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CONFIGURING VALUE FOR COMPETITIVE ADVANTAGE: ON CHAINS, SHOPS, AND NETWORKS

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Building on Thompson's (1967) typology of long-linked, intensive, and mediating technologies, this paper explores the idea that the value chain, the value shop, and the value network are three distinct generic value configuration models required to understand and analyze firm-level value creation logic across a broad range of industries and firms. While the long-linked technology delivers value by transforming inputs into products, the intensive technology delivers value by resolving unique customer problems, and the mediating technology delivers value by enabling direct and indirect exchanges between customers. With the identification of alternative value creation technologies, value chain analysis is both sharpened and generalized into what we propose as a value configuration analysis approach to the diagnosis of competitive advantage. With the long-linked technology and the corresponding value chain configuration model as benchmark, the paper reviews the distinctive logic and develops models of the value shop and the value network in terms of primary activity categories, drivers of cost and value, and strategic positioning options. © 1998 John Wiley & Sons, Ltd.

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INTRODUCTION

Understanding how firms differ is a central challenge for both the theory and the practice of strategic management (Nelson, 1991). In a dynamic economic and institutional setting, changes in the dominant competitive logic of firms is of particular interest (Prahalad and Hamel, 1994). Hence, a complete but parsimonious typology of the alternative forms of value creation is a prerequisite for expressing and exploring how firms differ in a competitive sense. The purpose of this paper is to propose and explore such a typology.

Porter's value chain framework (1985) is presently the accepted language for both representing and analyzing the logic of firm-level value creation. Although Porter's industrial organization (five-forces) competitive analysis framework (Porter, 1980) is challenged in resource-based critiques (Barney, 1991; Wernerfelt, 1984), the value chain maintains its central role as a framework for the analysis of firm-level competitive strengths and weaknesses.

Value chain analysis is a method for decomposing the firm into strategically important activities and understanding their impact on cost and value. According to Porter (1985, 1990), the overall value-creating logic of the value chain with its generic categories of activities is valid in all industries. What activities are vital to a given firm's competitive advantage, however, is seen as industry dependent.

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Having supervised in-depth application of the value chain model to more than two dozen firms from a variety of industries[1] during the last 4 years, we have experienced serious problems in applying the value chain framework. Whereas the primary activity typology of the value chain appears well suited to describing and understanding a traditional manufacturing company such as presented in the familiar 'Crown Cork and Seal' case (1977), the typology and underlying value creation logic are less suitable to the analysis of activities in a number of service industries.[2] It is not only difficult to assign and analyze activities in terms of the five generic primary value chain categories, but the resulting chain often obscures rather than illuminates the essence of value creation.

Consider the insurance company. What is received, what is produced, and what is shipped? Few insurance executives would perceive uninsured people as the raw material from which they produce insured people. Nor would a description of an insurance company as a paper-transforming company, producing policies from blank paper, capture the value creation logic. This is not to say that the logistics of handling paper and data in a large insurance company is a minor undertaking to those involved in it. Significant savings can be realized by reengineering (Hammer, 1990; Schonberger, 1990) the document flow and considerable cost is incurred in operating the insurance company's computer systems. However, such a description hardly captures the essence of value creation in an insurance company from a strategic point of view. The logic of many strategically important activities such as reinsurance to cover risk, actuarial calculations, and customer relationship management are not well described by a paper-flow-transformation-process perspective.

Similar problems occur in the analysis of banks. Our experience is that value chain analysis frequently results in either postulating deposits as the 'raw material' that the bank's primary activities transform into loans, or postulating that all primary banking activities collapse into a single major activity class: operations. In either case, the chain model cannot deal explicitly with both lenders and borrowers as bank customers. The value chain metaphor obscures the competitive logic of banking by focusing attention on transaction-processing unit costs, with little attention to interest spread and risk management.

Slightly different problems occur when we try to analyze in more detail critical support activities such as technology development. Consider upstream petroleum exploration and field development. Value chain analysis directs too much attention to unit costs, i.e., finding costs, development costs, and production costs per barrel of oil. Although unit cost is a relevant performance measure when we consider the complete life cycle of an oil field, it is less useful as a guide to the economics of exploration. Efficiency in exploration is subordinate to effectiveness. Upstream petroleum is mainly the logic of extraordinary value creation such as finding giant oil fields or creating innovative field development concepts that alter the rules of commercial petroleum production. Value created seldom correlates with finding costs. We need an analysis framework that can handle the contingent nature of petroleum exploration and field development, where projects often require a custom approach and where most exploration projects are not successful.

We suggest that the value chain is but one of three generic value configurations. Based on Thompson's (1967) typology of long-linked, intensive and mediating technologies, we explore the idea that the value chain models the activities of a long-linked technology, while the *value shop* models firms where value is created by mobilizing resources and activities to resolve a particular customer problem, and the *value network* models firms that create value by facilitating a network relationship between their customers using a mediating technology. Hospitals, professional service firms, and educational institutions are examples of firms that rely on an intensive technology. Examples of companies that create value by facilitating exchange among their customers are telephone companies, transportation companies, insurance companies and banks.

Introducing three distinct value configurations leads us to propose that value chain analysis needs to be transformed into value configuration analysis, which in turn helps us clarify critical analysis assumptions. Value configuration analysis

[1] We have worked with, amongst others, insurance, banking, metal processing, telecommunication, health services, downstream and upstream petroleum, engineering, and transportation.

[2] For similar critiques see, for example, Løwendahl (1992); Armistead and Clark (1993).

is defined as an approach to the analysis of firm-level competitive advantage based on a theory of three value creation technologies and logics. The well-known value chain 'diagram' serves both as an analytical tool for the analysis of value creation in a specific firm and as a representation format (Morecroft, 1992). The analysis serves as a means to develop an understanding of the current competitive position of the firm and how this position can be both maintained and strengthened; the firm is the unit of analysis. We present alternative analytical representation and presentation formats that summarize the unique value creation logic of the intensive and mediating technologies.

