development of employee information and decision support systems, such as the quality and availability of information. This points to operational processes from which the data must be obtained, whereby security issues are likely to play a role. So, also within the IT domain, in an emerging, collaborative, iterative and concurrent manner it must be determined how (through which design) the strategic choice and area of concern will be operationalized. Additional strategic IT initiatives might thus emerge, for example concerning information security or compliance with rules and legislation. Associated programs and projects are likewise part of the IT project portfolio, and will be implemented through enterprise program management guidance.

Tight relationships exist between the enterprise strategy and architecture function and the enterprise program management core competency regarding the precise definition and execution of projects. Pilot projects are possibly required that determine the definite arrangement of enterprise design. Project priority is determined by many conditions. These priorities also become apparent in the collaborative, iterative process mentioned.

The foregoing sketch makes it clear that multiple collaborative, iterative and concurrent relationships and activities exist that operationalize strategic choices and areas of concern, which ultimately – through architecture – materialize in concrete enterprise design and the associated projects for realizing the design. The three core competencies form the foundation for that process. Evidently, decision-making must occasionally take place. However, the primary focus concerns the content about which must be decided, more than the structure of decision-making. Such content, as illustrated, is created in an emerging manner.

7.4.7 Enterprise Governance Process and Formal Meetings

Processes

In line with our remarks about the IT governance process given in paragraph 6.6.8, the previous discussion also indicates that the process of enterprise strategy and architecture development, enterprise design, and the definition of projects to implement the design is far from linear, planned and sequential. The process is concurrent and iterative, and has the characteristics of the generative thinking and learning perspective on strategy development discussed in paragraph 3.2.2. Depicting a process graphically with these characteristics is thus inherently problematic. Comparably as with IT governance, figure 7.32 aims nonetheless to illustrate the important activity domains and their relationships.

The process shown in figure 7.32 is similar to a large extent to the IT governance process discussed in paragraph 6.6.8. Not the development of IT systems, but the enterprise itself is the object of governance, within which corporate and IT governance is addressed concurrently. The figure reads as follows. Left are the activities that concern: (1) enterprise strategy and architecture development, (2) the development of enterprise commodity infrastructure and services, and (3) high-level design definition and verification. These activities are driven by all the topics shown in figure 7.30. The totality of activities defines programs and (pilot) projects in the manner described previously.

Subsequently, activities concerning enterprise project management are initiated, as well as those for managing the portfolio of IT projects. From an overall level, enterprise project management (or enterprise program management as it is generally called) controls the execution of projects.

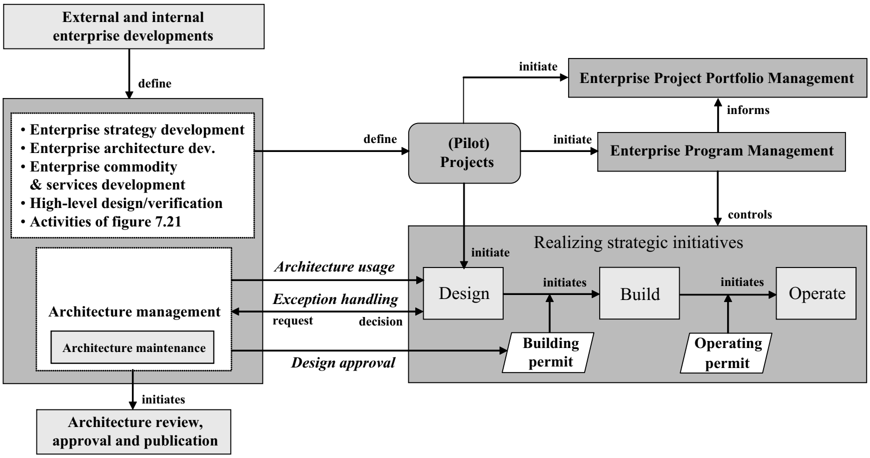


Fig. 7.32. Main activity domains and their relationships

The definition of (pilot) projects initiated the (detailed) function and construction (re)design of the enterprise or parts thereof (investment approval might be part of this initiation). Function and construction enterprise (re)design uses the applicable enterprise architecture. Exception handling deals with the requests and decisions about architecture deviations. Ultimately, the process of architecture compliance (possibly with approved deviations) leads to the issue of a building permit. As we have seen, alongside these activities, architecture management deals with architecture review, approval and publication, as well as with architecture maintenance: updating the set of principles and standards to address new insights and developments. Finally, prior to taking the (re)design into operation, the issuing of an operating permit helps to verify that various aspects for ensuring proper operational conditions are addressed, such as the arrangement of adequate testing, the availability of skilled resources, and equipment and site preparation. These latter issues are considered to be management, rather than governance aspects.

The enterprise governance process emerges as the result of the activities of the enterprise governance competence. In summary, this competence is effective in:

- Enterprise strategy development: establishing enterprise strategic choices and the definition of areas of concern and their objectives
- Technology assessment in close cooperation with the IT governance competence
- Using a formal conceptual framework and associated methodology for enterprise design that includes:
  - Designing the essential structural-functionalistic foundation (enterprise ontology)
  - The definition of enterprise design domains
  - The definition of enterprise architecture regarding the enterprise design domains that address strategic choices and objectives pertinent to areas of concern
- Architecture management that ensures:
  - Initial architecture development, review and formal publication
  - The utilization of, and compliance with, architecture in the design process and handles exceptions
  - The maintenance of architecture; periodic review and revision if required
  - High-level design and detailed design assessment
- The definition of enterprise commodity infrastructure and services
- Enterprise life-cycle management
- Managing central funding for enterprise commodity infrastructure and services
- Enterprise program management and enterprise project portfolio management that includes:
  - The definition of enterprise project and portfolio management categories of initiation (e.g. mandatory, opportunity, maintenance, etc.)
  - The definition of program and project methodology standards for initial program and project description, and continuous reporting
  - Post-project evaluation
- Maintaining productive collaborative relationships with the IT governance core competencies
- Maintaining effective relationships with stakeholders, specifically the enterprise community
- Developing and maintaining appropriate personal competencies
- The ability to grow and develop in maturity
- The ability to carry out the aforementioned activities concurrently, iteratively and perpetually.

Formal Meetings

We have argued amply that the competence-based approach to governance finds its justification in (1) the generative thinking and learning perspective on strategy development and implementation, and (2) the necessary design focus for addressing strategic choices and objectives pertinent to areas of concern. As illustrated, concurrent, iterative, and parallel activities become manifest in an emerging fashion. Many decisions are made 'ongoing' by the various actors involved, which is the essence of the organismic perspective. Nonetheless, certain courses of action and decisions have to be formalized. These courses of action and decisions concern the topics discussed previously, and are associated with the nature of the three enterprise governance core competencies. Hence, pertinent to the three enterprise core competencies, some formal meetings can be defined. Since the nature of these meetings can be appreciated from the topics discussed previously, we will only summarize them briefly.

- Enterprise strategy and tactics
  - Chaired by: CEO
  - Frequency: quarterly
  - Participants: business executive management, CIO.
- Business and IT strategy and tactics
  - Chaired by: CEO
  - Frequency: quarterly
  - Participants: business executive management, CIO, management of the IT service delivery organization.
- Enterprise design approval and architecture exception handling
  - Chaired by: the person in charge of the enterprise strategy and architecture core competence
  - Frequency: weekly
  - Participants: staff of the enterprise strategy and architecture competence, project leader of the project under consideration.
- Architecture review and approval
  - Chaired by: the person in charge of the enterprise strategy and architecture core competence
  - Frequency: ad hoc
  - Participants: staff of the enterprise strategy and architecture competence, senior enterprise architects, possibly other stakeholders, such as representatives of the enterprise operational domain.
- Project progress
  - Chaired by: person in charge of the enterprise program management core competence
  - Frequency: bi-weekly

  - o Participants: staff of the program management competence, project leaders on a case-to-case basis.

- Project evaluation
  - o Chaired by: the person in charge of the enterprise program management competence
  - o Frequency: ad hoc
  - o Participants: depends on the nature of the evaluation.

- Portfolio review
  - o Chaired by: the person in charge of the enterprise portfolio management competence
  - o Frequency: monthly
  - o Participants: management of the other enterprise governance core competencies, management of the IT portfolio management core competence (see Chapter 6), management of the financial support competence.

- Investment approval
  - o Chaired by: CEO depending on the investment level
  - o Frequency: follows regular pattern of the enterprise
  - o Participants: depends on the nature of the investment proposal.

7.4.8 Enterprise Governance Maturity Levels

Comparably as with IT governance, we will use two orthogonal axes to define the enterprise governance maturity grid, as shown in figure 7.33. The horizontal axis concerns the organizational maturity of the enterprise governance competence, while the vertical axis concerns the output maturity, hence, concerns the effects the enterprise governance competence is able to establish.

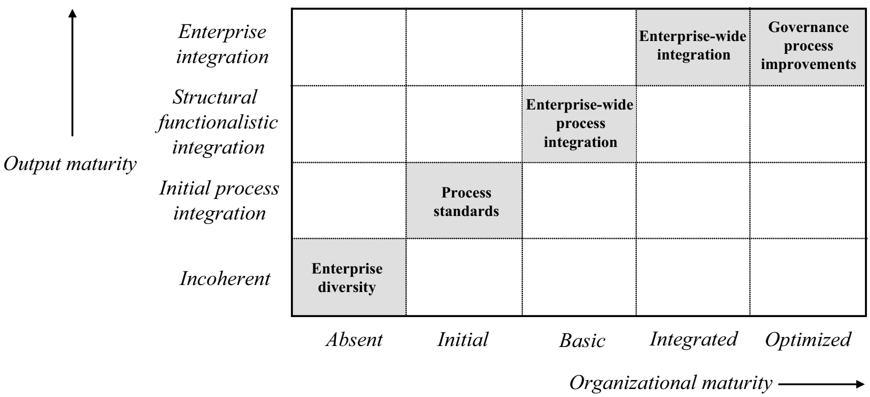


Fig. 7.33. Enterprise governance maturity grid

As emphasized earlier, from the initial enterprise governance set-up there will be a gradual increase in governance maturity: not everything can be optimized fully right from the start. For this growth in maturity, the initially instituted governance competence provides the foundation and is the very source of improvement. The process towards increased maturity is contingent upon various enterprise conditions, such as management buy-in, culture or pressing issues in need of governance. As an illustration, figure 7.33 shows various steps towards increased maturity. Despite the discrete nature of these steps, increase in maturity takes place in a continuum, whereby not necessarily all aspects associated with a certain level must be satisfied prior to addressing some higher-level activity. The two maturity axes can be outlined briefly as follows.

Organizational Maturity

This concerns the maturity of the enterprise governance core competencies, their integration, the associated processes, as well as addressing the personal competencies of the governance employees. We have defined five levels, labeled as follows:

- *Absent*: no enterprise governance competence exists.
- *Initial*: Some governance is exercised. Initial governance is mostly manifest through attention for some architecture (e.g. related to processes). Attention for rationalizing the portfolio of enterprise projects also manifests an initial focus on enterprise governance.
- *Basic*: all enterprise governance core competencies are arranged and their associated processes established. Roles and tasks are outlined, and personal employee competencies are defined. All core competencies use concepts, knowledge and methodologies that are relevant within their respective activity domain: architecture theory and utilization, portfolio management, and program management. Architecture is used in enterprise projects.
- *Integrated*: the enterprise governance core competencies are fully integrated and constitute the enterprise governance competence. This competence is fully integrated in the enterprise (strategic) development processes. Architecture compliance and exception handling processes are an integral part of enterprise development. Formal attention from the enterprise governance competence for enterprise commodity infrastructure and services development and life-cycle management is acknowledged and accepted. Enterprise CI&S budget is centralized, and ownership rests with the enterprise governance competence. All enterprise projects are assessed by the program management competence, and project progress is supervised.
- *Optimized*: indicators and metrics have been defined that enable enterprise governance competence optimization. One might consider indicators pertinent to staffing, training, architecture exceptions, exception handling, project success rate and so on. Periodic architecture review and updating takes place, as well as post-project evaluation.

Output Maturity

The depth, reach and impact of enterprise governance is expressed by the output maturity. Four levels are identified:

- *Incoherent*: due to the absence of enterprise governance, considerable diversity exists which precludes the enterprise operating as an integrated whole.
- *Initial process integration*: some initial enterprise integration is arranged at the process level, such as through (information) technology standards.
- *Structural-functionalistic integration*: full enterprise integration is arranged for the foundational substrate of the enterprise, based on a formal design methodology and the use of architecture for enterprise process implementation and the associated IT support.
- *Enterprise integration*: comprehensive enterprise-wide integration is established, involving all (necessary and sufficient) enterprise design domains, for which architecture is developed to address strategic choices and objectives pertinent to areas of concern.

7.5 Service-Oriented Architecture and Enterprise Governance

7.5.1 The Service-Oriented Concept

The term 'service' has many meanings. In paragraph 2.4.4 a service was defined as an "intangible exchange of effort for money that occurs in an interpersonal relationship that can't be recaptured, only repeated" [Bell and Zemke 1990]. Enlarging the scope beyond that of interpersonal relationships, we can generally refer to a relationship between a service requestor and a service provider, whereby the service addresses the execution of activities by the service provider on request of the service requestor. Thinking in terms of services is thus based on the request/reply pattern, which fits within the basic transaction pattern discussed in paragraph 7.2.

Although the service-oriented concept originated from within the discipline of information technology, in our view the underlying notion can be applied to any service. Essentially, the service-oriented architecture approach means that design principles (architecture) are used for service request and service reply, such that the utilization of a service by the service requestor – hence the provisioning by the service provider – takes place through a well-defined interface, whereby the service utilization is fully independent of its implementation. Put another way, the interface defines the service, and the service requestor can use the service without bothering about how the service provider has implemented the service provisioning: the interface 'hides' the internal arrangements of proving the service. The service-oriented approach is thus a specific way of *designing* service invocation and provisioning, based on the associated architecture. As figure 7.34 indicates schematically, the service-oriented approach implies that the interface must be defined precisely.

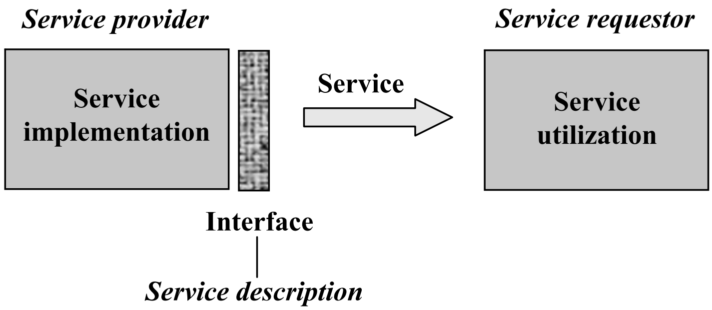


Fig. 7.34. The service-oriented concept

The basic idea is that by specifying the interface conditions precisely, including the functionality the service provides, a service requestor can easily change to another service provider offering the same service under similar interface conditions. Hence, the service-oriented concept will enhance enterprise flexibility considerably. An important aspect thus concerns the service description that must be available at the interface. Three aspects are important [Berg et al. 2007]:

- *Service logic*: describing the functionality provided and the manner through which the service can be invoked
- *Quality of service*: the specification of operational performance (e.g. response time, availability) and associated conditions (e.g. maximum number of concurrent users)
- *Delivery conditions*: the specification of commercial and legal conditions.

From the development and support perspective, Mulholland et al. stress creating arrangements additionally for communication with, and the support of, third party developers, as well as for communication among these developers [2006]. Notably, the 'service-oriented architecture' label might suggest unjustifiably that use of the term 'service' does imply that the conditions described above are satisfied. Evidently, given the general use of the 'service' term these conditions are not implied. Only for certain services, their utilization is fully independent of their implementation.

For many services, the way to invoke and utilize them is clear intuitively because of knowledge about their provisioning or the interface conditions. So we can literally consume a meal service in a restaurant since we know how that generally takes place. Often some service descriptions are given: the menu, opening hours or method of payment. When a 'served' restaurant is expected, but self-service appears the mode of operation, the consumption of the meal service turns out not to be independent of its implementation. In many cases the utilization of a service is indeed not independent of its implementation. For example, the use of an external service for carrying out monthly employee salary payments involves many administrative and documental arrangements that define the relationship with the external service provider. Changing to another provider is thus cumbersome. Likewise, utilization of a telephone service is often not implementation-independent for various reasons, one being the telephone number itself. Again, this implementation-dependence limits flexibility in changing to another provider. One might consider the ability to obtain cash from any automatic teller machine, and with any bank card, as a financial service whereby its utilization is fully independent of the various implementations.

7.5.2 Service-Oriented Architecture and Enterprise Process Execution

Services Executing a Process

In terms of the enterprise ontology discussed in paragraph 7.2, understandably services can be used in enterprise processes for performing coordination or production activities. This is no novelty: many processes use internally or externally provided services for carrying out certain tasks, such as administrative, parts supply, logistics or IT services. Rather, the novelty is the use of services that satisfy the conditions outlined in the previous paragraph, such that their utilization is fully independent of their implementation. In this case, a service concerns the provisioning of functionality – hence the execution of process activities – through a well-defined interface, whereby the interface specification is necessary and sufficient for invoking and using the service [Sprott 2002].

Services that satisfy the service-oriented architecture principles can be provided by internal, as well as by external, service providers. The emergence of so-called 'web services' is both a manifestation of the trend towards the use of services for the execution of business processes, and a manifestation of externally-provided services that satisfy the service-oriented architecture approach. Web services provide well-defined functionality that can be invoked by accessing the web. Put another way, these services are Internet-accessible software components designed to perform a specific piece of an enterprise process. Notably, the service-oriented approach might be arranged through using web services, but they are not necessarily required. Other types of services can also be used, such as services developed in-house.

When using the services concept for executing an enterprise process or parts thereof, three roles can be identified:

- *Service provider* offering the service and publishing the service as such
- *Service requestor* utilizing the service
- *Service registrar* that provides a searchable registry of service descriptions that enable service providers to publish their services, and service requestors to find needed services.

Various standards have emerged for publishing and invoking IT-based service functionality that support the service-oriented concept within the IT domain [Erl 2007].

A number of fundamental changes are associated with the service-oriented architecture approach. For example, rather than IT applications supporting enterprise processes, the services execute enterprise processes or parts thereof. One might thus envisage the execution of an enterprise process as the orchestration of the services that must be invoked [Veryard 2002]. Meanwhile, business process execution language has been developed that enables such orchestration (for certain types of services) [Erl 2007]. Figure 7.35 shows an example where various services and their orchestration execute a process from the on-line purchasing of items to their delivery. We might consider figure 7.35 as the symbolic representation of the execution of the transactions T01, T02, and T04 in figure 7.10, through the use of services, whereby it is assumed that the action rules enforce a positive reply (promise) only if stock is available, otherwise the request must be declined. The dotted line in figure 7.35 indicates that other activities have to be carried out, not covered by services.