Table 1 summarizes the main differences for the three value configurations that the remainder of the paper develops in more detail. Distinctive value creation technologies are the critical reference point. The next section presents the main characteristics of the long-linked value creation logic and the corresponding value chain configuration. The section also develops the key concepts and assumptions of value configuration analysis. The next two sections develop the main elements of the value shop and the value network configurations. An initial review of the distinctive logic of the alternative value creation technologies is used to motivate our proposed value configuration representations and situate the discussion of cost and value drivers. The review of the technologies is primarily conceptual. Although it is based on both our interpretation of relevant literature and on consideration of illustrative examples, the assertions made should be viewed as propositions and hypotheses in need of further research.

The three generic value creation technologies with their associated distinctive value configuration models provide the foundation for a theory and a framework for the analysis of firm-level competitive advantage. The discussion section develops some of the implications of the proposed framework for strategic analysis and strategy with emphasis on the distinctive importance of drivers. The section also links the proposed configurations to organizational design as strategy implemen-

Table 1. Overview of alternative value configurations

	Chain	Shop	Network
Value creation logic	Transformation of inputs into products	(Re)solving customer problems	Linking customers
Primary technology	Long-linked	Intensive	Mediating
Primary activity categories	• Inbound logistics • Operations • Outbound logistics • Marketing • Service	• Problem-finding and acquisition • Problem-solving • Choice • Execution • Control/evaluation	• Network promotion and contract management • Service provisioning • Infrastructure operation
Main interactivity relationship logic	Sequential	Cyclical, spiralling	Simultaneous, parallel
Primary activity interdependence	• Pooled • Sequential	• Pooled • Sequential • Reciprocal	• Pooled • Reciprocal
Key cost drivers	• Scale • Capacity utilization		• Scale • Capacity utilization
Key value drivers		• Reputation	• Scale • Capacity utilization
Business value system structure	• Interlinked chains	• Referred shops	• Layered and interconnected networks

tation and to competitive logic at the business value system level. The paper concludes with some implications for further research.

THE VALUE CHAIN

Porter's work (1985) is the key reference on value chains and value configuration analysis for competitive advantage. Porter, however, does not use the term value 'configuration' analysis as the value chain is the sole value configuration considered. In our review of the value chain model we make explicit a number of arguments that are implicit in Porter's value chain analysis framework.

Value creation logic

We propose that the value chain models a *long-linked* technology (Thompson, 1967), where value is created by transforming inputs into products. The product is the medium for transferring value between the firm and its customers. Raw materials and intermediate products are typically transported to the production facility that transforms the inputs into products which are shipped to customers.

Marketing serves two complementary purposes. The first is in the development and refinement of the chain by providing product specifications and volume estimates. The second is to simulate the required level of demand for the chain's output to ensure stable operation and capacity utilization. Post-purchase service is performed to ensure proper use of the product by the customer, to remedy defects or to increase the lifespan of the product.

Consider assembly line-based manufacturing as an example of a long-linked value creation technology. The assembly line is designed to produce standard products at low cost per unit by exploiting cost economies of scale. The activities are buffered from short-term input or output fluctuations in adjacent activities by intermediate storage.

Interdependencies between activities are dealt with through coordination. Thompson distinguishes between pooled, sequential, and reciprocal interdependence (1967: 54–55). *All* value creation technologies have some degree of pooled interdependence—to the extent that organizational activities share common resources. Some technologies have pooled and sequential or pooled and reciprocal interdependence, and the most complex technologies have pooled, sequential, and reciprocal interdependence. In firms with a long-linked value creation technology, the interdependencies of the primary activities are also sequential where, for example, the outputs of inbound logistics are the inputs to operations.

The value of products is a function of Buyer Purchasing Criteria (Porter, 1985: 141–143). Variation in Buyer Purchasing Criteria gives rise to selective adaptation of products or differentiation. Differentiated products can command a higher price if they provide a better match with Buyer Purchasing Criteria. Customer value is defined either by the cost reductions that the product can provide in the customer's activities or by the performance improvements that the customer can gain by using the product. Porter's generic strategies of cost or differentiation (1980) are aimed at improving either the cost or value of a product relative to the average of the industry.

Technology development is performed to either reduce the cost of a product, particularly through process improvements, or to raise the commandable price by improving the adaptation of the product to Buyer Purchasing Criteria.

Representation of value creation

The value chain analysis framework postulates that competitive advantage is understood by disaggregating the value creation process of the firm into discrete activities that contribute to the firm's relative cost position and create a basis for differentiation. The basic assumption underlying the disaggregation is that activities are the building blocks by which a firm creates a product that is valuable to its customers. Different activities have different economics and contribute differently to the valuable characteristics of the product.

The activity disagregation must be complete in the sense that it captures *all* activities performed by the firm. To maintain a strategic and manageable perspective on value creation, it is important that the activity disaggregation not be too detailed, while still enabling one to identify those activities that are strategically important. The heuristic proposed by Porter for disaggregating activi-

ties[3] is that the resulting activities (1) have different economics, (2) have a high potential impact on differentiation (value), or (3) represent a significant or growing proportion of cost.

The value chain configuration is a two-level generic taxonomy of value creation activities (Porter, 1985). Primary activities are directly involved in creating and bringing value to the customer, whereas support activities enable and improve the performance of the primary activities (for a similar two-level activity categorization see also Kornai, 1971; de Chalvron and Curien, 1978; Stabell, 1982). The 'support' label underlines that support activities only affect the value delivered to customers to the extent that they affect the performance of primary activities. Primary value chain activities deal with physical products (Porter, 1985: 38).

Primary activities

The five generic primary activity categories of the value chain are (Porter, 1985: 39–40):

- *Inbound logistics*. Activities associated with receiving, storing, and disseminating inputs to the product.
- *Operations*. Activities associated with transforming inputs into the final product form.
- *Outbound logistics*. Activities associated with collecting, storing, and physically distributing the product to buyers.
- *Marketing and sales*. Activities associated with providing a means by which buyers can purchase the product and inducing them to do so.
- *Service*. Activities associated with providing service to enhance or maintain the value of the product.

The primary activity categories—particulary the inbound logistics–operation–outbound logistics sequence—are well suited to characterizing the main value creation process of a generic manufacturing company. Casual empiricism suggests that manufacturing or process industry firms frequently use the value chain activity category vocabulary when defining and describing their operations. Marketing is included as a primary activity category as these activities inform the customer of the relevant product characteristics and ensure product availability on the market. Similarly, the inclusion of service as a primary activity category follows from the fact that service can be critical for the value realized by the customer.

The set of generic activity categories is a template for identifying critical value activities that provide a basis for understanding and developing competitive advantage from the perspective of the firm as a whole.

The value chain configuration is not meant to model the actual flow of production. The value chain activity focus can be used for identification of strategic improvement needs or opportunities, but is not necessarily useful for specifying a reengineering of business processes.

Generic activity categories are not the same as organizational functions. Related activities from a competitive advantage perspective can span several organizational functions. A single function can similarly perform activities that need to be distinct from a competitive advantage perspective. This is perhaps most apparent in the distinction between primary and support activities.

A firm's value chain is embedded in a system of interlinked value chains (Porter, 1985: 34). This value system includes the value chain of suppliers of raw materials and components. It also might include the value chain of distinct distribution channels before the product becomes part of the buyer's value chain. The overall system is thus a chain of sequentially interlinked primary activity chains that gradually transform raw materials into the finished product valued by the buyer.

Support activities

The generic support activity categories of the value chain are:

- *Procurement*. Activities performed in the purchasing of inputs used in the value chain.
- *Technology development*. Activities that can broadly be grouped into efforts to improve product and process.
- *Human resource management*. Activities of recruiting, hiring, training, developing, and compensating personnel.
- *Firm infrastructure*. Activities of general man-

[3] Porter's discussion of the appropriate level of disaggregation applies to these individual activities. He is not thinking of the choice of generic activity categories.

agement, planning, finance, accounting, legal, government affairs, and quality management.

The categories of support activities are not uniquely linked to the value creation logic of a long-linked technology. The same categories of support activities should therefore be relevant to other primary value creation logics. Porter does not argue explicitly for his categories of support activities, and the taxonomy appears to follow pragmatically the traditional functional organization of the firm, where support categories cover those functions not included in the primary activity categories of the value chain configuration.

Value configuration diagram

Figure 1 shows the generic value chain diagram. The sequencing and arrow format of the diagram underlines the sequential nature of the primary value activities. The support activities in the upper half potentially apply to each and all of the categories of primary activities. The layered nature of the support activities are apparently meant to tell us that activities are performed in parallel with the primary activities. The margin at the end of the value chain arrow underlines that the chain activities are all cost elements that together produce the value delivered at the end of the chain.

For the analysis and diagnosis of a particular firm's competitive advantage, it is necessary to identify the firm's individual value activities using the generic value activity categories. Figure 2 shows an example of the instantiated value chain diagram for a copier manufacturer with primary value activities (Porter, 1985).

Diagnosis of competitive advantage

Allocating individual activities to generic categories is an analytical choice with strategic implications. The same applies to the choice of activities that are considered for explicit enumeration.

Value chain analysis is often limited to and summarized by the identification and discussion of strengths and weaknesses in terms of critical value activities (Hax and Majluf, 1992). A more detailed first-order analysis assigns costs and assets to the value activities.

Second-order analysis requires a closer look at the structural drivers of activity cost and value behavior. The drivers are related to the scale and scope of the firm, linkages across activities, and environmental factors. Cost and value drivers are often analyzed separately.

First-order analysis

The allocation of costs and assets to each activity can be used to assess the activities that are the most important determinants of overall product cost. Comparing differences relative to competitors or other relevant benchmarks provides an indicator of competitive advantage and improvement potential.

Obtaining reliable and accurate cost and value data for value chain analysis is difficult (Hergert and Morris, 1989). Traditional accounting data are most often not collected and reported in a fashion consistent with the needs of value chain analysis. As noted above, effective analysis for diagnosis of competitive advantage requires not only obtaining historical data, but also projecting trends and comparing results with similar data from competitors.

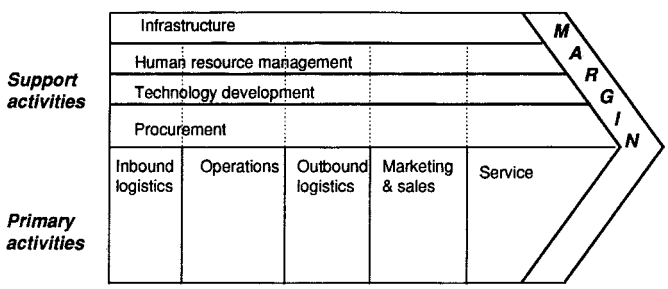

Figure 1. The value chain diagram. Reprinted with the permission of The Free Press, a division of Simon & Schuster from *Competitive Advantage; Creating and Sustaining Superior Performance* by Michael E. Porter. Copyright 1985 by Michael E. Porter.