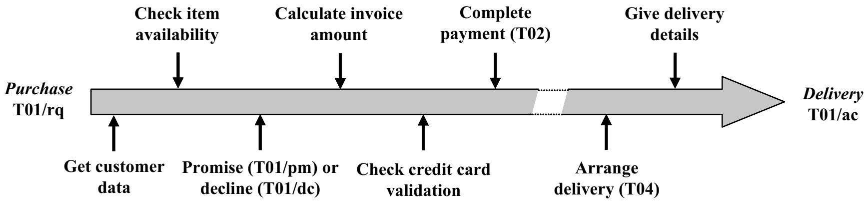


Fig. 7.35. Example of services executing an enterprise process

Defining the type and granularity of services is generally not a simple issue, but follows from considerations about enterprise design. These considerations benefit considerably from using the enterprise engineering methodology outlined previously. Notably, in this example a service is used for handling the coordination activity for promising or declining the purchase request, while two services act at the ontological level for arranging payment and delivery. The other services are of infological nature.

Services that are based on service-oriented architecture principles operate autonomously. That is, they are invoked and used in the process through the process orchestration, whereby the respective services have no inherent relationships with one another. Relationships are formed by the process orchestration and can therefore be changed easily. The set of services thus forms a loosely-coupled system that offers a high level of flexibility: the type of services, their orchestration or their provisioning can be changed simply. The autonomous character of services also appears from the fact that there is (in principle) no control about their use: where, when and in which processes the services are used is unknown.

Applications on the other hand are often linked tightly to the supporting process and the underlying infrastructure. As such, they manifest limited flexibility. Minor changes turn out to be time-consuming. For example, if various administrative and operational applications use currency exchange rate information, the incorporation of a different exchange rate involves changing all applications manually. Alternatively, the provisioning of an exchange rate service that can be invoked by the various applications enables updating all applications simultaneously. In view of the above, the IT support for enterprise processes will thus shift from developing applications to providing services [Hotle 2002].

Evolutionary Development: Services and Applications

Prior to service-oriented thinking, IT-based functionality to support enterprise processes was (and to a large extent still is) arranged through applications. Understandably the adoption of the service-oriented approach will not, and cannot, lead to a sudden discontinuation of the existing applications used. Hence, the eventual transition to the service-oriented delivery of IT functionality must be incremental and evolutionary. The services that are to be developed initially and subsequently are based on process design considerations, which are based in turn on (strategic) objectives that are to be operationalized through enterprise design. Moreover, the evolutionary transition to services does not necessarily imply the discontinuation of existing applications all together. Technologies have been developed that provide an interface to existing applications (that 'wrap' these applications), such that their functionality can be disclosed as a service. This might not turn out to be an easy task, since the structure of applications might preclude easy separation of the desired functionality and access to it. Similar considerations as mentioned above, and mentioned in paragraph 6.8 regarding the reduction of IT legacy complexity, play a role regarding the question as to which applications (or their parts) should have their functionality disclosed as a service. Addressing all these issues adequately cannot be accomplished without the enterprise governance competence.

7.5.3 Service-Oriented Architecture and Enterprise Governance

Our brief outline of essential aspects of the service-oriented architecture approach indicates some fundamental changes regarding the execution of enterprise processes and the delivery of IT-based functionality. These changes can be summarized as follows:

From		**To**
Implementation-dependent application utilization	→	Implementation-independent service utilization
Application development	→	Services development
Tightly coupled applications	→	Loosely coupled services
Single-use development	→	Development for reuse
Rigid arrangements	→	Flexible arrangements
Applications supporting processes	→	Services executing processes

From an organizational perspective, perhaps the most significant impact of the services-oriented architecture approach is that on enterprise governance. Since services execute enterprise processes or parts thereof, the definition of services is associated closely with the design of processes. Enterprise process design – based on transactions – as discussed in paragraph 7.2, must precede the discussion about services to be used. Such design is essential for defining the type of services and their granularity, their utilization, as well as their performance and support requirements. This analysis also determines the possibility of using externally-available services. Further, when services are developed in-house, the specifics of a service definition determine its possible reuse. Evidently, the level of reuse affects the economics of developing a service greatly. Thus a service definition that might be appropriate for one business unit only should be adapted to make enterprise-wide reuse possible and likely. For that, the central enterprise governance competence is essential, and should have the financial means to govern services development in the desired direction. This requirement compares fully with the financial requirement regarding the development of IT commodity infrastructure and service discussed in paragraph 6.6.2, and the ability to reduce and avoid IT legacy complexity discussed in paragraph 6.8. Finally, it should be stressed that defining a service definition is not part of application development, but of enterprise process design.

Paragraph 7.4.3 argued that services are becoming an increasingly important part of the enterprise commodity infrastructure and services. As such, they are subject to life-cycle management. This process starts with the identification and specification of a service based on enterprise process design. The service must subsequently be developed, certified and published in the services register as a usable service. Finally, the life-cycle management process ends when the service is discontinued and removed from the services register.

Obviously, all these activities fall within the enterprise strategy and architecture core competence discussed in paragraph 7.4.3, which maintains, also in the case of service development, the close relationships with the IT strategy and architecture core competence. Figure 7.36 summarizes important activities concerning the service-oriented approach.

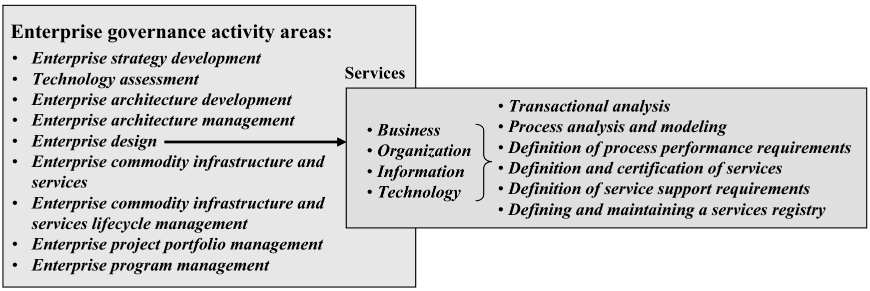


Fig. 7.36. Enterprise governance activity areas

The importance of enterprise governance can also be stressed in view of the following. It is argued that web technology, on which (most) services are based, enables the assembly of simple composite applications (by combining two or more services) called ‘mashups’ [Mulholland et al. 2006]. In turn, said enablement will stimulate user-driven innovations concerning the provisioning of business process functionality. Since these IT developments do not fit very well within the planned, top-down delivery of IT functionality, these ‘mashups’ or ‘shadow IT developments’ by innovative users pose a governance problem. It is all about enabling “development on the edges”, while maintaining business and IT operational integrity and security [op. cit.]. We feel these ‘developments on the edges’ resemble the creative boundary discussed in paragraph 2.4.6. Fully congruent with earlier observations, these technology dynamics, and the possibilities they offer, also necessitate the organismic perspective on governance.

We might observe that when the enterprise governance competence has been established, introduction of the service-oriented architecture approach can be accomplished relatively easily, since the activities of the enterprise governance competence prior to introducing the service-oriented approach are already of a similar nature. However should no enterprise governance competence exist, the introduction of the service-oriented approach is likely to be jeopardized seriously. Introducing the enterprise governance competence as a result of embarking on the service-oriented approach is thus a major undertaking. Since services concern the design and execution of enterprise processes inherently, the associated governance must take place, as stated, within the enterprise governance competence. Lack of such governance often leads to service-oriented governance being taken up from within the IT governance domain. In view of our discussion, we feel this approach is inherently flawed, and is likely to fail because of the apparent lack of ‘business buy-in’.

7.6 Competencies at the Personal Level

7.6.1 Dimensions of Personal Competencies

Competencies can be addressed at two levels: the enterprise and personal level. As mentioned earlier, an enterprise competence is an integrated whole of enterprise skills, knowledge and technology. To a considerable extent, enterprise competencies rest on the competencies of employees: the competencies at the personal level. When discussing these competencies within the context of enterprise governance, we will concentrate specifically on the enterprise strategy and architecture core competence, hence on the personal competencies of the enterprise architect. Before addressing these personal competencies, we will sketch some general underlying thoughts about the personal competencies topic.

Human Resource Management can be seen as the "set of instruments for stimulating optimal performance behavior" [Koopman 2000]. Within considering HRM, the notion of 'competence' has gained more recent interest. The reason for this has to do with the subjects discussed in Chapters 2 and 3: the dynamics and complexity of the internal and external enterprise context. As emphasized, the associated uncertainty does not make it possible, and also not fruitful, to define employee tasks and required employee behavior precisely. Increasingly, the narrowly defined task descriptions of the traditional mechanistic approach are less fruitful. What sort of performance and behavior is required in specific instances must thus be determined to a considerable extent by employees themselves, based on their competencies. This is the essence of the organismic way of organizing emphasized in Chapter 2. As such, the task- or function-oriented HRM changes into competence-oriented HRM [op. cit.].

Comparably with the competencies at the enterprise level, personal competencies are also formed by the integration of different personal aspects or traits. Various descriptions about personal competencies are used. Personal competencies are mostly defined in view of what is ultimately manifest in behavior [Kolk 2000]. This standpoint is used in the following description: "Competencies are defined in measurable behavior characteristics that determine the ability to function successfully – knowledge, skills, craftsmanship, attitude, social skills, personal traits" [Boelens 1997]. However this description contains several overlapping aspects. If skills and attitudes are seen as behavioral characteristics, then personal competencies can be considered as the unity of knowledge and behavioral characteristics. Further, competencies at the personal level can be distinguished in general and specific aspects of the competence. General aspects, for example, concern the ability to cooperate, to take initiatives, or showing customer-orientation and decision-making skills. Specific aspects of the personal competence have to do with knowledge and behavioral characteristics associated with the specific enterprise domain [Smid and Rambelje 1997]. In our case, the specific enterprise domain is that of enterprise governance. Before addressing these specific aspects, will discuss the general aspects of a personal competence.

As stated, personal competencies are ultimately manifest in behavior. According to Kolk, the possession of competencies is a necessary, but not sufficient, condition for certain behavior [2000]. Actually manifesting competencies through behavior requires the motivation to do so. Hence, within this view motivation must be distinguished clearly from competencies. This is a subtle point, since it is suggested implicitly that competencies exists 'autonomously' as a personal trait, while rather, these traits become manifest through behavior, and thus presume the motivation to actually manifest that behavior. One might thus argue that motivation is a contributing factor in defining a personal competence. Despite this subtlety, the following description of a personal competence is useful [based on Kolk 2000, p. 29]:

- A competence is an integrated whole of knowledge, skills, and traits (intelligence and personality) that is manifest in behavior
- Competencies are recognizable at an individual level

- Competencies can be assessed and evaluated
- To a greater or lesser degree, competencies can be improved through training and coaching.

An initial challenge is to structure and describe competencies in an intuitively understandable manner. This means classifying competencies under categories that do not overlap, hence that are mutually independent, or put another way, classifying competencies under 'dimensions' that are orthogonal. The literature is relatively unanimous in offering three main categories, or dimensions, for classifying competencies. Various labels are used, as shown below [Kolk 2000, p. 37]:

- *Cognitive*, thinking, intellectual, knowledge
- *Relational*, feeling, affective, interactive, trust
- *Action-oriented*, power, acting.

Pertinent to these three categories, the second challenge concerns the formulation of skills and traits that are recognizable at an individual level, and are 'atomic'. The latter means that an aspect identified as a personal competence should not be reduced easily to underlying, more basic skills and traits. So, in our view, the capacities of 'entrepreneurship' or 'working methodically' are not atomic, since these capacities are determined by more basic skills and traits. An interesting summary of twenty-one basic skills and traits is determined by the Laboratory of Applied Psychology [Kolk 2000]. We return to this basic set when determining the required personal competencies of the enterprise architect.

7.6.2 Competencies of the Enterprise Architect

Knowledge

As indicated above, personal competencies concern the integration of knowledge, skills and personal traits that is manifest in behavior. The knowledge aspect of a personal competence is evidently contingent upon the specific working area. For the enterprise architect, this working area concerns the arrangement of the enterprise as a whole, based on generally vague strategic intentions. Hence, the knowledge of an enterprise architect specifically concerns enterprise design and the associated enterprise engineering theory and methodology. Since design concerns the enterprise in its totality, the knowledge domain is likewise broad, comprising multiple areas of attention. The curriculum for enterprise architect education is thus significantly broader than the topics mentioned in this paragraph. Table 7.6 gives an indication of important curriculum topics.

Understandably, the knowledge areas mentioned in table 7.6 have to do with the enterprise engineering discipline (enterprise ontology and enterprise architecture) and the four main enterprise design domains: business, organization, information and technology. Additionally, system thinking, as well as enterprise development and change, are relevant knowledge areas. Finally, some general knowledge areas are mentioned. Appreciably, within these knowledge areas a large number of topics are contained, of which several have been discussed in this book. As the table shows, the enterprise architect is not an IT architect. The focus of the former concerns the enterprise as a system, whereas the latter architect is concerned with the IT systems of the enterprise. For the IT architect, specific knowledge about IT system design is evidently essential alongside IT architecture and the associated aspects. This knowledge concerns the various IT design domains mentioned in Chapter 6. Within the IT profession, many 'types' of architects are identified. In view of our approach to architecture and architecturing, one might question the proper use of the term 'architect'.

Table 7.6. Important knowledge areas for the enterprise architect

System thinking	
General system theory	Enterprise engineering
The enterprise as a system	Reliability theory
Business and Organization	
Strategy development	Organizational theory
Enterprise economy and market aspects	Quality and service management
Information	
Structure of information	Information access, security
Management of information	Presentation of information
(Information)Technology	
Aspects of IT system design	Infrastructures
Important technologies and their application	Technology trends
Enterprise development and change	
Modern enterprise context	Views on governance
Conditions for success	Change management
General	
Methods for analysis and synthesis	Decision-making methods
Written reporting and presenting	Group dynamics

Skills and Traits

Chapter 4 discussed the process of architecturing. This concerns defining design principles and standards – pertinent to enterprise design domains – that address strategic initiatives and objectives addressing the areas of concern. Alongside the knowledge areas mentioned above, more general skills and traits are required. Skills and traits concerning the cognitive dimension are evidently essential. An important competence aspect has to do with the notion of unity and integration, emphasized throughout this publication. Many different aspects play a role. Integrating these different aspects in a coherent, overall perspective is – other than analysis – a process of *synthesis*. One might argue that analysis has to do with differentiation and reduction. So, as discussed in paragraph 3.2.2, integration cannot be the result of analysis. Alongside analytical capacities, the enterprise architect should thus also possess the capacity to synthesize: the ability to integrate various multidisciplinary aspects into a coherent and consistent overall perspective concerning the enterprise as a whole.

Architecturing was identified in Chapter 4 as a participative process, involving many stakeholders. This certainly holds for an enterprise, since the broad scope of its design involves many stakeholders inherently. The enterprise architect must maintain productive relationships with these stakeholders. Skills and traits pertinent to the relational dimension are thus relevant. The coaching role of the enterprise architect follows from the fact that this architect, in view of its role, has a more senior position, and thus should share knowledge and experience.

The inherent normative, freedom-limiting, aspect of architecture implies that architecture must be intentionally defined. For that, the enterprise architect must take the initiative and manage the process of architecturing in view of general and specific enterprise (strategic) developments and areas of concern. Architecturing is often problematic, since stakeholders are likely to have conflicting interests that discourage the acceptance of design principles and standards. Similar aspects play a role concerning the translation of strategic initiatives and areas of concern in a concrete (high-level) enterprise design. In view of the many stakeholders and the multidisciplinary character of enterprise development, many conflicting interests

Table 7.7. Skills and traits of the enterprise architect

Cognitive	
Analytic capability	Speed of understanding
Planning	Vision
Judicious	Organizational awareness
Resourcefulness	Capacity for synthesizing
Relational	
Empathy	Cooperation
Customer orientation	Coaching
Sociability	Relational management
Action orientation	
Initiative	Resoluteness
Guiding	Risk acceptance
Result orientation	Stress-resistant
Convincing power	Responsibility

and goals thus often play a role. Decision-making must often take place under time pressure and with limited knowledge. The competencies under 'action orientation' are relevant in this respect.

Table 7.7 summarizes the 21 basic skills and traits defined by the Laboratory for Applied Psychology [Kolk 2000, p. 40], complemented with the capacity for synthesizing under the cognitive dimension. Understandably, not all skills and traits are equally relevant under all circumstances. The specific circumstances or the relative position of the enterprise architect play a role. Roughly speaking, for the enterprise architect skills and traits of the cognitive dimension are of primary importance.

Personal skills and traits that are relevant for the other two enterprise governance core competencies will not be discussed. In our view, project portfolio management is primarily of an administrative nature: activities for ensuring that the project portfolio is accurate and up-to-date, such that project management and pertinent evaluation and decision-making is facilitated. The skills and traits shown in table 7.7 are also relevant for enterprise program and project management. For this function, the focus lies with the lower part of the competence dimensions, specifically the 'action orientation' dimension.

8 The Praxis Illustrated

Previous chapters presented examples elucidating our theme of discussion. In addition to these examples, this chapter provides further illustration of the inherent character of enterprise governance and enterprise engineering, showing some core facets about the praxis of these concepts within the context of a fictitious company called EnerServe, which needs a considerable transformation. EnerServe is a longstanding energy company. They have power plants for generating electrical energy, a distribution network and meters installed at customers' premises for measuring energy usage. EnerServe is affected by the development of Europe's open energy market which enables customers to select their supplier for delivering electrical energy and gas, independent of the geographical location of the customer and supplier. So suppliers are not necessarily associated with a certain geographical activity domain, but can (in principle) supply throughout Europe. EnerServe must change fundamentally because of the open energy market. An essential question within EnerServe's enterprise governance competence thus concerns how EnerServe must adapt to the new situation. The EnerServe case aims to show that it is not so much the top-down, management and planning-oriented governance approach which is crucial for making sense of the new situation and its consequences, but the enterprise governance competence, and more specifically the enterprise strategy and architecture competence. It is this competence that identifies and addresses the topics discussed in this chapter. Without the ability to discuss all facets of EnerServe's transformation comprehensively, the case aims to illustrate how the core concepts discussed previously can be applied. The case also corroborates the importance of the competence-based perspective on governance within which design occupies a central place, and whereby developments occur in an emerging fashion. As such the innate nature of enterprise governance and enterprise engineering is illuminated.