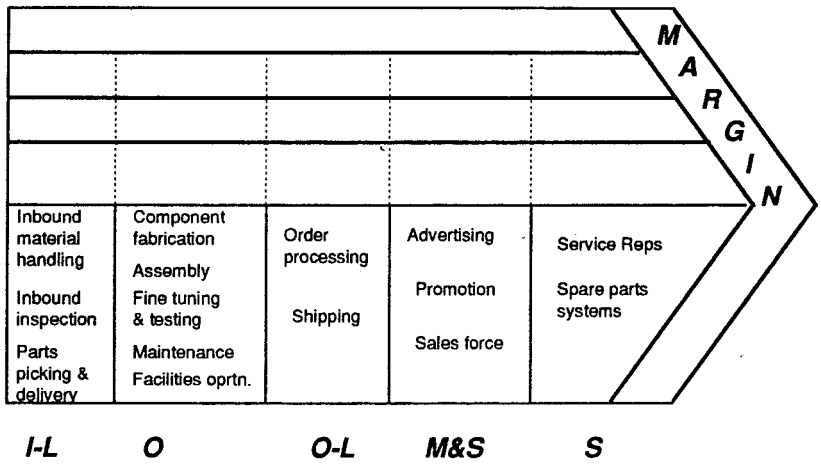

Figure 2. Value chain diagram for a copier manufacturer. Reprinted with the permission of The Free Press, a Division of Simon & Schuster from *Competitive Advantage; Creating and Sustaining Superior Performance* by Michael E. Porter. Copyright 1985 by Michael E. Porter.

Despite the inherent difficulties often encountered, first-order analysis is useful for a number of reasons. First, value configuration analysis is useful because it promotes the right questions: what is the firm's competitive position and how can it be sustained or improved? Second, the awareness and commitment promoted by *the process* of diagnosing competitive advantage is often just as important as obtaining accurate estimates of costs and value. Third, the difficulty of obtaining a good understanding of cost and value behavior for critical value activities is an indicator of causal ambiguity and barriers to imitation (cf. for example, Reed and DeFillipi, 1990). This difficulty underlines the potential competitive advantage that might be obtained from effective value configuration analysis.

Drivers of cost and value

The cost behavior of value activities is determined by structural factors that are defined as cost drivers. Identification of structural factors provides a heuristic for assessing the cost behavior and cost economics of the value activities for a firm. The relative importance and absolute magnitude of cost drivers will vary from industry to industry and from firm to firm. Exploiting and shaping these structural factors is a main source of competitive advantage.

Drivers are partly related to internal relationships, partly related to external factors, and partly related to the relationship between internal and external factors.

Porter (1985) identifies 10 generic drivers: scale, capacity utilization, linkages, interrelationships, vertical integration, location, timing, learning, policy decisions, and government regulations. All drivers of cost and value identified by Porter are potentially relevant. However, their relative importance and role might differ across firms and, as we shall show, systematically across the three alternative value creation logics. The value chain model promotes a heavy focus on costs and cost drivers (Porter, 1991).[4] The main drivers of value are the policy decisions that are made by product and segment choices when the firm is established or is repositioned.

For the generic value chain, the major driver of cost is scale. Associated with scale is the structural importance of capacity utilization. Internal scope relates to the degree of vertical integration forwards towards customers and backwards into suppliers. Thompson (1967) argues that vertical integration is the primary means for chains to reduce control costs due to supply and demand uncertainty.

Traditional economics of scale relate to both

[4] Porter (1991) proposes three uses of the value chain model: (1) a template for understanding cost position, (2) a template for understanding product effects on cost position of buyer, and (3) a tool for analyzing the added costs that differentiating might imply.

economies of labor–capital substitution and learning. The other main drivers relate to the economics of both internal and external scope.[5] Scope and scale have diseconomies that follow from the need for coordination due to nonperfect decomposition (Simon, 1982) of the activities of the firm.

The primary activities of the long-linked technology have both pooled and sequential interdependence. There are, therefore, potentially significant cost and value drivers in the form of linkages across primary activities and with the primary activities of suppliers and customers.

Strategic positioning options

The purpose of value configuration analysis is diagnosis and improvement of competitive advantage. Competitive advantage is relative to existing and potential competitors. Competitors are defined by product and market segment scope. A third dimension is scope in terms of value activities in the business value system of interlinked firms. This is often referred to as degree of vertical integration. Strategic positioning for competitive advantage is therefore an issue of choosing position in terms of product scope, market scope, and business value system scope. We suggest that the structure of the business system is a function of the underlying value configurations of the firm. Or stated differently, there are unique value system scope options relative to the different configurations.

The appropriate choice of position depends on the drivers of cost and value. For firms with a long-linked technology, relationships between scale, capacity utilization, market scope, and uncertainty in input and output markets are the critical generic determinants of the appropriate strategic position. The drivers shape the business value system, the industry, and thereby also the competitive position. Competitive position will also be a function of where the industry is in the product life cycle.

A position of competitive advantage cannot be chosen directly, but must rather be attained by appropriate actions in terms of scope and in terms of attempts to modify the drivers of cost and value.

Sustainable competitive advantage is determined by the nature of the sources of competitive advantage. These are in part captured by uniqueness and nonimitability of the drivers of cost and value that underly a position.

The logic of the value chain implies an analysis of competitive positioning based on variants of cost leadership. That is, the value chain framework has most to say about how to achieve a cost leadership position. The overall flow logic of the primary activities direct attention only to those Buyer Purchasing Criteria associated with improving the flow of the larger value system that includes buyers and suppliers.

THE VALUE SHOP

Value shops—a short form for 'firms that can be modeled as value shops'—rely on an *intensive* technology (Thompson, 1967) to solve a customer or client problem. Selection, combination, and order of application of resources and activities vary according to the requirements of the problem at hand. Thus while the chain performs a fixed set of activities that enables it to produce a standard product in large numbers, the shop schedules activities and applies resources in a fashion that is dimensioned and appropriate to the needs of the client's problem. The problem to be solved determines the 'intensity' of the shop's activities.

Examples of firms that rely on an intensive technology are professional services, as found in medicine, law, architecture, and engineering. Important functions or parts of firms can also have a value creation logic that is best understood as a value shop, even though the primary activities of the overall firm have a value creation logic that is consistent with the product and transformational logic of the value chain. For example, petroleum exploration and petroleum field development[6] in the upstream petroleum industry (Jones, 1988) and more generally industrial product and process development (Clark and Wheelwright, 1993) can be understood as based on an intensive, problem-solving technology. These functions or units are most often represented as support activities in a value chain

[5] Scope can be further divided into horizontal and vertical scope.

[6] As opposed to petroleum field operation.

configuration. The value shop configuration can therefore be used to model the value creation logic of critical support activities.

We have called the value configuration of an intensive technology a 'value shop.' The 'shop' label captures that a firm so configured is directed at a unique and delineated class of problems—in a fashion similar to the way the shop of a mechanic repairs cars. The shop metaphor signals that assembly and matching of both problems and problem-solving resources are important for the organization and management of the value shop.

The shop metaphor also signals that organizations with intensive technologies often both improve performance and reduce costs by incorporating the object worked on, be it by hospitalizing patients, by performing education in the classroom, or by providing consulting services on customer premises (Thompson, 1967: 43). In upstream oil, the object incorporated is a model of the basin, play, prospect, or field—most often in the form of maps, seismic sections, stratigraphic columns—but increasingly in a computer-supported medium and using a computer-supported representation.

Value creation logic

Problems can be defined as differences between an existing state and an aspired or desired state (Simon, 1977). Problem-solving, and thus value creation in value shops, is the change from an existing to a more desired state. In the case of medical services, the change is to cure the patient of a sickiness. In the case of the architect, the change can be to raise a building or other structure at a particular site. Problems involve situations requiring remedial action and situations where there are improvement opportunities.

The intensive technology is thus directed at bringing about desired changes in some specific object of interest to the client or customer. In many cases, the object is human, such as in health care and education. But the same value creating logic is found in firms where the object is an artifact to be created or modified, such as a site, a system, or a knowledge state. In petroleum exploration, the object is a basin, play, and prospect with more or less uncertain petroleum resources that, when explored, might be transformed into fields with proven commercial reserves.

Consider the case of the patient who visits a general practitioner because he has a chest pain. The physician starts the consultation (Stoeckle, 1987) by asking about the chief complaint—the symptoms that brought the patient in for medical care, and involves also asking questions about the patient's relevant history. The physician then typically performs a physical examination. The examination may uncover indications for a suspected hypothesis or may trigger a reformulation of the hypotheses. Diagnostic tests are used to confirm or rule out suspected diagnoses. Sometimes trial therapy also serves as a diagnostic test. No therapy, i.e. wait and see, might also serve to pinpoint relevant diagnoses. In some cases the physician concludes that the patient needs to be referred to a specialist in cardiology. In the final stage of the consultation, the physician makes a treatment plan for the patient, specifying the treatments to administer and the procedure for monitoring the patient's progress. Monitoring progress towards resolving the client's chest pain problem might involve a house call or a patient visit to the office of the physician.

The simple example of the medical consultation illustrates a number of key distinctive characteristics of value creation with an intensive technology.

Value information asymmetry. A strong information asymmetry between the firm and its client is perhaps the single most important attribute of an intensive technology. The asymmetry is the reason that the patient approaches the general practitioner. The physician knows something that the patient thinks he needs. Equally important from a value creation perspective, the firm delivers value even by determining that the client has no problem. The medical doctor often might deliver value by merely attending to the client. All this is due to the fact that the client–patient is not able to determine if the service is correct or appropriate, even in cases where the outcome is negative (Friedson, 1960; Karpik, 1989).

Configured to deal with unique cases. Client problems often involve more or less standardized solutions, but the value creation process is organized to deal with unique cases. In many situations, less specialized personnel could handle most of the problems. However, the professional (e.g., the medical doctor) always needs to be

involved to be able to recognize and deal with the limited number of cases that require their expertise, have been incorrectly diagnosed, or where the treatment is not performing as expected (Abbott, 1988). The patient expects the service of the professional and is motivated to follow and trust the testing and treatment by reference to the relevant expertise.

Cyclical, iterative and interruptable activities. The flow of activities is not linear, but iterative between activities and cyclical across the activity set. Diagnosis moves back and forth between hypotheses and new data collection that confirm, reject, or lead to a reformulation of the diagnosis. Treatment might initiate a new problem-solving process to determine the most appropriate way of administering the treatment (Simon's, 1977, wheels-within-wheels metaphor). A treatment can result in the resolution of the client's problem, but can also initiate a new and perhaps a different sequence of activities. The process is not only iterative, but also potentially interruptable at all stages, either when the symptoms are found to be a false alarm, when there is no known solution, or when the problem needs to be referred to a specialist.

Significant sequential and reciprocal interdependence between activities. The iterative and cyclical nature of problem-solving in shops results in a high degree of both sequential and reciprocal interdependence between activities. For example, appropriate definition of the problem to be solved is vital for all other activities; feedback both from trying to generate a solution and from implementing a chosen solution might require redefinition of the problem or search for alternative solutions. The consequent high demands for coordination across activities are often dealt with by assigning the problem to a single professional who follows the problem to resolution and by using lateral integration mechanisms (Galbraith, 1973) that facilitate information exchange while maintaining high professional commitment and responsibility. In demanding cases that require the interplay of multiple disciplines and expertise in the development of innovative solutions, the coordination needs are often addressed by assigning a full-time cross-functional team (Clark and Wheelwright, 1993). In all cases the heavy coordination needs are addressed by reducing the coordination across the problems and clients to simple pooled interdependence.