8.1 Open Energy Market Challenges for EnerServe

8.1.1 Core Activity Domains and the Fundamental Design Principle

We will explain the essential facets of the open energy market without trying to be comprehensive. Some detailed aspects that might unnecessarily reduce the clarity of the case outline are thus omitted. When discussing the operational transactions and processes, we will also occasionally divert slightly from the actual practice to clarify the responsibilities of the different actors more precisely.

The open energy market enables customers to select an energy supplier of their choice easily, either initially, or by switching over to another supplier. Evidently, switching to another energy supplier should not entail switching to another infrastructure. So, the open energy market implies the use of one infrastructure through which multiple suppliers can deliver energy. This implies a formal distinction between two activity domains: *supply* of energy, and the *transport* of energy. The *production* of energy can be seen as the third core activity domain. Within the new setup, suppliers purchase energy (provided by energy producers) on the open market for further selling to their customers. In fact, the open energy market has introduced the notion of energy trading, whereby suppliers aim to balance demand and supply in a most cost-effective way.

Similarly as with infrastructure, it is highly undesirable if switching to another supplier necessitates installation of new energy metering equipment associated with the new supplier. Thus a fourth core activity domain plays a role: the *metering of energy usage* must be done by equipment owned by a separate entity, independent of a specific energy supplier. This means that metering is not affected by switching.

So choosing an energy supplier freely can only be effected if the choice can be made easily. Put another way, switching to another supplier should be merely an administrative affair. This is then only possible if a fundamental design principle is used: the consumption of energy must be fully independent of the actual implementation of supply (a truly service-oriented architecture design principle, cf. paragraph 7.5). Not having this principle would imply more than merely administrative measures since specific aspects associated with the actual arrangement of delivery should be taken into account when switching.

As can be appreciated, producing, transporting and delivering energy is a highly collaborative affair, in which multiple parties must operate and communicate seamlessly. Such a unified and integrated operation obviously needs governance. This overarching governance is effectuated by the industry-wide 'Energy Governance Body'. This body has defined various standards, including those on energy procurement and payment, the way customers and connections are defined, usage is measured, billing takes place, etc.

In summary, the following core activity areas can be identified for:

- Production of energy
- Supply of energy to end-users
- Distribution (transport) of energy
- Metering of energy usage.

8.1.2 EnerServe's Transformation

Prior to the open energy market, EnerServe took care of all four activity areas. These activity areas were not distinguished formally as in the open market situation. Hence the new situation entails splitting the old organization into the four identified areas, such that the associated activities can be carried out autonomously. As indicated, the network will be used by various energy suppliers. This necessitates network operation by an independent party and the discontinuation of EnerServe's network activities in their current form. The network part of EnerServe could possibly position itself as a network operator. Similar considerations hold for metering equipment. Two activity domains are considered of particular interest to EnerServe from a competitive viewpoint: energy production and energy supply. But these domains must be fully independent. So the production part can produce energy for the supply part of EnerServe, but also for other suppliers, while the supply part of EnerServe can purchase energy from other producers. Essentially, EnerServe faces the significant transition from a situation with entangled processes covering four activity areas, to a situation with integrated but decoupled processes covering those areas. Although the full magnitude of the open market dynamics is not yet clear – various developments regarding the precise interaction among the different actors within the open market have not been finalized – EnerServe concentrates initially on arranging its supply part, since this is crucial for serving existing and new customers. Appreciably, the open energy market necessitates EnerServe's reorientation pertinent to its strategic position and perspective (cf. paragraph 3.2.3). The rest of our discussion we will focus on the supply part of EnerServe.

8.1.3 The Switching Process

Apart from initially starting a contract, or ending one, the really new feature is the ability to switch easily between energy suppliers. A central administrative concept is the so-called 'connection registry', managed by the network operator, and for which the Energy Governance Body has defined standards. This registry keeps track of every energy connection point with its unique connection number, whereby each customer is uniquely associated with a connection point and a supplier serving that connection point. The connection number plays a central role in communication between different suppliers mutually and between the suppliers and the network operator. Additional data is stored in the collected records, such as the customer's energy consumption at the specific connection point. EnerServe must thus inform the network operator of the energy consumption (meter readings) of its customers.

The contract with the current supplier must be terminated if a customer wishes to switch to EnerServe. That should normally be done by the customer owning the contract. But to speed up the process, and to avoid all kinds of coordination issues on the customer side, it is agreed among the various energy market actors that the new supplier takes care of terminating the customer's contract with the current supplier. Authorization for that must be obtained from the customer. To distinguish itself positively from its competitors, EnerServe takes full responsibility for adequate contractual transition. A contract with a supplier also includes a so-called 'connection and transport agreement' (required by law) between the customer and the network operator. The formal authorization mentioned previously also authorizes the supplier to act on behalf of the customer in terms of this agreement.

By law the contract can be revoked within a seven-day period. The switching procedure is basically as follows:

1. Registration of a new customer at proposed contract starting date 'd', which must include the formal authorization to terminate the existing contract. The minimum contract period is one year.
2. Confirmation by e-mail and letter and the start of the seven-day period.
3. Providing the meter reading of date 'd' to both EnerServe and the current supplier.
4. EnerServe requests the network operator to change the connection code associated with the customer from the current supplier to EnerServe as per date 'd', which defines the starting date of the contract.
5. Payment of the final invoice to the current supplier.

Along with taxes, there are three categories of consumer costs: (1) energy delivery by the supplier, (2) transport costs charged by the network operator, and (3) meter costs charged by the owner of the measuring equipment. As a service to its customers, EnerServe will send one (monthly) invoice to customers containing all costs. EnerServe must transfer the collected charges to the network operator and the meter company periodically.

The process illustrates that switching is indeed an administrative affair. Since customers can switch or revoke an intended transition to a new supplier relatively easily, the administrative processes are highly dynamic.

8.1.4 New Perspectives

To clarify essential characteristics of the new situation, the enterprise strategy and architecture competence of EnerServe (which we take as a given organizational competence) assessed the external developments and their consequences, identifying a number of new perspectives that EnerServe should deal with in its enterprise design.

Managing Demand and Supply (Energy Trading)

In the traditional situation, demand and supply were matched through merely technical means, whereby energy generation was adjusted to energy demand. But the open market makes it possible to purchase energy 'from the market'. This market is defined by energy producers, but also by energy suppliers who, for various reasons, might resell already-purchased energy. Energy trading will thus become an important new competence, comparable with the financial and oil market. Short-term and long-term developments concerning energy demand, supply and prices are important dynamic parameters for action. This indicates an important new competence that EnerServe must establish. The effectiveness of this competence not only has consequences for the adequacy of energy supply, but also has economic consequences given the energy volume to be acquired. Alongside integrated information about actual and predicted energy usage and prices, information systems for decision support and scenario planning also seem relevant.

Business and Market Dynamics

The open energy market introduces considerable dynamics. What was once a closed market with monopolistic enterprises, changes into an open market with many players and increased competition. Competition is fueled by the ability to switch to another supplier easily, which in and of itself increases the dynamics energy suppliers are facing. Trading energy and matching demand and supply also introduces considerable dynamics for EnerServe.

These dynamics have fundamental implications for the way of working (the strategic perspective, cf. paragraph 3.2.3). Delivering energy in a closed market, from a monopolistic position, is often associated with a focus on internal enterprise facets, whereby the relatively stable environment tends to give the enterprise rigid characteristics. However the introduction of the open energy market necessitates a shift in EnerServe's culture and way of working: from a predominantly internal focus towards an external, customer- and service-oriented focus. This shift calls for additional activities beyond merely the delivery of energy. Increased dynamics require flexible and adequate responses from EnerServe to changed conditions, including scalability to accommodate further growth.

Mergers and Acquisitions

Creating an open market for delivery of a commodity such as energy will likely create tendencies among enterprises in the energy sector to create scale and synergy advantages. These tendencies develop since the market is Europe-wide on the one hand, so scale advantages can be exploited trough mergers or acquisitions, while on the other energy suppliers from outside Europe might penetrate the European market through merging with, or acquiring a European partner. Apart from the inherent dynamics of these developments, these tendencies also have implications for the internal organization (and the associated IT support) since the integration effort in the case of a merger and acquisition should be minimal. A clear organizational outline, such as reflected in ontological models, is thus essential.

Costs: 'Price-Based Costing'

The open energy market is based on the idea that such an approach would lead to better service and lower energy prices for consumers. Customers simply switch to another supplier if the service or price is considered better. One might argue that energy is a commodity, and that commodities are only judged on the basis of price. As such, operational costs are an important area of concern. Associated with this is an important paradigm shift. Where the monopolistic position could previously offer the possibility to determine the price based on internal costs, now the open market dictates that cost must be based on the market price that can be asked. So EnerServe faces a shift from 'cost-based pricing' towards 'price-based costing'.

Service: The Importance of Complementary Services

Despite – or probably because of – the commodity character of energy supply, service turns out to be an important competitive weapon. Since energy supply is generally adequately arranged, the supply itself can be labeled as a hygiene factor: a basic condition that should be in place, but as such is not a motivator for selecting a specific supplier. Various other functions such as contracting and invoicing are also hygiene factors. These aspects do not act as motivators, but can certainly act as demotivators: they can be a reason to switch. Attention to 'operational excellence' is thus essential and conditional for customer satisfaction.

The delivery of complementary services might create a strong motivation to select a certain supplier, because of the value these services provide, and for which customers are willing to pay. So EnerServe should explore and exploit possible new business areas in this respect.

Delivering complementary services has three important advantages: (1) they act as motivators for selecting EnerServe, (2) provide extra revenue, and (3) create a barrier to switching since another supplier will deliver the same energy, but (most likely) not similar complementary services. Complementary services thus create higher switching 'costs'.

Rather than delivering complementary services by EnerServe itself, these services can most likely be delivered effectively in combination with business partners. Innovative services might follow from combining different services of other parties with those of EnerServe, such as energy delivery in combination with home security services or communication services. Services that help customers to save energy could also be considered. We might observe that the delivery of energy is highly regulated, but that is not the case for the delivery of complementary services, or significantly less so. Business degrees of freedom are thus considerably higher. Understandably, EnerServe must be able to combine and integrate services from different disciplines in a unified and integrated manner.

The Shift Towards Empowered Customers

As indicated earlier, the open energy market, with customers who can switch easily, necessitates that EnerServe changes from an internally, technology-focused enterprise towards an externally, customer- and service-focused enterprise. It is not the contract, but the relationship with customers which plays the central role. Customer relationship management (CRM) – with its associated values (culture), employee behavior, information supply, and so on – must become an essential area of attention. Within this focus, customer self-service is an important facet: offering services when and where desired by customers. 'Customer-managed relationship' (CMR) must also be considered, referring to the ability of customers to define the nature of the relationship with EnerServe, such as offering services that can be customized. Overall, the open energy market creates a power shift from supplier-initiated actions (push), to customer-initiated initiated actions (pull).

E-business (Channels and Services)

Within EnerServe's strategic direction, the execution of customer and operational processes will be based increasingly – if not exclusively – on web technology. This provides an important basis for decoupling autonomously operating units, while simultaneously ensuring their operational integration. Associated with this is a shift from offline towards online (real-time) activities, transactions and communication. EnerServe's intranet must evolve into an all-embracing information utility, where information is exchanged between individuals, between individuals and physical objects, and between these objects mutually (such as energy consumption data provided by the energy meter itself, connected to the Internet).

Core Characteristics of Changes: Paradigm Shifts

The essential changes (paradigm shifts) that EnerServe faces, are summarized below.

Closed market	➔	Open market
Internally focused	➔	Externally, customer focused
Technology focus	➔	Service focus
Customer contract focus	➔	Customer relationship focus
Single service	➔	Multiple (complementary) services
Stable environment	➔	Dynamic environment
Autonomous energy supply	➔	Collaborative energy supply
Passive energy delivery	➔	Active energy trading
Monopolistic	➔	Competition
Rigid	➔	Flexible
Convoluted processes	➔	Decoupled, but integrated processes
Vertical, functional focus	➔	Horizontal, process (supply chain) focus
Cost-based pricing	➔	Price-based costing
Stable rules and legislation	➔	Changing rules and legislation
Push (supplier-initiated) actions	➔	Pull (customer-initiated) actions
Few business events	➔	Many business events
Stable customer base	➔	Dynamic customer base

8.1.5 Strategic Choices

As indicated, the dynamics of the open energy market still leaves much to be decided upon. So far, the identified strategic choices of EnerServe are:

- Splitting the current organization in four activity domains, directed towards: (1) supplying energy to customers, (2) producing of energy, (3) transporting energy through the network, and (4) measuring of energy consumption.
- From a commercial perspective, EnerServe will concentrate on the first activity domain, the supply of energy.

- Development of complementary services (possibly) with partners.
- Economic model based on market energy prices (price-based costing).
- Strong focus on service and the relationships with customers.
- Developing a competence for managing energy demand and supply.

8.1.6 Areas of Concern

In view of the new perspectives, paradigm shifts, and the strategic choices a number of areas of concern has been identified by EnerServe's strategy and architecture competence. Strategic choices and objectives pertinent to areas of concern must be further operationalized through EnerServe's design. For that enterprise architecture must be developed, as we will show below. The areas of concern are summarized below. In various cases, the areas of concern are mutually supportive. That is, addressing one area is likely to aid in successfully addressing one or more other areas.

Enterprise Integration: Decoupling and Uniting

This apparent contradictory notion is probably the core theme underlying the transition to the open energy market. EnerServe must be 'untangled' into the four core activity areas – operated by different autonomously-operating parties – whereby integrated energy delivery must be safeguarded, as well as integrated administrative processes. This is not a trivial issue. Since EnerServe did not distinguish strictly between the four activity areas in the closed market situation, operational processes and the supporting IT systems show a high level of intermix of the four areas. Untangling processes and IT systems is thus a daunting task.

The open market with various parties in the different activity domains also creates a high level of interdependencies among actors in the business network. All parties involved must be able to interact, cooperate and collaborate seamlessly. Integration concerns:

- Integrated customer data.
- Processual and informational integration of geographically dispersed entities.
- End-to-end processes and process management.
- Multi-channel integration and transparency.

Process Excellence

Operational integrity – and more generally process integrity – is a core condition for EnerServe's success. This condition is relevant not only for the primary delivery of energy, but also for administrative and customer processes on which successful switching depends. Data integrity is hereby likewise crucial.

Process excellence necessitates a shift from EnerServe's current vertical, hierarchical focus, towards a horizontal, process focus. Modelling EnerServe and its processes adequately will thus become critical for the successful transformation to the new situation.

Reduction of Complexity

As indicated, the current EnerServe organizational arrangement shows many interwoven processes. A considerable complexity is associated with this. This complexity is similarly manifest in IT systems (legacy complexity). It is EnerServe's experience that substantial rigidity and costs are associated with the current complexity. Hence reduction of complexity is essential for creating flexibility, scalability and the reduction of operational costs.

Customer and Service Orientation

Acquiring and retaining customers is EnerServe's lifesaver. Customer and service orientation[2] must therefore permeate into every cell of EnerServe, and must be manifest in all it does: employee behavior, management practices, culture (norms and values), information supply, and the various structure and systems (e.g. employee assessment and remuneration systems, communication systems, accounting and management reporting systems, and so on).

Complementary services valued by customers will create extra revenue, but above all, are expected to create extra switching barriers. EnerServe will focus on the relationship with customers and their loyalty, and on lifetime economic value. Attention must go to knowing, understanding and realizing customer wishes, and affecting customer behavior, for example concerning energy saving. Customer self-service offers interesting possibilities for creating customer value, while simultaneously enhancing the effectiveness and efficiency of processes.

Flexibility and Speed

The indicated dynamics requires EnerServe flexibility and speed, such as for:

- Reduction of time-to-market for new products and services.
- Creating new products and service from existing components expediently.
- Resolving customer complaints quickly.
- The ability to accommodate and integrate business partners and suppliers quickly.
- Easy access to various data sources.
- Adapting processes to new situations simply, and flexible deployment of resources.
- Fast and accurate reporting on EnerServe's performance (customers, employees, operations, financial).

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[2] The term 'service orientation' has different meanings. First, the term refers to employee behavior directed towards satisfying customers. Second, the term is used in 'service-oriented architecture', referring to the provisioning of business services (the execution of tasks in business processes) which is compliant with certain architecture principles (cf. paragraph 7.5).

Scalability

The ability to accommodate business growth is seen as vital for EnerServe. Accommodating growth means scalability along two dimensions: (1) existing products and services must be made available to new customers quickly, and (2) existing customers must be able to receive new products and services quickly. Appreciably, activities that address the concerns for decoupling and integration, reduction of complexity, process excellence, or flexibility and speed, are also conducive to scalability.

Business Intelligence

Transforming and unifying operational data into informational data on an EnerServe-wide scale enables the use of that data in operational and decision-making processes, such that the quality of these processes is enhanced. One might consider business process management, business process improvement or customer relationship management, as well as market, consumer and competitive analysis. In view of the required flexibility and speed, EnerServe design must enable real-time use of informational data. Given the energy trading function mentioned earlier, adequate business intelligence is key.

Employee Involvement

As the paradigm shifts identified previously indicate, EnerServe must reinvent itself in many ways. Creativity, innovation and new initiatives are vital in all areas. It is EnerServe's conviction that employee involvement is the crucial condition for success in all areas. Hence EnerServe embraces the organismic way of organizing. Employee involvement depends heavily on the enterprise context in which employees operate: EnerServe's culture, management practices and the various structures and systems. Optimal use of employee capabilities also requires optimal processes and informational support. Employee involvement can further enhance enterprise flexibility and speed significantly, as previously mentioned.

Security and Compliance

Service, customer orientation, flexibility and speed, e-business, and business integration are concerns necessitating simple and immediate (on demand) communication with actors in the business network, independent of time and place. This translates into immediate and simple access to data networks and data sources. Such access entails considerable risks, due to possible breaches of operational and/or informational integrity. Security and compliance thus play an EnerServe-wide role.

Meanwhile, rules and legislation have been passed that pose requirements for aforementioned integrity. Satisfying these rules and legislation (compliance) must therefore be part of EnerServe's design.

Costs

Delivering a commodity service in an open market inevitably leads to a primary focus on costs: price-based costing rather than cost-based pricing is the name of the game. EnerServe's management is convinced that costs represent a fine result but a poor objective. Put another way, costs and their reduction, are a result of EnerServe-wide activities associated with areas of concern mentioned previously. This concerns lowering the absolute cost level, the cost per unit of measurement, and specifically costs that are associated with the complexity of processes and their IT support.