Multiple disciplines and specialities in spiralling activity cycles. Offshore petroleum field development illustrates an intensive technology that requires the interplay of several different specialities in the development of artifacts. Field development moves from discovery to realization of the field operation through the following stages: application for concession, exploration, feasibility studies, field development and planning, basic engineering as part of planning for field development, detailed engineering, and with fabrication, construction, hook-up and commissioning as realization of field development (Hallwood, 1990). This might appear to be a sequentially interlinked set of activities. It is rather a refinement of a basic problem-solving cycle where each cycle implements the solutions chosen by the previous cycle or each cycle is passed the new problem that has resulted from the resolution of the initial problem. The process also changes in terms of the object of interest: in upstream petroleum, from the basin and play to the prospect; once the prospect is identified as a potential field, it becomes delineated into several components that, depending on their extent and form, need to be developed with one or more platforms (wells).[7]

Problem-independent information acquisition activities. The professional often has a standard information acquisition procedure to make sure that the problem has been correctly framed. An example is the doctor who always takes the patient's temperature, inspects his throat, and knocks on his knee, irrespective of what the patient presented as the symptoms or the nature of his illness. This standardization of information acquisition activities provides both value and limits overall costs, in part as it provides the basis for early anticipation of succeeding activities.

Leveraging expertise. Firms with an intensive technology are labor intensive with professionals and specialists in the problem domain covered as the core and frequently the largest component of the workforce. Scale of operation beyond the

[7] Note that the object changes name as it moves through the shop (analogous to the change of problem space in the Newell and Simon (1972) representation of human problem-solving).

collection of independently performing professionals is achieved by leveraging experienced senior professionals with more junior and less experienced colleagues (Maister, 1993). Senior personnel mentor and back up their less experienced colleagues (Dalton, Thompson, and Price, 1977), while clients are assured that at all times they get the appropriate professional expertise and problem-solving effort. The role of senior personnel has to balance quality assurance and direction with the need to make sure that the performing professional takes responsibility with a motivation to perform a best effort using best practice.

Coperformance of support and primary activities. Human resource management of professionals—recruiting, developing, and retaining good professionals—is critical. However, this human resource activity is often performed as part of doing professional work, in part because the managing professional is a performing professional (Lorsch and Mathias, 1987). In part, a distinct human resource activity is limited because the recruiting and retention capability of firm depends primarily on the reputation and quality of the problem domain professionals.

Similarly, marketing, procurement, and technology development are seldom distinct activities in all but the largest firms with an intensive technology. These activities are dependent on and therefore often carried out by the professionals in the course of solving client problems.

Consider marketing. Defining the client's problem is also client acquisition. Marketing is largely relationship management (Eccles and Crane, 1988; Cox *et al.*, 1987) that involves referrals from customers and colleagues (Karpik, 1989). The professionals—or rather their reputation—is often the critical marketing resource.

An important procurement activity is acquiring or accessing the technology of the profession or specialization. The performing professionals accomplish this as part of their efforts to keep up-to-date with the state-of-the-science and the state-of-the-art of their profession.

Learning and innovative problem-solving is the modus operandi in firms with an intensive technology. Choice of challenging customer problems is a main means for technology development.

Referrals based on reputation and relationship. Relations between firms with an intensive technology within the corresponding business value system is either one of referral or of subcontracting. In the case of referral, as when the generalist passes the client to a specialist, the responsibility for the problem and client is often irrevocably transferred. In the case of subcontracting, as when an oil company subcontracts a drilling assignment to a service company, the principal firm retains problem ownership and control. The resulting business value system is a network of relations and reputations (Friedson, 1960; Karpik, 1989).

Representation of value creation

Firms that can be modeled as value shops are typically populated by specialists and experts, often professionals, in the problem domain covered. A profession by definition has a knowledge base, methodology, and language that are unique and that require long training to master (Abbott, 1988). Accordingly, the primary activities of the value shop are often couched in terms and sequenced in a form that is unique to each speciality and profession. Therefore, a common terminology for primary value shop activities abstracts the generic categories of problem-solving and decision-making activities (Pounds, 1969; Simon, 1982; Stabell, 1983).

Primary activities

There are five generic categories of primary value shop activities. Each category is divisible into a number of distinct activities that depend on the particular industry and firm strategy:

- *Problem-finding and acquisition*. Activities associated with the recording, reviewing, and formulating of the problem to be solved and choosing the overall approach to solving the problem.
- *Problem-solving*. Activities associated with generating and evaluating alternative solutions.
- *Choice*. Activities associated with choosing among alternative problem solutions.
- *Execution*. Activities associated with communicating, organizing, and implementing the chosen solution.
- *Control and evaluation*. Activities associated with measuring and evaluating to what extent

implementation has solved the initial problem statement.

Problem-finding and acquisition have much in common with marketing in the value chain. The client owns the problem and in certain cases, such as health services and education, 'embodies' the problem.[8]

Choice is an activity category that in most contexts is of limited importance in terms of effort and time, but is important from the point of view of value. It also represents the interface between different specialities and a major discontinuity in the problem-solving cycle.

Interfirm relations across decision cycles in the business value system are either by referral after problem-finding, referral after choice activities, or subcontracting of execution activities. The resulting wheels-within-wheels or spiralling activity configurations define the vertical scope of the business value system.

Support activities

As many support activities, such as human resource management, are coperformed with the primary activites, one might conclude that they should be removed from the value shop diagram. These functions may not be well taken care of—precisely because they are not distinct, but they are crucial to competitive advantage.

Value configuration diagram

Figure 3 is the generic value shop diagram. The cyclic nature of the activity set is captured by the circular layout of the primary activity categories, where postexecution evaluation can be the problem-finding activity of a new problem-solving cycle. The wheels-within-wheels nature of the activity set can be shown by expanding the execution activity into problem-solving–choice–execution–evaluation activities. The spiralling nature of the activity set is obtained when a decision cycle refers (and passes control to) a different or more specialized shop that picks up a reformulated or reframed client problem.

Figure 4 illustrates the instantiation of the primary activity categories of the value shop diagram to the general practioner shop. The medical consultation shop appears to be a diagnosis-focused shop. Treatment plans follow more or less directly from the diagnosis.[9]

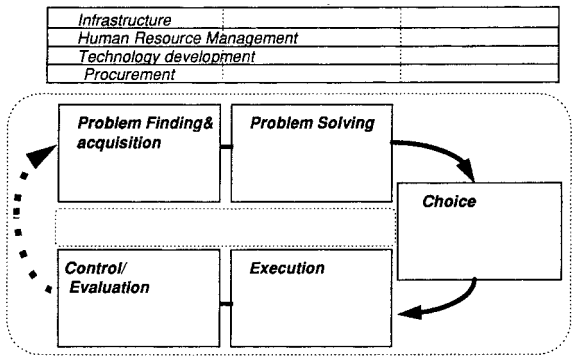

Figure 3. The value shop diagram

Figure 5 presents the instantiation of a value shop diagram for upstream petroleum exploration and field development that illustrates a spiralling activity set with referral. Petroleum exploration is a search-focused shop, where the search for petroleum is concluded once drilling proves the existence of petroleum in commercial quantities.

Simplified for our purposes, problem-finding in petroleum exploration is identifying an area with potential hydrocarbon prospects,[10] problem-solving is generating and evaluating prospects in the area, choice is what, if any, prospects to drill, while execution is drilling the prospects, and evaluation is the review of the results of the drilling.

Petroleum field development is a design-focused shop. Problem-finding is initiated by referral from exploration and we have chosen to define appraisal as an element of the field development activity set. Problem-solving in field development is the generation and evaluation of alternative development concepts, then choosing the field development concept to be used, if any; i.e., is there a commercially viable development concept for the discovery, execution is the actual development of the field to the point that the facility is ready for production, and postexecution evaluation tests that the field is ready for production.

[8] The value configuration models activities, not who performs them. A client may therefore be actively involved in the problem-solving, e.g., a patient taking his own temperature.

[9] i.e., in most cases there is limited problem-solving activity.

[10] A prospect is a potential hydrocarbon accumulation.

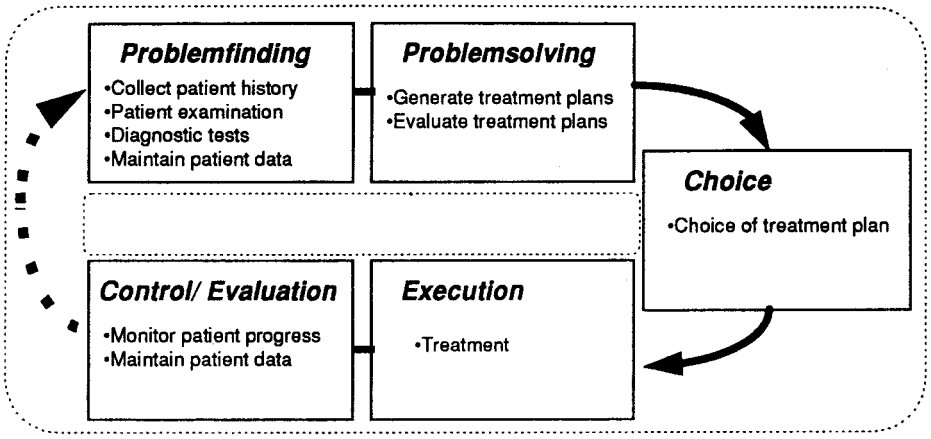

Figure 4. Value shop diagram for a general practitioner

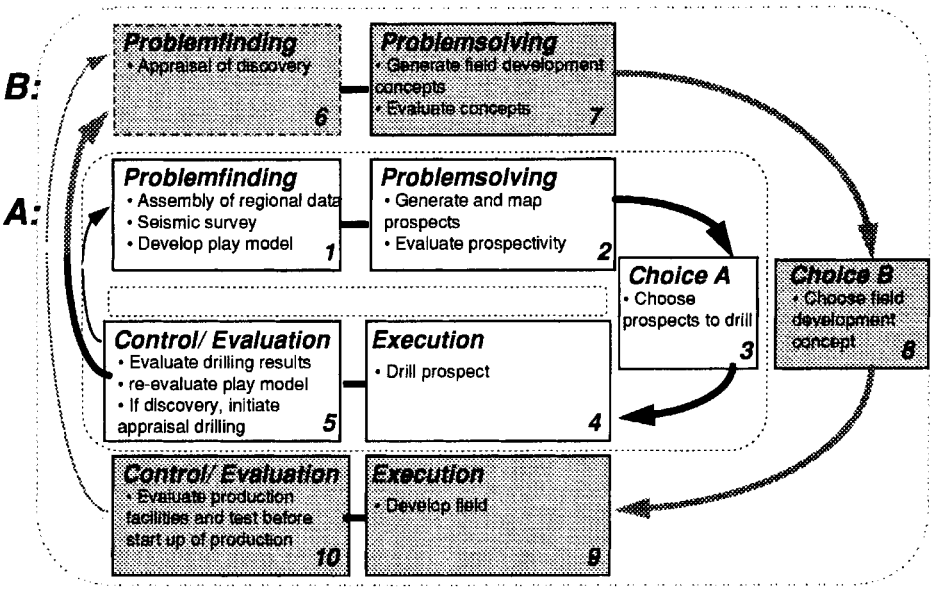

Figure 5. Value shop diagram for a petroleum explorer (A) and field developer (B)

The petroleum exploration and field development example raises the issue of choosing an appropriate level of aggregation of activity categories. We distinguish two versions of each major value shop activity category. The reason is that value and cost implications of activities appear to differ in exploration and field development, that exploration and field development rely on quite different disciplines and competences, and that they seem to be shops with a different problem-solving logic.[11]

[11] Search/classification vs. design shops.