Business Ethics

In addition to providing meaningful work for employees, and stimulating employee development actively – as exemplified by the adopted organismic way of organizing – EnerServe is conscious of its stakeholders. Safety and energy conservation are specific concerns.

8.2 EnerServe's New Requirements

8.2.1 Functional and Constructional Requirements

In view of EnerServe's new strategic position and perspective (cf. paragraph 3.2.3), a number of functional and constructional requirements have been defined with various stakeholders in a heuristic and participative manner guided by the strategy and architecture competence. Both sets of requirements are input for designing EnerServe (cf. paragraphs 4.2.6, and 7.2.4). The functional requirements concern the business of EnerServe, and are summarized in table 8.1 below.

Constructional requirements have to do with the arrangement of EnerServe, hence relate to the main constructional design domains: organization, information and IT (cf. paragraph 7.3.3). Table 8.2 shows the constructional requirements, categorized by the main design domains.

Table 8.1. EnerServe's functional requirements

Functional requirements	
Business	Open 24/7
	Enable easy, customer-friendly switching to EnerServe (and conversely, if so desired)
	Complementary service offerings associated with energy supply
	All customer interactions concerning the start or the termination of contracts (energy supply and complementary services) must be executed completely through EnerServe's website
	Customers must be able to manage their own account

(Continued)

	Easy and transparent communication through various interaction channels (e.g. website, telephone, mail, etc.)
	Handling of different tariff structures that must be transparent to customers
	Provide customer-specific data, such as the history of energy consumption on login to EnerServe's website
	Providing advice about the reduction of energy consumption based on the customer's profile
	Seamless communication with other energy suppliers, network operators, energy producers and metering companies
	Effective relationship building with customers (CRM, CMR)
	Self-service and self-design (composition of services) capabilities for customers
	Secure and user-friendly access to EnerServe through multiple channels for customers, employees, business partners and suppliers, anytime, anyplace
	Online capabilities for customers to plan service agent contacts
	Contract changes finalized within five working days
	Invoices received by customers within five working days after the invoice period
	Easy authorization by customers allowing EnerServe to act on their behalf

Table 8.2. EnerServe's constructional requirements

Constructional requirements	
Organization	Short time-to-market of new business functionality
	Seamless processual and informational interoperability and interconnectivity of customer and operational processes and interaction channels
	End-to-end process management
	Computer-supported means and methods for employee collaboration, decision support, data analysis and process management
	Extended enterprise integration, such that customer and operational data is collected by, and shared with, business partners and suppliers
	Quick reconfiguration of services and processes
	Real-time workload distribution for contract and invoice processes
	Individual employee work planning overviews with the ability of personal activity planning within work roster planning functionality
	Capability within work roster planning for employees to swap shifts
	Car pooling facilities as part of employee collaboration services
	Quality-, service-, and customer-oriented behavior of employees
	Culture directed towards creativity, innovation and improvement
	Expression and enablement of espoused norms and values in EnerServe's behavior
	Organizational arrangement directed towards employee development and self-efficacy
	Indicators for EnerServe's inherent performance capability
	Enhancement of customer productivity and assurance

(Continued)

	Error correction capabilities in customer interaction processes
Information	Customer recognition in a consistent manner at all customer contact points
	Availability of all customer information at all customer contact points
	Collection of customer and operational data during all interactions for improving services and processes, and for devising new services
	Unification and transparency of structured and unstructured data
	Integration of all customer data
IT	Reduction of time-to-market of new IT services
	Seamless interoperability and interconnectivity of systems, networks, data sources and interaction channels
	Reduction of legacy system complexity and costs
	Attaining an industry-comparable cost level and ratio between IT operational (continuity) costs and total IT costs
	Secure and user-friendly network access through multiple interaction channels based on user role and tasks
	Cross-functional transparency of all user interfaces
	Reliable IT services (system reliability and availability to be specified)
	Unified databases
	Integration of new and existing (legacy) IT systems and databases

8.2.2 Requirements Management

EnerServe's strategy and architecture competence publishes requirements in the same four-tier structure used for publishing architecture principles (cf. paragraph 4.2.8). We take an organizational requirement as an example:

1. <u>Requirement statement</u>
   Quality-, service-, and customer-oriented behavior of employees

2. <u>Rationale</u>
   The monopolistic delivery of energy is history. The market is rife with competition, and customers can switch easily to another energy supplier. Quality-, service- and customer-oriented behavior of employees is therefore crucial for EnerServe's survival and growth.

3. <u>Implications</u>
   Local employee freedom in performing their activities is essential. Bureaucracy must be eliminated. A fundamentally different management style must be acquired.

4. <u>Key actions</u>
   Investigate the type of employee behavior essential for EnerServe's quality-, service-, and customer-oriented focus
   Investigate necessary organizational changes
   Define employee and management training programs that accompany organizational change.

Publishing requirements in this way has a number of advantages for EnerServe: (1) it enables the creation of a shared vision, (2) it explicitly identifies implications, (3) it aids in ensuring coherence and consistency of requirements, (4) it ensures that necessary actions for successful change are identified and carried out, and (5) it provides formal input for design, guided by architecture, as further illustrated in paragraph 8.4.2 below.

Evidently, the key actions will subsequently entail a multitude of follow-up initiatives. So gradually through key actions – investigations, pilots and projects – the nature of EnerServe's transformation becomes apparent. We will show below that such gradual, emergent clarification is driven similarly by the key actions associated with the development of architecture.

8.2.3 IT Development and Operational Management Requirements

Evidently, the methodology for the development and operation of IT systems and networks must match the formulated (IT) requirements. EnerServe's IT governance competence is convinced that the effectiveness and efficiency of the development process can be enhanced significantly through reusing already-developed applications, or application components, or by using externally available functionality. In this connection, the service oriented architecture approach is favored (cf. paragraph 7.5).

The importance of seamless end-to-end process operation and management has been stressed previously. This focus must be translated to EnerServe's IT operational management, which was traditionally focused on individual IT system and network operation, rather than concentrating on their integrated operation. The notion of loosely coupled, but integrated operating (IT) entities also has consequences for IT operation management. Reliability, availability and scalability should not be addressed at the individual component or system level (only), but must be addressed from the overall integrated perspective. Finally, the use of service oriented architecture also entails that IT operation management should focus on the performance of the service as a whole, rather than focusing on an individual component. Monitoring and possibly restoring the operational integrity of IT services thus requires a mindset shift, as well as an associated new arrangement of IT operational processes, roles and tasks.

8.2.3 New EnerServe Arrangements: Its New Design

In view of the paradigm shifts, strategic choices, areas of concern and requirements, new EnerServe arrangements have to be devised. Employee involvement was identified as an important area of concern (cf. paragraph 3.3). Hence the new arrangements – the design of EnerServe – are based on the organismic way of

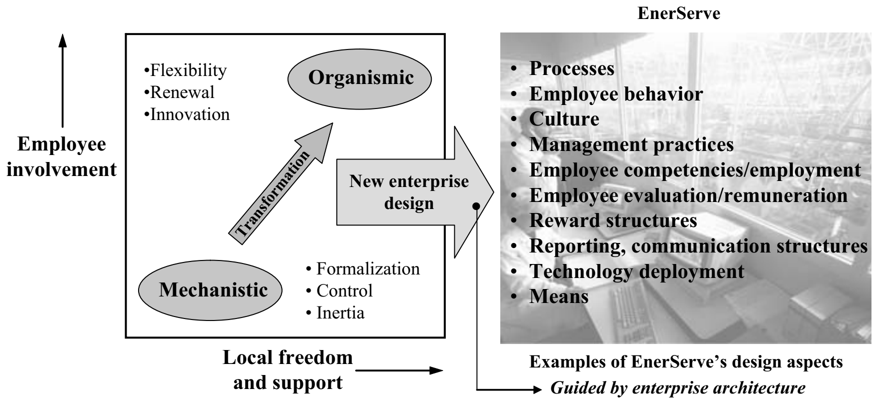

Fig. 8.1. EnerServe's transformation

organizing (cf. paragraph 2.4). The transformation from the current way of organizing to the new one is shown schematically in figure 8.1.

Figure 8.1 indicates a few of the multiple areas that have to be addressed in a coherent and consistent manner for making EnerServe's strategic transformation successful (cf. paragraph 3.2.4). EnerServe's strategy and architecture governance competence has defined architecture for guiding EnerServe's design to: (1) ensure unified and integrated arrangement of the multiple areas that need to be addressed, and (2) pay adequate attention to the areas of concern. We cannot outline the specifics of all areas that have to be dealt with within the limited space of this case. Specific knowledge areas play a role, such as concerning employee motivetion and behavior, culture, effective communication, remuneration and reporting structures, leadership and so on. But we will provide examples of architecture principles for the various business, organization, information and IT design domains in which those topics are addressed.

Before presenting EnerServe's enterprise architecture, we will show the essence of its structural-functionalistic foundation: EnerServe's ontology (cf. paragraph 7.2). This shows the new activity domains and the fundamental nature of the associated new processes. It is on this structural-functionalistic foundation that EnerServe's other arrangements – of which examples are given in figure 8.1 – become manifest.

Appreciably, in the course of producing the ontological models shown in the next paragraph, the process of making sense of the new situation is continued concurrently. Essential transactions, associated processes, core data types and actor roles are discussed and clarified. Moreover, the process models support the dialog about the specific nature of business rules guiding the process execution (cf. paragraph 7.2.2).

8.3 EnerServe's Ontology

8.3.1 Interaction Model and Process Models

As a first step in EnerServe's fundamental transition, the essential operational aspects of the new situation have been defined from the energy supply viewpoint (transactions concerning complementary services are outside our current scope). Within the adopted DEMO enterprise engineering methodology, defining essential operational aspects means defining EnerServe's ontology. The strategy and architecture governance competence has devised the interaction model shown in figure 8.2.

The interaction model shows the various internal and external actor roles (cf. paragraph 7.2). Internal actor roles are associated with one transaction only: the realization one production fact. Composite actor roles are associated with more than one transaction. Since there is generally no information about the precise nature of external actor roles, they are depicted as composite actors (CA). The various external actors represent three of the core activity domains mentioned previously. Transactions concerning trading energy and the periodic transfer of collected charges are not shown and will be discussed below. So we will concentrate initially on the transactions shown in figure 8.2. Table 8.3 gives the transactions and their respective results.

With reference to the interaction model, and the process models shown below, the transactions can be explained briefly as follows.

Table 8.3. Transaction-result table

Transaction	Result
T01	R01 Contract *K* started
T02	R02 Authorization *A* obtained
T03	R03 Address *L* changed
T04	R04 Contract *K* ended
T05	R05 Meter reading *R* provided
T06	R06 Invoice *I* paid
T07	R07 Contract K^* (with previous supplier) ended
T08	R08 Contract *K* ended
T09	R09 Connection *N* changed
T10	R10 Customer *C* disengaged from connection *N*
T11	R11 Customer *C* linked (to EnerServe) at connection *N*
T12	R12 Network charge *B* for period *Q* defined
T13	R13 Meter charge *G* for period *Q* defined
T14	R14 Final invoice *I* completed
T15	R15 Meter control for period *P* performed
T16	R16 Charges control for period *P* performed
T17	R17 Invoice control for month *M* performed

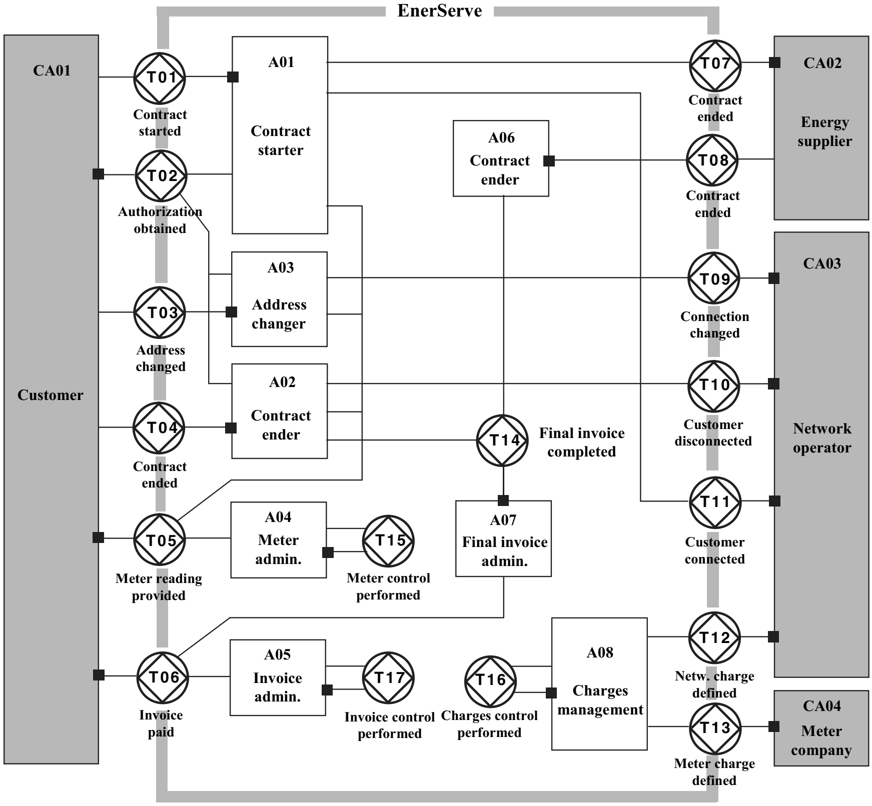

Fig. 8.2. Interaction model

Contract Starting

For switching to EnerServe, the customer initiates transaction T01, leading subsequently to EnerServe's initiation of T02 for obtaining the customer's authorization to end the customer's contract with the current energy supplier through T07. The authorization includes EnerServe's full responsibility in this respect, such that the consequences of inadequate contract termination are accepted by EnerServe. This way of modeling differs slightly from the actual practice, but in our view it is more conducive to defining responsibilities properly. Without being authorized formally (including appropriate conditions), terminating the contract with the current supplier would merely imply an implicit delegation of tasks from the customer to EnerServe.

As the figure 8.3 process model shows, execution of T01 has to wait for the authorization received. Authorization is always required, since EnerServe also acts on behalf of the customer regarding the connection and transport agreement

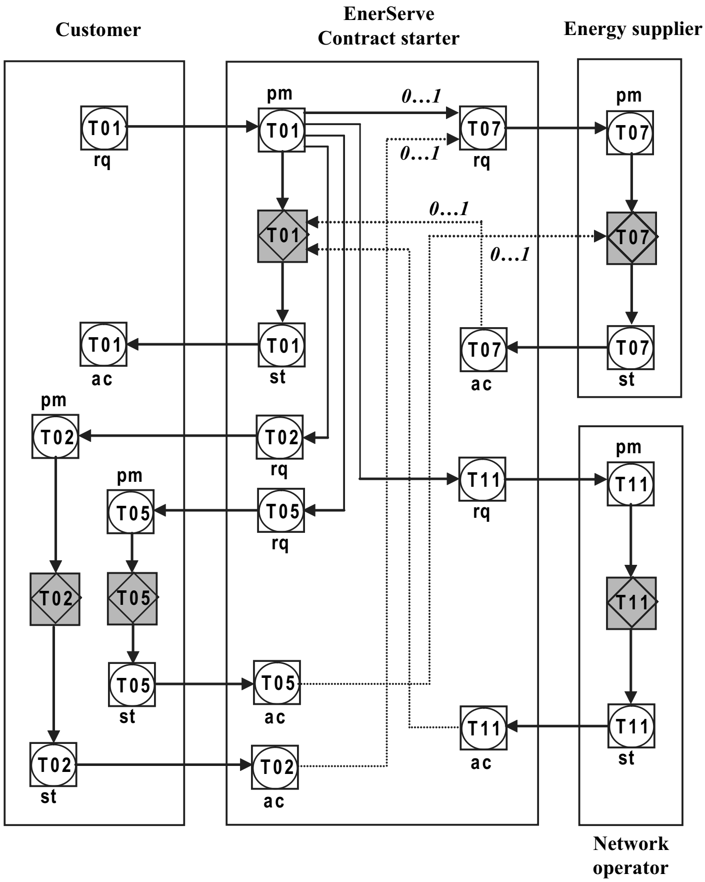

Fig. 8.3. Process model: contract starting

between the customer and the network operator. For ending a customer contract with the previous supplier properly, EnerServe must provide the meter reading, which is arranged through transaction T05. Subsequently, the previous supplier will send the final invoice to the customer. As illustrated, for EnerServe this situation occurs when an EnerServe customer switches to another supplier.

It might be the case however, that the customer does not have a current energy supplier, for example by coming from abroad, or by moving from the parents' home to a newly-bought house. Hence T07 is optional, as indicated by the range *0…1*: either not required (*0*) or required (*1*). For EnerServe to be the energy supplier, EnerServe must be linked to the customer's connection number in the connection register. Hence T11 is initiated by the 'contract starter' actor role. The contract is operational, hence T01 completed, once (in addition to T02/ac) the results of T07 and T11 are accepted.

Contract Ending

Two situations lead to contract ending: (1) the customer switches from EnerServe to another energy supplier, and (2) the customer ends the contract for reasons other than switching to another supplier, for example by moving abroad. In the first case, the new energy supplier requests termination of the contract through transaction T08, which is the mirror situation described earlier, when a customer switches to EnerServe. The second case is initiated through transaction T04, next leading to T10 for ensuring that the customer is disengaged from the connection number. In both cases the final invoice needs to be determined and paid, which is arranged through transaction T14. Payment is arranged by initiating transaction T06. This transaction is also initiated by the self-activating transaction T17, which ensures the monthly payment of the energy used. Notably, also if the contract is ended through transaction T04, authorization is required for ending the connection and transport agreement with the network operator. The meter reading (through T05) must also be provided.

The process model of figure 8.4 shows that payment transaction (T06) is contained within transaction T14. So, the completion of T14 has to wait for T06/ac. Subsequently, the completion of T04 has to wait for T05/ac, T10/ac and T14/ac,

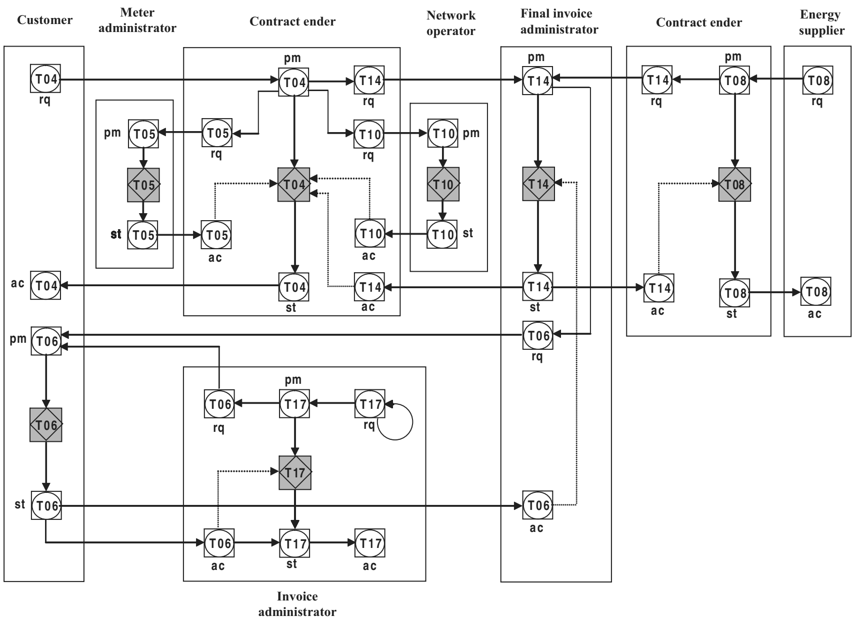

Fig. 8.4. Process model: contract ending

while the completion of T08 depends on T14/ac only. Similarly, the completion of T17 has to wait for T06/ac.

As the interaction model indicates, transaction T03 is initiated when a customer continues to use EnerServe, but changes to a new address. As a follow-up, transaction T09 ensures that the customer is linked to the connection number associated with the new address. The new address might possibly be served by a supplier other than EnerServe. However the associated contract should have been ended by the previous inhabitant. As before, the meter reading must be provided. Authorization must also be obtained to arrange the new connection and transport agreement. Defining the associated process model is left to the reader.

Transport and meter charges are determined for every period *Q* (e.g. yearly) through the self-activating transaction T16, leading to the initiation of T12 and T13. The related process model is not shown, but compares with that associated with the transactions T17 and T06 in figure 8.4. This likewise holds for the transactions T16 and T05, which concerns periodic meter reading.

Notably, the contract ending process could have been arranged slightly differently by not having the payment transaction T06 included within T14, but initiated by the contract ender. Then the nature of T14 changes into only defining the amount of the final invoice. Different waiting conditions also apply. As one might verify, the interaction model changes, and a somewhat more complex process model is also associated with this option.

8.3.2 State Model

EnerServe's state model of production facts and the associated object classes is shown in figure 8.5. Relevant logical relationships between object classes are given (cf. paragraph 7.2.2). The black dot indicates that the relationship is mandatory. So, for example, a customer must have a contract, while a contract must be related to a customer. The horizontal bar indicates uniqueness: the contract *K* identifies the customer *C* uniquely. Since a customer might have more than one contract, the reverse is not true: a customer does not identify a contact uniquely. Two horizontal bars imply that both elements of the respective object classes are related uniquely. For example, a connection is uniquely related to an addresses, vice versa.

The production results are shown in the state model. For the specific nature of the results, we refer to table 8.3. Particularly noteworthy are the binary production results R10, R11, R12, and R13, indicated by a two-part diamond.

In addition to the previous models, the state model identifies the core object classes of which the data is essential for carrying out EnerServe's processes. Hence the state model assists EnerServe's governance competence in defining the core elements of EnerServe's data dictionary.

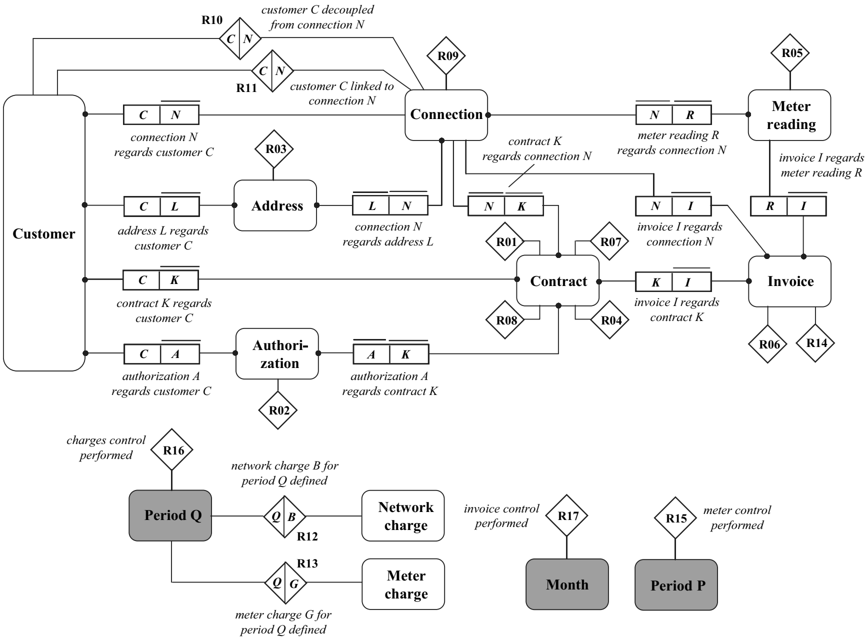

Fig. 8.5. State model

8.3.3 Additional Transactions

In addition to the transactions shown in figure 8.2, the transactions concerning energy trading and the (monthly) transfer of network and meter charges must be included. These transactions are depicted in the interaction model of figure 8.6, which must be seen as an extension to figure 8.2.

Table 8.4 shows the transaction results.

Table 8.4. Transaction-result table

Transaction	Result
T18	R18 Network charge *B* transferred
T19	R19 Meter charge *G* transferred
T20	R20 Transfer control for month *M* performed
T21	R21 Energy *E* paid
T22	R22 Energy *E* bought
T23	R23 Energy *E** sold
T24	R24 Energy *E** paid

We will not elaborate further on these additional transactions. Since they are rather straightforward, the associated process, state, and interstriction models can be defined easily.

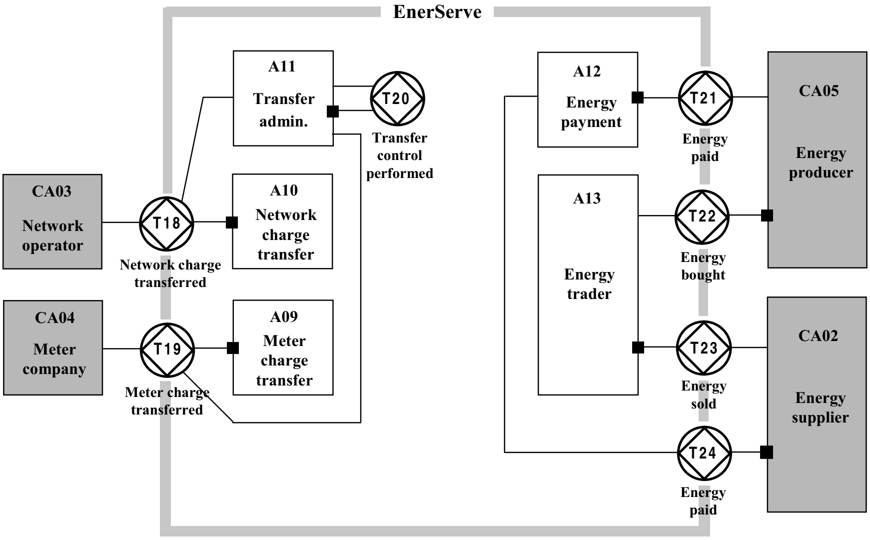

Fig. 8.6. Interaction model with additional transactions

8.3.4 Interstriction Model

An interstriction model shows the various information links. We will limit ourselves to the interstriction model associated with the interaction model of figure 8.2. This model is derived as follows (cf. paragraph 7.2.2):

- Taking the interaction model of figure 8.2, and changing the solid lines into dotted lines, representing the information links.
- Interpreting the transaction symbol as the combination of two data banks: production data and coordination data associated with a certain transaction (cf. figure 7.13 of paragraph 7.2.2).
- Adding links to external data banks. These are data banks not (only) created by the transactions shown in the interaction model. The result is shown in figure 8.7.

The nature of the external data banks can be explained as follows. Data banks are about production facts (hence, the diamond shape). The data bank about meter readings is made up of production facts created by the transactions between suppliers requesting, and customers providing, the meter readings. Similarly, connection data is produced by internal transactions within the network operator concerning the connection registry updates. Further, contract data is produced by EnerServe (concerning supply) and the network operator (concerning connection and transport). Finally, there is the data bank about taxes produced by governmental agencies. Because there could generally be more than one transaction involved in producing the data bank, the external data banks are identified as composite production banks (CPB).

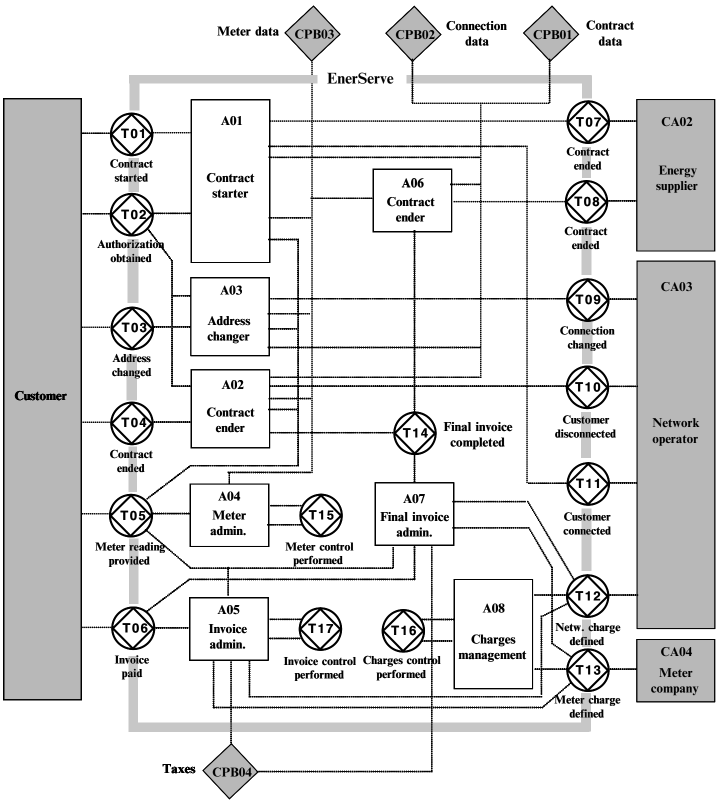

Fig. 8.7. Interstriction model

Since the interstriction model is about information links, the model aids in (1) defining EnerServe's applications (or possibly modifying existing ones) that enable the various actors to acquire the information they need, and (2) positioning EnerServe's commodity infrastructure and services that will be discussed below. Both aspects operationalize the notions of business/IT alignment and enablement.

8.3.5 *Action Model and Business Rules*

The coordination activities of the transactions are guided by business rules. A special subset of business rules concerns action rules, which are considered as imperative business rules that must be followed (cf. paragraph 7.2.3). Together with business representatives, the strategy and architecture competence must devise the business/action rules. As an example, action rules for transaction T01, in the case of switching, might read:

T01/pm: Prior to initiating the switch inform the customer about contractual conditions and indicate that if the contract with the current supplier exceeds the minimum contract period, or is within the seven-day period after contract initiation, switching is possible at no costs or else there will be a fine for premature contract termination imposed by the current supplier.
Request the customer's authorization to end the customer's contract with the current supplier, and to arrange the connection and transport agreement. Decline the switch if no authorization is obtained.
Inform the customer about EnerServe's conditions concerning the authorization.
Request the meter reading and request the termination of the contract with the current supplier formally as per date 'd', and provide the meter reading to the current supplier.
Await the formal statement from the current supplier that the contract has been terminated, and inform the customer accordingly.

T01/st: When the current contract has been ended and the customer's connection number is linked to EnerServe, confirm to the customer by e-mail that the contract is operational under the specified conditions. Subsequently send the contractual documents.

T01/ac: If switching has been performed adequately, accept by returning the duly signed contract copy or else no formal contract is started. Contact EnerServe's customer care center for follow up activities.

We will not present the business/action rules for all coordination activities. The example given shows the typical nature of these rules.

8.3.6 Process Models and the Definition of Services

Services at the business level execute parts of business processes (cf. paragraph 7.5). Defining the type and granularity of these services is not a simple issue. Proper process design is evidently a prerequisite for the ability to define meaningful services that can also be reused.

For EnerServe, the process models shown in figures 8.3 and 8.4 provide a fruitful reference for considerations about services development. For example, in the case of the contract ending process (figure 8.4), for the execution of T06/rq and T14/rq the use of services for the execution of tasks might be considered:

- T06/rq: send invoice
- T14/rq: complete final invoice

As the process model shows, within the process executed by the 'final invoice service', the 'send invoice service' will be used. Noticeably, the latter service is used in two processes, initiated by the transactions T14 and T17 respectively.

Notably, many services must be defined that enable EnerServe's operation. All these services are part of the EnerServe commodity infrastructure and services discussed below. Examples are: corporate directory services, data archiving services, services for extracting data from operational systems and for transforming and loading them into informational systems, etc. Many of these services operate concealed within the IT domain, for ensuring adequate IT system operation. Other services are used directly for executing (parts of) business processes. For example, the execution of transaction T06 by the customer is enabled by (1) services to authenticate users and authorize them to perform certain actions, and (2) services that enable electronic payment. As such, these services provide the means for actually implementing the production activities of transaction T06.

Finally, we might observe that workflow services (as part of overall collaboration services) aid in controlling the flow of transaction activities, including the associated waiting conditions.

8.3.7 Actor Roles and Functional Entities

As illustrated, the interaction models show EnerServe's essential actor roles. These actor roles might be clustered logically, for example based on an organizational architecture principle requiring that clustering actor roles into functional units must be based on minimizing external relationships with functional unit. An example of such clustering is shown in figure 8.8.

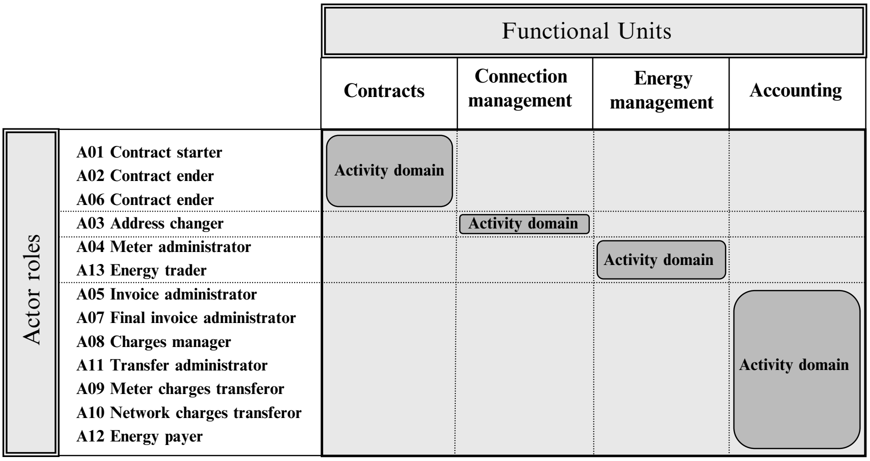

Fig. 8.8. Clustering of actor roles

The clustering shown in figure 8.8 identifies four activity domains. In addition to a variety of personnel competencies that are relevant for the different activity domains, the associated information support (applications) is evidently a crucial aspect. Unwarranted fragmentation of information support by various applications, as a result of EnerServe's existing IT arrangements, can thus be identified.

8.4 Enterprise Architecture for EnerServe

8.4.1 From Enterprise Ontology to Implementation

After having defined the ontological models, further construction models must be designed that enable the ultimate implementation (cf. paragraph 7.2.4). Since ontological models are fully implementation-independent, it is still unclear how implementation should occur. For example, how should EnerServe implement transaction T01, starting a contract? How should customer interaction occur? Interaction through the Internet leads to another construction model than interaction by having the customer come to an office. Hence, for implementation, further design is required which yields the construction models. Design guidance is required in the form of enterprise architecture. Enterprise architecture is defined with reference to areas of concern, and applicable to four main enterprise design domains: business, organization, information and technology (cf. paragraph 7.3.3). For technology EnerServe currently limits itself to information technology. A number of subdomains are defined per main design domain (cf. paragraphs 7.3.4 through 7.3.6).

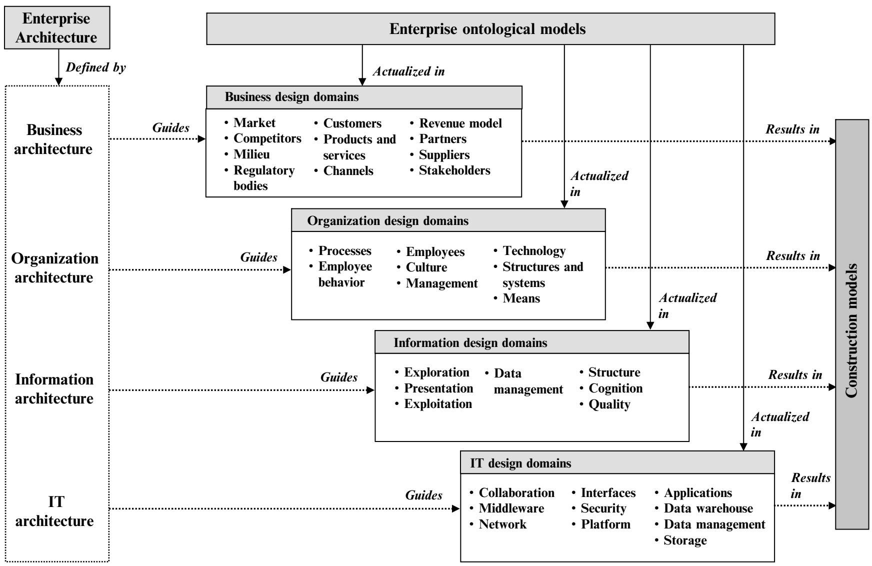

Fig. 8.9. The transition from ontological models to construction models

The transition form the EnerServe ontological models mentioned previously to construction models that can be physically realized is shown schematically in figure 8.9. The four main enterprise design domains are shown with their respective sub-design domains. The ontological models are actualized – are made concrete – in the design domains, guided by architecture. This results in a set of construction models that enable ultimate physical implementation. The architecture principle (mentioned below) that 'the Internet must be the primary customer interaction channel' will lead to an IT-based interaction solution. A screen layout can then be considered as a construction model. Other models might be: the clustering of actor roles into functional units as shown in figure 8.8, the actual arrangement of electronic invoicing and payment, the (management) reporting structure or the structure of functional payment levels, and so on. Below we will show some IT-based construction models, indicating key infrastructure and services areas.

Through guiding the actual realization of ontological models, architecture has two important goals: (1) ensuring the unified and integrated operation of EnerServe, and (2) addressing the areas of concern (cf. paragraph 4.2). As stressed earlier, these two goals are not 'automatically' implied by the ontological models. The use of different process implementations in different areas of EnerServe would – while having the same ontological model – impair process integration. The ability to address areas of concern also needs design in addition to ontological design. So for example, customer and service orientation is not an inherent property of ontological models, particularly since these models are implementation-independent. Architecture must thus be defined to make EnerServe customer- and service-oriented, , as is shown below.

8.4.2 Requirements and Architecture

Figure 8.9 indicates that architecture guides the design within a specific design domain. Not identified in this figure are the requirements that must be addressed when designing. EnerServe's strategy and architecture competence is aware of the subtle difference between architecture and requirements (cf. paragraph 4.2.6). As a clear distinction: requirements are formulated by the system user(s), while architecture is defined by system designer(s). Since architecture holds for a class of systems, requirements concerning a specific system are not (generally) the basis for defining architecture, but are rather the areas of concern (cf. paragraphs 4.2.5 and 7.3.2). Figure 8.10 aims to illustrate this message. For example, the constructional requirement for real-time workload distribution, as mentioned in table 8.2, is addressed in EnerServe's design domains by using a design theory and associated methodology. That design is guided by architecture, which is applied in the design domains. The architecture examples shown in figure 8.10 are defined to address the areas of concern also mentioned in figure 8.10, which generally hold for the class of enterprises. So the requirement can be seen as a specific instance of the concern for flexibility and speed, which is addressed in design domains through the design theory and methodology, guided by architecture, which was already formulated based on identified areas of concern.

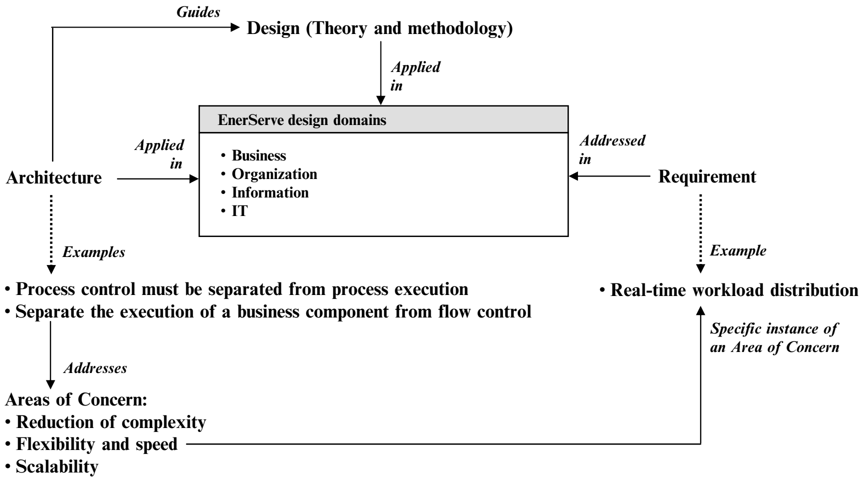

Fig. 8.10. Design: architecture versus requirements

8.4.3 Architecture Definition and Publication

Reference Context

Architecture applies to one or more design domains, and addresses one or more areas of concern (cf. paragraph 4.2.5 and 7.3.2). The tables below show the architecture per sub design domain. Some principles apply to more than one design domain. The numbers behind the principle refer to the areas of concern discussed previously (and resumed below), that the principle aims to address.

1. Enterprise integration: decoupling and unifying
2. Process excellence
3. Reduction of complexity
4. Customer and service orientation
5. Flexibility and speed
6. Scalability
7. Business intelligence
8. Employee involvement
9. Security and compliance
10. Costs
11. Business ethics.

Architecture Publication

EnerServe publishes architecture principles and standards in formal documents. These documents provide an overview of the design domain to which the architecture and standards apply by:

- Explaining the design domain and the concepts germane to the domain.
- Indicating (technology) trends affecting the design domain.
- Presenting architecture in a four-tier structure (cf. paragraph 4.2.8): (1) the principle statement, (2) rationale for the principle, (3) implications of the principle, and (4) key actions necessary to effectuate the principle.
- Showing the relationships with other design domains and their architecture.

Through these documents (1) a formal and comprehensive view on architecture is provided and communicated, (2) the nature, rationale and implications of architecture are outlined and corroborated, (3) a comprehensive overview of key actions is given, which also serves as a reference for project definition, and (4) unified and integrated EnerServe design is supported.

In view of the volume of such publications, we will only illustrate this publication structure in a few cases.

Finally, all architecture design documents provide an overview of the product standards relevant within the domain. These standards are subject to life-cycle management, since new standards need to be introduced, while existing ones need to be phased out. EnerServe's strategy and architecture competence has defined seven life-cycle categories:

1. Need to investigate: technology trends require studying the standard's feasibility
2. Under investigation: the new standard is currently studied
3. Planned: a formal date for introducing the standard has been defined
4. Standard: currently used
5. End of life: although currently used, a date for discontinuing the standard is defined
6. Obsolete: standard may no longer be used
7. Restricted: standard may only be used in certain defined areas or instances.

Towards Achitecture Maturity

The results shown below manifest EnerServe's commitment to enterprise architecture. Design principles and standards are defined in a heuristic, participative process of EnerServe's strategy and architecture competence together with various stakeholders. We must stress that EnerServe's approach to enterprise architecture reflects their first steps of a learning process towards enterprise architecture maturity. Some principles might thus be considered less specific for design guidance. EnerServe's strategy and architecture competence stress the importance of including these principles for a number of reasons:

- They act as initial high-level design guidance, whereby the notion of design is considered broadly as devising courses of action aimed at changing existing enterprise conditions into preferred ones (cf. paragraph 1.1.2).
- The principles make intentions, opinions, norms and values explicit, and thereby stimulate a productive dialog about issues that would otherwise

remain covert and thereby not addressed, which would most likely lead to incoherence and inconsistency.
- They form the basis for making architecture precise through iterative and collaborative learning processes, and allowing them to be 'internalized' by the EnerServe community.

8.4.4 Business Architecture

In short, the business architecture guides the design of EnerServe's relationships with its environment, thus guides how EnerServe's commercial domain must be exploited and explored (cf. paragraph 7.3.4). As indicated, the numbers behind a principle refer to the areas of concern the principle aims to address. So the architecture principle that enables customers to manage their own data will enhance customer satisfaction and also reduce costs. Hence the principle addresses the areas of concern 'customer and service orientation' as well as 'costs'. Table 8.5 shows the business architecture defined by the strategy and architecture governance competence.

Table 8.5. Business architecture examples

Design domain	Architecture	
Market	Delivery of products and services must enable differentiation between high, average, and low consumer markets	4
	The complementary services market must be fully integrated with the market of primary energy services	1,4
Competitors	Products and service delivery must enable quickly following competitor strategies	5,7
Customers	Relationships with customers must be customer manageable	4
	Historic customer energy consumption must be presented on customer login	4,7
	All customer interaction channels must be fully integrated	1,4,5
	Customers must manage their own data	4,10
	Customer suggestions for improvements must be actively evoked	2,3,4
	The status of customer request handling must be indicated on customer login	4,7
	Loss of income due to defecting customers, and income gained by new customers, must be recorded	1,4
Products and services	The price structure must differentiate between high, average, and low energy consumers	4
	Invoicing must be (dynamically) based on the lowest pricing arrangement	4

(Continued)

	Invoicing and payment must only be handled electronically	1–6,9,10
	Hedging possibilities for energy price increases must be part of customer offerings	4
	Complementary services may only be offered in connection with the primary energy service	3,4,10
	Invoices must be comprehensive, and contain network and metering charges, and/or charges for complementary services	3,4
	Quality aspects of products and services must be explicitly defined and linked to process capabilities	2,6
	Products and services may not be sold unless tested in a trial period by a representative target customer group	2,3,4,10
Channels	The Internet must be the primary customer interaction channel	1–6,10
	All customer interaction channels must be fully integrated	1,2,4,6
Revenue model	Given the various price categories, charges to customers must be determined automatically based on the lowest possible charge out	4
	The charge out model must encourage energy saving	4,11
	The charge out mechanism must exclude higher energy unit price due to energy saving	4,11
Partners	Delivery of complementary products and services through partnerships only	3,6
	Customer relationships with EnerServe partners must be arranged through the EnerServe interface	1,3,7
	Relationships with partners should be based on long-term engagement/involvement	3,10,11
Suppliers	Trading must be directed to preferred suppliers	3
	Relationships with suppliers should be based on long-term engagement/involvement	11
Milieu	Products and services delivery must be arranged in an energy conscious manner	11
	Products and services delivery must enable easy transition of current supply to 'green' energy supply	3,5,11
Regulatory bodies	Regulatory developments must be proactively followed, possibly influenced, and translated to implications for EnerServe	5,7
Stakeholders	EnerServe performance indicators must enable interactive dialog with stakeholders	5,7
	EnerServe must stimulate energy conservation community development	11
	Communication media must enable effective employee-to-business, business-to-employee, and employee-to-employee communication	3,8

Illustration of the Principle Publication Structure

As an illustration, we will take a principle for the 'products and services' design domain, and show its publication structure.

1. Principle statement
   Invoicing and payment must be handled electronically only.
2. Rationale
   The digital form of invoices and payment allows easy integration of these processes with other EnerServe processes (e.g. financial and accounting process). Process quality is increased, and the complexity of processes – hence costs – is reduced due to the significant reduction of manual interventions. Customer satisfaction will most likely increase. Further, the process are faster in execution, while they can be more easily adapted to business growth. The electronic nature of the processes enable greater security and adherence to rules and regulations.
3. Implications
   Current non-electronic forms of invoicing and payment must be reduced gradually. This has consequences for some customers and the internal administrative staff. Specific implications are faced by customers without acceptable electronic means.
4. Key actions
   Investigate solutions for electronic invoicing and payment services. Consider the consequences for the current administrative staff.
   Investigate possible solutions (or exceptions) for those customers not having (or unlikely to have) adequate means to handle invoices and payment electronically. Define under which conditions exceptions to the principle must be granted.
   Define the requirements for electronic invoicing and payments services. Develop electronic invoicing and payments services as part of the EnerServe Commodity Infrastructure and Services (cf. paragraph 7.4.3).

The activities mentioned as key actions define activities and eventually projects (listed in the enterprise project portfolio) that must be executed under the guidance of enterprise project management, and controlled for their content by the strategy and architecture competence.

8.4.5 Organization Architecture

EnerServe's internal design is guided by construction architecture, consisting of three sub-architectures. The first of these is organization architecture (cf. paragraph 7.3.5). Information and IT are also part of internal arrangements, but the associated architecture will be addressed separately below. Organization architecture principles are given in table 8.6.

Table 8.6. Organization architecture examples

Design domain	Architecture	
Processes	For all processes essential to EnerServe's mission, key data must be defined, measured and presented that indicate the inherent performance capability of the process	2,7,10
	Process design and execution (business rules) must express and enable espoused norms and values	1,4,8
	Only processes may be defined that are essential for carrying out EnerServe's mission	3,5,10
	Process safety must prevail over efficiency	11
	Process execution must be business-event driven	1,2,3,5,6
	Process design may include enforced business rules only in case of safety, health or compliance considerations	3,5,9,10
	Customer process design must enhance customer productivity and assurance	4
	Decision-making must take place at the lowest possible level	2,3,4,5,8
	Process control arrangements must be separated from process execution arrangements	3,5,6
	Process control must enable communicating the process state	2,7,9
	Services may only use the common vocabulary in their communication	1,3,6
	Local efficiency must be subordinated to end-to-end process performance	2,5,6,10
	Customer interaction processes must include easy to use error correction capabilities	2,4,10
	Quality control must be an integral part of employee activities and must take place at the point of production or service delivery	2,3,8,10
	Process design must address delegation of communicative actions associated with transactions explicitly	2,9
	Processes must enable easy data extraction for use in other processes or informational systems	1,3,6,7
	Contract, procurement and payment processes must have non-repudiation protection	2,9
	All processes requiring authorization must store operational data	2,9
	All operational authorizations must be linked to personnel data	2,9
	System access must be based on authentication and role-based authorization	9
	Process design must exclude the necessity for data reconciliation	2,3,6,9
	Financial and contractual operational events must update associated information systems real-time	2,7,9
	Process events must be logged in read-only data storage	9
	Customer contract and purchase actions must always be confirmed	2,4,9

(Continued)

	Timely feedback to customer/employee suggestions for improvement must be monitored	2,3,4,8
	Costs of non-quality must be made explicit and linked to process capabilities to aid improvement	2,3
	Process design must enable cross-functional information sharing for supporting employee collaboration	1,2,3,8,10
	Invoicing and payment must only be handled electronically	2,3,6,10
	Process data must enable statistical process control	2,7
	Clustering of actor roles into functional units must be based on minimizing the unit's external relationships	2,3,5,6
	The concepts used in relation to processes (e.g. quality, productivity, safety, reliability, etc.) must be defined in operational terms, such that these concepts have meaning for the processes and their control	1,2,6,7,8,9
Employee behavior	EnerServe's organization must focus on behavior directed to the desire to achieve, creativity, openmindedness, participation, and EnerServe's mission	1–5,8
	Self-initiated behavior must be enabled and evoked for enhancing EnerServe's performance	2–5,8,10
	Employee behavior must focus on the contribution to the overall process, the (internal) customer, and EnerServe's mission.	1–5,8,10
	Cross-functional, collaborative behavior must prevail over behavior geared to local sub-optimization	1–5,8,10
	Employee behavior must focus on continuous improvements and innovation to enhance performance and create new revenue streams	2–5,8,10
	Cross-functional teams must receive the power and means to pilot suggested improvements	2–5,8,10
Culture	EnerServe's culture must be directed to customer satisfaction and the improvement of performance enterprise-wide	1–5,8,10
Employees	Employee involvement must be a core focus of EnerServe's development	2–5,8,10
	Employment of employees must reflect EnerServe's espoused culture	1,8
	EnerServe's organization must enable and stimulate employee self-efficacy and development	8
	Employee suggestions for improvements must be evoked actively	2,3,4,5,8
Management	Management behavior must reflect EnerServe's mission, espoused culture and customer and stakeholder objectives	1,8
	Management must enable employee self-organization	8
	Management at all levels must be trained and assessed pertinent to leadership characteristics	1,8
Technology	Only proven technology may be used in primary processes	2,9,10
	Technology must enhance customer productivity and assurance, and employee competencies	2,4,8,10

(Continued)

	Critical systems must have fail-operational protection	2
	Technology arrangements must be modular	3,5,6,10
	Only open standards technology may be used	1,3,6,10
Structures and systems	Employee and management assessment and remuneration systems must support and evoke desired behavior and adherence to espoused norms and values	1,8
	Financial, accounting and management reporting systems must reflect EnerServe's mission and customer and stakeholder objectives	1,8
	Employee bonus payment must only be based on EnerServe's overall performance	1,8
	Individual performance-related incentive pay systems and associated targets may not be used	1,2,3,8
	Performance assessment of customer service units must be based on satisfactorily addressed customer issues	1,4,8
	Rewards systems must recognize team and individual efforts and contributions to the enhancement of EnerServe's performance	1,2,3,8
	Accounting structures must be in accordance with the International Financial Reporting Standards	9
	Accounting units of measure must exclude local sub optimization and must focus on EnerServe's performance overall	1,2,6,10
	Accounting must treat education as an investment rather than cost	1,8
	Financial structures must make costs of non-quality explicit and linked to process capabilities to aid improvement	2-7,10
	Absenteeism must be accounted for as a production cost	10
Means	Only certified material and equipment may be used	2,9,10
	Methods for delivering products and services must address safety and security issues/measures explicitly	9,10,11
	Cross-functional teams must be established that continuously assess possibilities for improvements and innovation to enhance performance and create new revenue streams	1–8,10
	Employee job descriptions must focus on the contribution to the overall process, the (internal) customer, and EnerServe's mission.	1,8
	Prior to formalizing necessary work instructions, they must be understood and endorsed by the employees using them	2–6,8,10
	Cross-functional teams must receive the power and means to pilot suggested improvements	2–6,8,10

Illustration of the Principle Publication Structure

We use an organization architecture principle for the 'processes' design domain.

1. Principle statement
   Process design must address delegation of communicative actions associated with transactions explicitly.

2. Rationale
   In various cases, a communicative action (e.g. request, promise, state or accept) is not done by the actor who should logically do it. For example, the acceptance of purchased goods might be done by an employee in the receiving warehouse, or delegated even further to the person using the goods. So, a repair technician using a spare part ultimately determines acceptance of the part. The technician thus has valuable information pertinent to the quality of the spare part that should be used in improvement processes. By addressing these cases explicitly, opportunities for quality improvements are recognized.
   Further, specifically in the case of financial processes, explicitly addressing task delegation ensures better compliance with rules and regulations by the actor doing the delegated tasks.

3. Implications
   The currently used process design methodology must be adapted or discontinued, in order to address task delegation adequately.
   Information given to, or provided by, the actor doing the delegated tasks must be defined explicitly.

4. Key action
   Investigate the currently used process design methodology and adapt or replace the methodology accordingly.

8.4.6 Information Architecture

As stated, information architecture is also an aspect of the construction architecture and guides the design of EnerServe's information handling and usage (cf. paragraph 7.3.5). Table 8.7 shows the defined information architecture principles and standards.

Table 8.7. Information architecture examples

Design domain	Architecture	
Exploration	Operational systems must enable easy data extraction for informational systems	1–10
	Informational systems must provide flexible capabilities for data analysis and trends prediction for external and internal data or combinations thereof	1–10
	Integrated links with external sources for general economic data, energy volume and price developments, consumer and demographic data, must be established	7
	Application design must enable analysis about how customers use the applications	2,3,4,7,9

(Continued)

Presentation	Presentation of key data must include the capacity to verify their meaning	1,3,5,6,7,8
	Type and purpose of information must be linked to presentation styles consistently	1
	End-users must be able to personalize data presentation	4
Exploitation	Data that enables considered local decision-making by employees must be available for all process steps	2,3,5,8,10
	Information about customers' energy consumption must be available at all customer contact points	1,4,7
	Information about EnerServe's performance must be available at all employee portals	1,8
	Information about EnerServe's energy conservation results must be available for all stakeholders	11
	Cross-functional information sharing must be defined and used in supporting employee collaboration	1–5,8,10,
Data management	Meta-data must be centrally managed	1,3,6,7,9,10
	Meta-data must be part of the data they describe	1,3
	Process events must be logged in read-only data storage	2,7,9
	Redundant data entry about the same data is not allowed	1,2,3,6,9,10
	Data from operational systems must update informational systems real-time	2,4,7,9
	All data must have associated accessibility policies	9
	Authentication and authorization data must be stored centrally	3,9
	Data to authenticate/authorize users must be stored in one central directory	2,3,5,6,9,10
	Data transport over public lines must be encrypted	9
Structure	Information must be structured according to the XML standard	1,2,3
Cognition	Semantics must be consistent over all processes	1,2,3
	Data definitions must be in accordance with the EGB standards	1,2,3,9
	The data concepts used in relation to processes (e.g. quality, productivity, safety, reliability, etc.) must be defined in operational terms, such that these concepts have meaning for the processes and their control	1,2,6,7,8,9
Quality/Security	All informational data may have only one authoritative source	1,2,3,9
	Customer, employee, business partner and supplier data must be available from one unified source	1,2,3,8,10
	Multiple data entries about the same data must be excluded	1,2,3,8
	Data must be validated at the source	2,9
	Data errors must be traceable to the source	2,9
	User authentication and authorization must be based on one service only	3,9

Illustration of the Principle Publication Structure

The structure will be illustrated through an information architecture principle for the ‘data management’ design domain.

1. Principle statement
   Data from operational systems must update informational systems real-time.
2. Rationale
   Information is a key enterprise ‘recourse’. Timely availability is key in order to control enterprise processes adequately and respond to otherwise unnoticed trends and developments. These might for example concern quality degradations, material consumption or consumer behavior. Improved process performance, business intelligence, as well as security and compliance are the result of timely availability of information. Moreover, the ‘real-time‘ enterprise offers opportunities to enhance the customer and service orientation, since customer data is always current and can be used productively and proactively in all subsequent customer interactions.
3. Implications
   Data must be considered as a corporate asset. No restrictions on their utilization outside the domain where the data are generated should exist. Operational processes should not limit the extraction of informational data.
4. Key actions
   Study how different types of operational data must be extracted, transformed, and loaded (ETL) into unified informational databases.Define ETL, backup, (re)store, replication, synchronization, archiving, and reporting services in the context of data warehousing.

8.4.7 IT Architecture

The final and third part of EnerServe’s construction architecture is its IT architecture, which guides the design of EnerServe’s IT systems (cf. paragraph 6.6.2 and 6.6.6). Unlike the architecture principles stated previously, the IT architecture principles often show their specialist nature[3]. Nonetheless, most of the principles shown below are intuitively comprehensible.

[3] The examples provided are based on, and inspired by, the work of Senior IT Architects of the CIO Office of KLM Royal Dutch Airlines.

Table 8.8. IT architecture examples

Design domain	Architecture	
Collaboration	Collaboration services must be made available through the chosen collaboration suite. Disjointed point solutions are not allowed	1,2,3,5,10
	Collaboration services must operate within EnerServe's web hosting environment	1,3,6,10
	Proprietary collaboration features may not be used	1,3,6,10
	The provisioning of collaboration services must be positioned within the service-oriented architecture approach	1,3,5,6,10
	Embedded collaboration features in other software packages must be disabled	1,3,6,10
Interfaces	Presentation of services must be based on the user profile	3,9
	Business objects may only be assessed through standard access components	3,6,10
	All user access through the Internet must be arranged through one technical entry point only	1,3,6,9
	Different presentation components must be used for different languages	3,6
	End-users must be able to personalize data presentation	4,8
	Portlets must disclose resources using a service-oriented approach	3,5,6
	Each portlet may correspond to one service only	3,5,6
	Individual portlets must be reusable for different functions	1,3,5,6
	Portlets may not bypass the security of different back-end resources	9
	Portlets must be multi-channel compatible	1,2,3,5,6
	Portlets may not contain business logic	3,5,6
	Control and presentation of data must be separated	3,5,6
Applications	All applications must be Intranet, Internet, and Extranet transparent	1,2,3,5,6
	All applications must be 'look and feel' transparent	1,2,3,5,6
	Application design must enable analysis about customer application usage	7
	Always use an n-tier structure	3,5,6
	Separate the execution of a business component from flow control	3,5,6
	A business component must be able to communicate its state	2,9
	Optimistic locking (assuming the unlikelihood of different users affecting the same data at the same time) must be used to enable concurrent user access	3,5,6
	All applications must enable portal and multi-channel access	1,3,5,6
	Use 'service wrappers' to access legacy systems	3,5,6,10

(Continued)

	Every component must communicate through a local ORB, whereby enterprise access must be arranged through a service gateway	3,5,6
	Application integration must be arranged at the enterprise process level	3,5,6
	Applications must be designed to be business-event driven	2,3,9
	Commercial off-the- shelf solutions must be compliant with EnerServe's architecture	1,3,6
	Commercial off-the-shelf solutions may not be modified other than through the available configuration options	1,3,6
Middleware	No business logic may be executed by middleware services	3,5,6
	Object request broker standard 'XYZ' must be used	3,6
	Message oriented middleware must be used	1,3,5,6
	Use a hub and spoke mechanism for business component communication	1,3,5,6
	Services may only use the common vocabulary in their communication	1,9
	Asynchronous messaging must be used	3,5,6
	Separate service provisioning from service implementation	3,5,6
	Format and standard transformations must be minimized	3,5,6,10
	Two-phase commit style distributed transactions over service innovations must be avoided	2,3,5,6
Security	Security services utilization must be fully independent from their implementation	3,5,6
	Security services must be suitable for integrated monitoring and management in IT operational processes	2,9
	Security services must enable easy inclusion or exclusion of users	3,5,6,10
	Access to systems must be based on authentication and role-based authorization	3,9
	Contract, procurement and payment processes must have non-repudiation protection	9
	EnerServe-controlled access devices must include protection against malicious software and/or content	9
	Security services must include detection capabilities for unauthorized use or attempts to change the service	9
Data warehouse	Databases must be partitioned	3,5,6
	An operational data store must be separated from the data warehouse	3,5,6
	Operational data must be separated from informational data	3,5,6
	The data warehouse must be the only authoritative source for all decision support databases	1,2,3,5,6,9
	The data warehouse must be read-only	9

(Continued)

	Users' access to the data warehouse must be arranged through data marts	3,5,6
	No operational data may be stored in the data warehouse	3,5,6
	Data storage in the data warehouse must be in accordance with archiving and aggregation policies	1,3,9
Data management	A hub and spoke model for data distribution must be used	1,3,5,6
	Data must be validated at the source	3,9
	Data errors must be traceable to the source	2,3,9
	Data changes may be arranged through data-editor applications only (no direct manual data changes are allowed)	3,9
	Processes must enable easy data extraction for use in other processes or informational systems	1,3,6,7
	Meta-data must be centrally managed	1,3,9
	Meta-data must be part of the data they describe	1,3,9
	Redundant data entry about the same data is not allowed	1,2,3,9
Network	Resources must be accessed via a single virtual network	3,5,6
	Resource access must be location-independent and only based on the resource name	1,3,5,6
	Network access must be secured through a standard integrated security service	9
	Network access must be based on authentication and role-based authorization	9
	Network access must be based on two-factor authentication	9
	The network must support any-to-any communication to enable integration, interoperability and information sharing	1,5,6
	TCP/IP must be the standard transport protocol. Deviation only when unavoidable for access to business partners or suppliers	3,5,6
Platform	Only platforms mentioned in the Technical Reference Document may be used, and for the indicated purposes only	3,5,6,9,10
	All new application components must be hosted on EnerServe's web hosting environment	1,3,5,6,10
	All platforms must be configured identically (component transparency)	3,5,6
	Platform workloads must be distributed according to service-level characteristics	2,6
	All platforms must be operable in a network-centric environment	1,3,5,6
	A partitioned server may not be attached to Internet DMZ's, or other network zones	3,5,6,9
Storage	Data storage must be in accordance with RDBMS	3,5,6
	Data storage and data processing must be decoupled	3,5,6

(Continued)

	Data storage in Storage Area Networks (SAN) may only be assessed via locally attached application servers	3,5,6,9
	The generic TCP/IP network may not be used for intra SAN traffic	3,5,6
	Access to a single SAN in the DMZ is not allowed	3,5,6,9

We will give a number of examples that illustrate the publication structure of the IT architecture principles, and illustrate additionally how the key actions that are associated with the principles (also) define the portfolio of projects to be executed (cf. paragraph 6.6.3).

As a first example, consider a principle for the 'collaboration' design domain.

1. Principle statement
   Collaboration services must be made available through the chosen collaboration suite. Disjointed point solutions are not allowed.
2. Rationale
   Collaboration among human actors in enterprise is paramount. Delivering collaboration services dynamically within the context of enterprise processes, any place, any time, is a key enabler for improving enterprise performance and innovation. These services must operate seamlessly in an integrated fashion. Point solutions are considered more costly and risky because of integration issues. A non-integrated approach will lead to a chaotic, ineffective and inefficient collaboration infrastructure. A 'collaboration suite' provides the integrated approach and is defined as a coherent and integrated set of software applications that enable employees to collaborate either synchronously or asynchronously.
3. Implications
   The current singular collaboration functionality must be phased out. Possible redundancy with existing services provided by point solutions will occur.
4. Key actions
   Conduct a study for selecting the preferred collaboration suite. Analyze and describe the services initially required.
   Investigate migration of current point solutions to the collaboration suite.

The second example concerns a principle for the 'interfaces' design domain.

1. Principle statement
   Presentation of services must be based on the user profile.
2. Rationale
   Only access to services is to be granted for which the user is authorized, and that are relevant for the user's area of activity.
3. Implication
   Security information must be available for the user interface.
4. Key action
   User profile management must be introduced.

For the third example we use a principle for the 'data warehouse' design domain.

1. Principle statement
   Databases must be partitioned.

2. Rationale
   Partitioned databases enable faster implementation of changes and avoid multiple programs being affected if data are not partitioned.

3. Implication
   The principle implies that more, but smaller data tables will be required.

4. Key actions
   A partitioning policy must be defined.
   The organizational competence for partitioning databases must be created.

As a final example, consider a principle for the 'network' design domain.

1. Principle statement
   Resource access must be location-independent and only based on the resource name.

2. Rationale
   Flexibility and speed is a crucial enterprise area of concern. Access any place and any time is crucial. This principle also enables role-based access.

3. Implications
   EnerServe's business must conform to the corporate naming standards. Partner and supplier resource names must be known.

4. Key actions
   Develop Dynamic Naming Service linked to the global Corporate Directory Service, containing user, server, and workstation profiles.
   Investigate and migrate instances not compliant with this principle. Develop corporate naming standards.

The examples show the importance of presenting the architecture through a formal structure that – alongside the rationale for, and the implications of, the principle – also identify key actions (cf. paragraph 4.2.8). These key actions stimulate further actions in the form of studies and projects, which could very well lead to further architecture definition. As such, EnerServe's strategic (IT) agenda is gradually defined and the nature of EnerServe's transformation becomes apparent in an emerging fashion. The whole approach – governed by the strategy and architecture competence – aims to create a coherent and consistent (communicable) approach to EnerServe's development, such that it operates in a unified and integrated manner.

8.4.8 Architecture Principles and Areas of Concern

As indicated by the examples given previously, architecture principles and standards are applied in one or more design domains, and address one or more areas of concern. The tables categorized the principles and standards with reference to the design domains. However, it might be valuable to show all architecture principles and standards with reference to a certain area of concern. Here, architecture serves as the communicative bridge between strategic concerns and requirements on the one hand, and EnerServe's arrangement (construction) on the on the other (cf. paragraph 7.2.4). Appreciably, the publication structure of architecture principles is also an important communication vehicle.

As an example, table 8.9 below shows all the architecture principles and standards that address the area of concern 'security and compliance'. The main enterprise design domain to which the principle applies, is indicated. Since architecture can apply to more than one design domain, the categorization according to table 8.9 implies that a few principles are mentioned more than once.

Table 8.9. Architecture for security and compliance

Security and Compliance **Design domain**	**Architecture**
Business	Invoicing and payment must only be handled electronically
Organization	Process design may include enforced business rules only in case of safety, health or compliance considerations
	Process design must address delegation of communicative actions associated with transactions explicitly
	Contract, procurement and payment processes must have non-repudiation protection
	Process control must enable communicating the process state
	All processes requiring authorization must store operational data
	All operational authorizations must be linked to personnel data
	System access must be based on authentication and role-based authorization
	Process design must exclude the necessity for data reconciliation
	Financial and contractual operational events must update associated information systems real-time
	Process events must be logged in read-only data storage
	Customer contract and purchase actions must always be confirmed
	The concepts used in relation to processes (e.g. quality, productivity, safety, reliability, etc.) must be defined in operational terms, such that these concepts have meaning for the processes and their control
	Only proven technology may be used in primary processes
	Only certified material and equipment may be used
	Methods for delivering products and services must address safety and security issues/measures explicitly
Information	Application design must enable analysis about how customers use the applications
	Meta-data must be centrally managed
	Process events must be logged in read-only data storage
	Redundant data entry about the same data is not allowed
	Data from operational systems must update informational systems real-time
	All data must have associated accessibility policies

(Continued)

	Authentication and authorization data must be centrally stored
	Data to authenticate/authorize users must be stored in one central directory
	Data transport over public lines must be encrypted
	Data definitions must be in accordance with the EGB standards
	Data must be validated at the source
	Data errors must be traceable to the source
	User authentication and authorization must be based on one service only
IT	All user access through the Internet must be arranged through one technical entry point only
	A business component must be able to communicate its state
	Applications must be designed to be business-event driven
	Services may only use the common vocabulary in their communication
	Security services must be suitable for integrated monitoring and management in IT operational processes
	Access to systems musty be based on authentication and role-based authorization
	Contract, procurement and payment processes must have non-repudiation protection
	EnerServe-controlled access devices must include protection against malicious software and/or content
	Security services must include detection capabilities for unauthorized use or attempts to change the service
	Data storage in the data warehouse must be in accordance with archiving and aggregation policies
	Data must be validated at the source
	Data errors must be traceable to the source
	Data changes may be arranged through data-editor applications only (no direct manual data changes are allowed)
	Meta-data must be centrally managed
	Redundant data entry about the same data is not allowed
	Network access must be secured through a standard integrated security service
	Network access must be based on authentication and role-based authorization
	Network access must be based on two-factor authentication
	Only platforms mentioned in the Technical Reference Document may be used, and for the indicated purposes only
	Data storage in Storage Area Networks (SAN) may only be accessed via locally attached application servers
	Access to a single SAN in the DMZ is not allowed

We have stressed that addressing compliance following from corporate governance considerations must be addressed from the overall enterprise governance perspective focused on the design of the enterprise as a whole (cf. Chapter 1 and 5). Various reasons were given to underpin this viewpoint. As the EnerServe case illustrates, two of these reasons are worth mentioning specifically. First, satisfying compliance requirements follows from design guidance that is based on various other considerations pertinent to the design of the enterprise. As the tables 8.5

through 8.8 indicate, there are multiple instances where architecture principles address more than one area of concern than only ‘security and compliance’. Second, addressing compliance adequately implies that the totality of the enterprise arrangements must enable compliance, not just some isolated or specific area. As table 8.9 shows, the principles that address security and compliance cover all four main design domains, hence address enterprise-wide design.

8.4.9 EnerServe’s ‘legacy’ IT Systems Complexity and Service Oriented Architecture

As indicated earlier, prior to the open energy market situation, EnerServe did not formally distinguish between the four activity areas identified in paragraph 8.1.1. Consequently, EnerServe’s processes associated with these activity areas are highly intertwined. During the period of the monopolistic energy market, EnerServe also developed an inward-looking culture and management style, which was associated with a vertical and hierarchical management structure (the mechanistic focus as indicated in figure 8.1). Many functional areas within EnerServe became process and technology silo’s, making the creation of end-to-end process considerably complex and costly. Complexity and costs likewise translated to IT systems and networks. Untangling the IT legacy systems and reducing their complexity are thus a key IT requirements. Both requirements are addressed in close relationship with EnerServe’s overall strategy (cf. paragraph 6.8).

For disclosing the functionality of legacy IT systems, EnerServe has opted for the service-oriented architecture approach (cf. paragraph 7.5). Considerations for this approach are:

- Greatly supports the concern for decoupling and at the same time ensuring an integrated operation. Hence, the approach aids in creating flexibility and integration.
- Fits within the web-oriented IT environment.
- Fits within a process-oriented enterprise.
- Avoids redundancy through reuse, which also reduces development costs and the time-to-market of new functionality.
- Offers a productive approach for (gradually) disclosing IT legacy system functionality.
- Enables incremental services development, which enables controlled business growth.
- Enables more fruitful business and IT dialog because of the inherent process focus that the services-oriented approach necessitates.
- Offers possibilities for delivering complementary commercial services through partners.

Although IT plays an important role in delivering services, the definition of services takes place within EnerServe’s enterprise governance competence, and is based on business processes. Hence, as discussed in paragraph 8.3.6, the process models are essential for defining services. Proper enterprise governance further ensures the ability for EnerServe-wide reuse of services.

8.5 EnerServe Commodity Infrastructure and Services

In addition to architecture, the EnerServe commodity infrastructure and services – among which IT commodity infrastructure and services are important elements – are crucial enablers for operationalizing strategic choices and objectives pertinent to areas of concern (cf. paragraph 6.6.2 and 7.4.3). Together with business representatives and IT architects, the strategy and architecture competence has defined the following initial set of commodity infrastructure and services that are specifically relevant from EnerServe's business perspective:

- Web-enabled IT infrastructure and services
- Central, enterprise-wide messaging services
- Multi-channel access and interaction services
- Data warehousing services
- Authentication and authorization services
- Collaboration services
- Electronic invoicing and payment services
- Enterprise content management services.

The elements of the commodity infrastructure and services will be briefly outlined below. Notably, a number of these services were already mentioned in paragraph 8.3.6 for executing transactions.

<u>Web-enabled IT infrastructure and services</u>
It is the conviction of EnerServe's governance competence that the Internet (or within EnerServe, the Intranet) must be regarded as the all-embracing information utility for communication between persons, between persons and devices, and between devices mutually. For example, energy metering devices will ultimately specifically provide information about energy usage autonomously through their coupling with the Internet.

Web-enabled IT services are based on: (1) Internet/Intranet utilization for information exchange and the execution of transactions, and (2) use of the web browser as the universal access or interaction mode. The web-enabled IT infrastructure and services fit within the chosen service-oriented architecture approach, and enables the use of web services.

Four basic functions need to be developed: (1) browser-based access, (2) hosting of (commodity) web applications, (3) data access, and (4) communication management. These are central aspects of EnerServe's web hosting environment, which constitutes the common foundation for the development and operation of all new business applications. This common foundation must be scalable to accommodate business growth. Evidently, availability and maintainability are likewise important criteria.

Central, enterprise-wide messaging services
These services constitute another important foundation for enterprise integration. Two core functions are provided: (1) standardized communication between entities in EnerServe's network, and (2) management and control of the communication, such that data exchange is reliable. An important aspect of these services concern the disclosure of legacy system functionality (cf. paragraph 6.8).

Multi-channel access and interaction services
Access to EnerServe's network occurs through different access devices. Such access must be totally transparent for the different devices. Apart from similar functionality and data presentation provided by the accessed application, the required transparency also implies that transactions started through one device must allow completion through another device. Hence cross-channel consistency is required. Process excellence and uninterrupted fulfilment of transactions is thus enhanced through this commodity service.

Data warehousing services
Data is a key EnerServe resource. Considerable amounts of data will be generated about customers, competitors, market developments, operational performance etc. These data must be stored and made available for analysis and reuse. Only reliable data can ultimately be productive for customer and operational process improvements, and for effectuating business intelligence. Data warehousing services are thus considered as a necessary commodity.

Authentication and authorization services
Increased customer- and service-orientation, as well as the notion of the 'extended enterprise', necessitate easy access to EnerServe for customers, employees, business partners and suppliers. Paradoxically, EnerServe must be open and secure. Authentication and authorization services address the paradox by granting network and information access in a secure way, such that compliance and business continuity requirements are fulfilled.

Collaboration services
Effective collaboration between employees mutually, and between employees and customers, business partners and suppliers, is crucial for effective and efficient execution of processes. Collaboration services support synchronous and asynchronous communication. Examples of the former are video conferencing, or application sharing, while e-mail, workflow, or document sharing are examples of the latter form of collaboration services.

<u>Electronic invoicing and payment services</u>
These commodity services allow easy integration of invoicing and payment processes with other EnerServe processes (e.g. financial and accounting process). Significant reduction of manual interventions will increase process quality, speed and customer satisfaction, combined with the reduction of complexity and costs. Through these services EnerServe can adapt to business growth more easily. The electronic nature of the processes enables greater security and adherence to rules and regulations.

<u>Enterprise content management services</u>
Enterprise content tends to grow very fast, and will become unmanageable without specific measures. These commodity services aid in the security classification of content, its ownership and the life-cycle management. Archiving, storage, preservation and presentation of content in a structural manner are core aspects of content management. Complying with rules and legislation concerning financial and/or contractual content is thus greatly supported by content management.

For communicating the importance of the enterprise commodity infrastructure and services, the strategy and architecture competence has created the overview of figure 8.11, showing the relevance of the commodity infrastructure and services for the various areas of concern mentioned earlier. The overview shows that alongside the architecture principles and standards, the commodity infrastructure and services also aid in addressing the functional and constructional requirements and areas of concern. This close relationship is a direct result of specifying key actions for operationalizing an architecture principle. For example, as illustrated above,

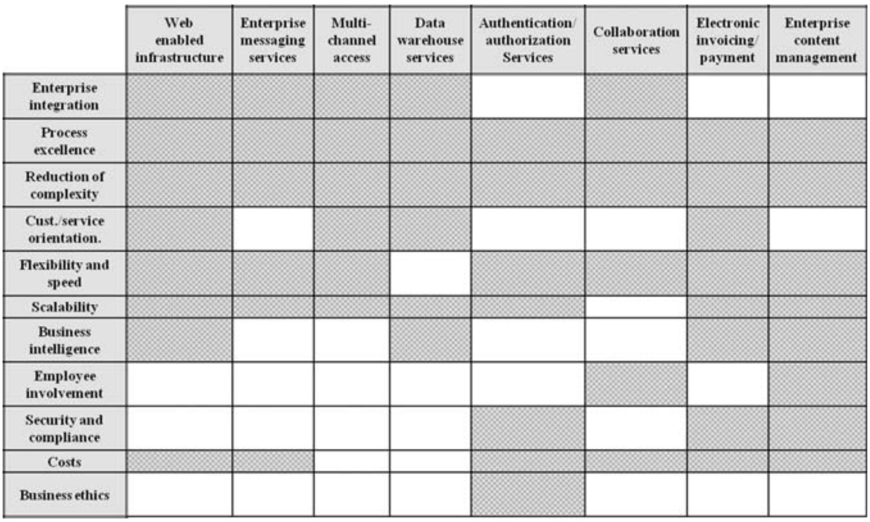

Fig. 8.11. Enterprise CI&S elements in relation to areas of concern

the business architecture principle ‘invoicing and payment must be handled electronically only’ has a number of key actions, among them the action for investigating solutions for electronic invoicing and payment services. So the commodity infrastructure and services are thus (also) the direct result of defining architecture and the associated key actions (cf. paragraph 6.6.2 and paragraph 7.4.3). Projects to realize EnerServe’s commodity infrastructure and services are part of the EnerServe project portfolio, and are executed by EnerServe Program Management.

It should be stressed that the set of EnerServe’s commodity infrastructure and services listed above is not necessarily exhaustive. New emerging insights might lead to the necessity for additional commodity infrastructure and services. For example, EnerServe sees increased employee mobility as a future area of concern that must be addressed. Increasingly, employees carry out tasks outside EnerServe’s private domain: the public area, home, or for example, at a customer’s location. This concern implies that employees must be provided with the capability for remote access from outside EnerServe’s private domain to EnerServe’s (IT-supported) business functionality. Subsequent analysis would then reveal whether the current architecture is adequate for arranging secure remote employee access, or that additional principles and remote access services are required. So, in an emerging fashion, new IT strategic issues for EnerServe are defined.

8.6 High-level Construction Models

As mentioned previously, ultimately the ontological models of EnerServe shown in paragraph 8.3 must be implemented. Various construction models have to be devised for that which detail the construction of EnerServe, as mentioned in paragraph 8.4.1. The design of these construction models is guided by the architecture principles mentioned previously. In view of the various business, organization, information and IT design domains, a variety of construction models can be envisioned. The construction models are often of a specialist nature, enforced by the design domain in question. As an example, figure 8.12 shows a high-level IT construction model that depicts important elements of EnerServe’s IT commodity infrastructure and services conceptually.

The high-level construction model of figure 8.12 can be explained as follows. The mentioned web-enabled infrastructure and services are central elements. New business functionality is provided through EnerServe’s web-based application and database hosting environment, to be distinguished from the legacy systems environment. Communication between users, applications and databases is arranged through the central enterprise-wide messaging services, that constitute the central ‘communication bus’. Sometimes one refers to the ‘enterprise service bus’. Through the central communication bus, legacy system functionality is disclosed through ‘service wrappers’ that create the interfaces to the legacy systems without basically changing the applications themselves. This type of legacy system access fits

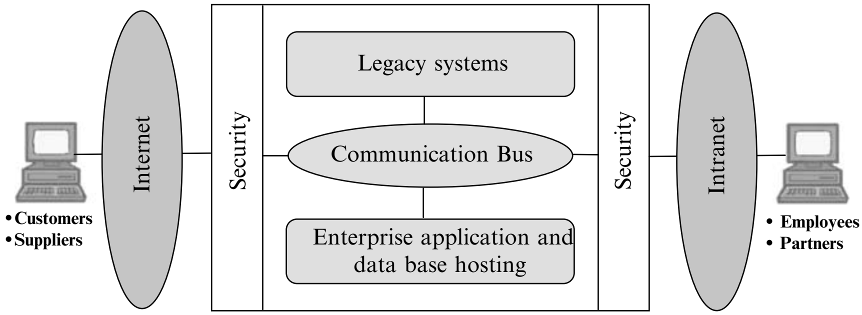

Fig. 8.12. High-level constructional model showing IT CI&S elements

within the service-oriented architecture approach chosen by EnerServe. Customer and supplier access to EnerServe is arranged through the Internet with the associated authentication and authorization services. Employees and business partners make use of the Intranet (or Extranet), which also has its associated authentication and authorization services. The Intranet outside the internal EnerServe domain can be viewed as such a secured part of the Internet infrastructure that it can be considered as part of the internal network (virtual private network).

Additionally, figure 8.13 details some of the security arrangements when certain end-users (customers and suppliers) access EnerServe from the public domain. Access is organized through a ‘demilitarized zone’ (DMZ) whereby various security applications take care of authentication, and subsequent authorization to access certain business applications in EnerServe’s private domain.

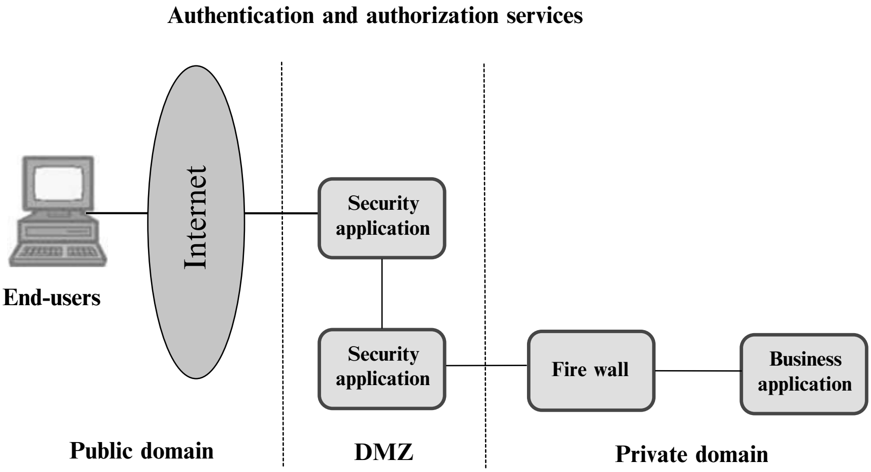

Fig. 8.13. High-level construction model showing security arrangements

An essential part of creating the construction models is the definition of various performance requirements, such as system and network availability (and the avoidance of single points of failure), mean time to repair, latency, data integrity, transmission capacity, the number of concurrent users, and so on. Considerations about these issues might lead subsequently to modifying certain aspects of the construction models. Hence construction models are finalized through an iterative and concurrent process.

8.7 Reflection

When contemplating the EnerServe case, the following observations are noteworthy.

First, crucial for making sense of the various dynamic developments in the area of energy supply, and addressing the associated complexity and uncertainty, is EnerServe's governance competence – and specifically the strategy and architecture competence – that brings forward new perspectives, important paradigm shifts, strategic choices, requirements, and areas of concern, that must be addressed. It shows the importance of the organismic way of organizing and the competence-based arrangement of governance: sense-making and finding the contours of the future outlook is a generative thinking and learning process, rather than a management-oriented, top-down and planning oriented one.

Second, EnerServe's essential operation in the new situation was clearly expressed by the ontological models. Devising these models also aids the process of sense-making: the dialog about the implementation-independent essence of EnerServe gradually clarified the core of the future operational and functional arrangements. Transactions and their production actions enabled the precise description of actor roles, which form the basis for establishing actor competencies and the associated information supply. As illustrated, the explicit identification of communicative actions served as a reference for defining business/action rules. The transaction patterns further facilitated in the definition of services for executing (parts of) business processes.

Third, architecture was defined for actualizing the ontological models, and (simultaneously) ensuring unified and integrated EnerServe operation, as well as for addressing the areas of concern. Design – guided by architecture – addressed functional and constructional requirements further. As the architecture examples indicated, they address areas of concern jointly: various principles affect more than one area of concern, and thereby provide the coherent and consistent structure for design guidance.

Fourth, the definition of key actions associated with (1) establishing functional and constructional requirements, and (2) the formulation of architecture principles, was shown to define gradually the nature of future (strategic) initiatives that had to be taken. Moreover, the definition of architecture, and the associated key actions, appeared to be important for establishing EnerServe's commodity infrastructure and services, as well as for initiating further studies or initiatives concerning EnerServe's development. Gradually, the notions of business/IT alignment and enablement are thus operationalized and made concrete. All kinds of barriers will affect the transition to the new situation, such as EnerServe's entangled processes and systems, or existing culture. All these issues manifest themselves and are addressed in an emerging, iterative and concurrent fashion, and are ultimately resolved through design.

Fifth, EnerServe's change 'management' appeared to be constituted implicitly by the governance competence: change came from within. Change became manifest through what the governance competence defined and produced as an innate force of action. Governance thus did not appear (primarily) as a capacity to execute top management-defined strategic initiatives. Rather conversely, strategic initiatives were (primarily) the result of governance. Initiatives were defined and executed by the governance competence in an emerging, concurrent, iterative and learning fashion. As illustrated, the governance competence devoted attention to the mutually related activities (cf. paragraph 7.4.3 and figure 7.30), whereby issues concerning corporate and IT governance were addressed concurrently.

In summary, EnerServe's governance competence interpreted the external and internal dynamics, identified paradigm shifts and areas of concern, formulated key actions, and ensured that requirements and the areas of concern are addressed through design, whereby strategic transition barriers are identified and taken into account. So, incrementally the nature of EnerServe's transformation and its design becomes apparent in an emerging, learning fashion. This process is shown schematically in figure 8.14.

What thus appeared as an obvious characteristic is that EnerServe's transition was fueled by the governance competence, and the design activities that competence

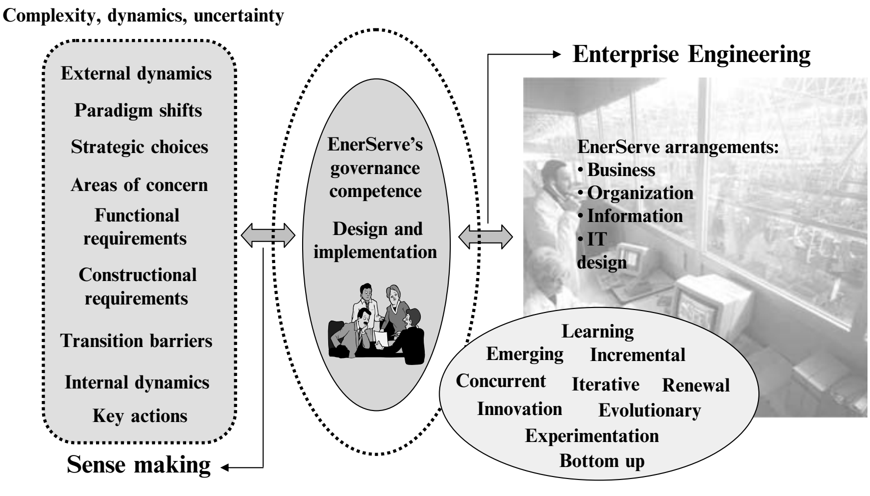

Fig. 8.14. The central role of EnerServe's governance competence

undertook, not by budget, management and planning processes, or by managing a project portfolio. How could such a portfolio be defined anyway without reference to design? For defining an adequate, coherent and consistent set of projects that is able to implement the new EnerServe arrangements, the enterprise governance and enterprise engineering approach thus turned out to be indispensable.

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Enterprise Governance and Enterprise Engineering

What Distinguishes this Book?

1. From within their respective disciplines, the topics of corporate governance, IT governance and enterprise governance are receiving broad attention. However, despite these topics are highly interrelated, they are not treated in a unified and integrated manner, as is done in this book. In itself, this fragmented treatment is not conducive to enterprise strategic success.

2. Moreover, virtually all approaches to aforementioned governance themes share the same underlying *mechanistic* characteristics: strongly management and planning oriented with its associated focus on internal control that supposedly should secure future enterprise success. For effective governance, a radically different *organismic* perspective is offered that rests on the creative and intellectual capacities of employees. Only within this different perspective enterprises can effectively address the dynamics, complexity and uncertainty that confront them, arrange themselves for adapting to future, unforeseen developments, and address the core reason for strategic failures.

3. Many sources argue that the core reason for strategic failures lies in ineffective internal managerial control. We argue on the contrary that strategic failures are primarily due to lack of coherence and consistency among the various components of an enterprise, which precludes it to operate as an unified and integrated whole. Our basic premise is that enterprise unity and integration does not come 'incidentally', but has to be *designed*. The design aspect – which is introduced under the label *enterprise engineering* and is notoriously absent in virtually all approaches to governance – is argued as a central area of attention for effective governance.

4. Only within the focus on design, the in the literature frequently mentioned notions of IT architecture and enterprise architecture can be meaningfully addressed. All too often, these notions are used in an imprecise and unmethodical manner. We aim to introduce the concept of architecture formally, associated with the notion of system design. The enterprise is then seen as a social-technical system in which IT systems are concurrently addressed in a unified and integrated manner, for which enterprise and IT architecture provide design guidance respectively.

5. Unlike most of the literature about IT and enterprise design, ample attention is devoted to addressing governance and design from a unified perspective, since without proper governance, design activities are all too often ineffective due to an apparent lack of 'contextual legitimacy'. The ability to adequately address enterprise design will thus be positioned as a core competence within the enterprise governance competence.

6. Both the advocated organismic governance perspective and the focus on design will be argued to imply a radical departure from the top-down, management-focused rational thinking/planning perspective on strategy development and implementation, in favor of the emerging, employee-focused generative thinking/learning perspective.

In summary, the key aspects that distinguishes the book are:

1. Unified rather than fragmented treatment of corporate, IT and enterprise governance
2. Organismic rather than mechanistic approach to governance
3. Design focus rather than a control focus for avoiding strategic failures
4. Formal rather than unmethodical introduction of the IT and enterprise architecture concept based on viewing the enterprise as a socio-technical system
5. Unified rather than fragmented treatment of governance and design: design as a crucial facet of governance
6. Emerging, employee-focused generative thinking/learning perspective on strategy development, rather than the top-down, management-focused rational thinking/planning perspective.

Key Words

1. Governance
2. Enterprise engineering
3. Enterprise/IT architecture
4. Business/IT alignment and enablement
5. Strategic development and implementation.

About the Author

Dr. Ir. Jan A.P. Hoogervorst studied Electrical Engineering at the Delft University of Technology, and completed his dissertation in Work and Organizational Psychology at the Amsterdam Free University. He fulfilled a number of managerial functions at KLM Royal Dutch Airlines and was responsible for Aircraft Systems Engineering, Aircraft and Aircraft Components Maintenance, Flight Crew Training, and Corporate Information Technology Strategy Development and Implementation. He currently works at Sogeti as an organizational advisor and management consultant, and as part-time university lecturer in Enterprise Governance and Enterprise Engineering.