Diagnosis of competitive advantage

In value shops, the evaluation of firm-level relative value advantage is more difficult than the evaluation of cost. Relative cost of an activity and its relative value contribution are not necessarily related (Porter, 1985: 121). Shop activities accounting for a small percentage of total cost can have a major impact on value. For example, structural factors that affect early activities typically have a significant impact on both the value and cost of later activities due to spiralling commitments as major phases both implement and are constrained by the choices made in earlier phases.

The challenge is to establish meaningful indicators of value in a situation where we are assessing the capability of the firm to address *future* client or customer problems—problems that are potentially unique and may require novel solutions.

Consider the example of the firm that provides medical treatment. First-order and second-order activity analysis would estimate both the relative value and cost component of each activity over the set of patients per unit of time. Professional time is a key determinant of cost. In large practices, or hospitals, the relative use of junior and senior personnel in activity performance is an important cost component, as is efficient use of diagnostic and treatment facilities. Value to client is estimated by the success ratio of treatments. Value is also associated with the convenience to the client, e.g. the number of tests used to arrive at a correct diagnosis and the length of treatment. This value is in part a function of the number of cyclings through problem-finding (number of times new diagnosis produced). Activity analysis would also need to develop cost and value estimates for different types of consultations (initial diagnosis, follow-up, yearly check-ups) and for different disease or client categories. As a general rule, the value of activity is assessed by its impact on the definition of the succeeding activity in the decision cycle.

Cost and value drivers

Value drivers as opposed to cost drivers are of critical importance in value shops. Competitive advantage follows from the fact that clients are primarily looking for relatively certain solutions to their problems, and not for services that have low prices as their main attribute.

Success as it materializes in reputation and relationships is the canonical value driver in firms with an intensive technology. Success improves access to both the best personnel and access to the best clients, problems, or projects (Perrow, 1961; Løwendahl, 1992, 1993). For example, architect clients wish to avoid risk and therefore seek an architect with an established reputation in work of a similar nature (Winch and Schneider, 1993). In upstream petroleum, outstanding reputation in exploration enables an exploration shop to recruit the best explorationists. It also improves the shop's ability to bid successfully for the most promising acreage.

Reputation signals value (Porter, 1985: 139). Relevant examples of signals of value and quality are demonstrated success such as winning an architectural competition or obtaining a Nobel prize, high-quality employees, publications in prestigious journals, and strong demand in the form of long queues and difficult access. The value-signalling issue is very much akin to the issues raised in the economics of information literature, where market signalling is a means for a potential employee to reveal information on their performance potential (Spence, 1973). While the information asymmetry in second-hand product markets leads to the fact that most often poorest-quality cars ('lemons') are offered for sale (Akerlof, 1970), the same information asymmetry in professional services appears to lead to a premium price and high demand for highest-quality services.[12]

Demanding projects and clients provide a basis for effective learning. Demanding projects that have been successfully performed provide the basis for building relationships and reputation. Success affects and is affected by the shop's ability to recruit, retain, and develop high-quality personnel. High-quality personnel transcends the effect of drivers such as linkages across activities, learning, and spillovers.

Consider *linkages*. As noted earlier, the significant activity interdependencies within a client project or problem lead to an organization of work where single professionals or teams of professonals are assigned responsibility for all activities related to each client problem. Overall performance and thus value depend primarily on the quality of the individual professionals assigned to client problems and projects.

Learning is an integral and explicit part of the problem-solving cycle of the shop. Evaluation and postimplementation control is a means to improve the shop's ability to deal more effectively with the problem at hand; both through better problem definition (problem redefinition), better alternatives, and better implementation.

Learning *across* projects and client problems is a critical *shop-level* (as opposed to individual professional) linkage in the value shop. This

[12] This difference in dynamics is related to the fact that while the asymmetry in the second-hand product market is related to time- and location-bound information, the value shop asymmetry is related to general and more universal information (Hayek, 1945).

interproblem learning is particularly important for interrupted problem-solving cycles that appear to be inconclusive, but provide rapid feedback if monitored and classified in a systematic fashion.

In general, the large number of very small value shops[13] suggests that there are limited advantages of scale and significant advantages of location in the value shop. This is in part because of the relative value of outstanding professionals, the costs of coordination of large groups of specialists and the need for effective communication in problem-finding and problem-solving. Location advantages are related to access to clients and access to knowledge in terms of personnel or professional communities such as universities or other firms (Porter, 1990).

Possible scale advantages are related to the scale of the client's problem and the distribution of the client across multiple locations. For example, we see that scale and location provide an important advantage for shops, e.g. large consulting firms, serving global clients.

Strategic positioning options

Business value system scope and product scope are heavily interrelated in the value shop. Both product scope and business value system scope are related to degree of specialization in problems or solution technologies. High vertical integration in business value system implies broad coverage of specializations and existence of generalists that can refer to appropriate specialists.

Choice of business value system scope will depend in part on market size and in part on the rate of change of the intensive technology. The larger the market for a speciality and the greater the rate of change in the intensive technology, the less vertically integrated the firm.

An additional unique strategic positioning option in firms that can be modeled as value shops is the degree of incorporation of the problem object. Problem incorporation is primarily a tool for reducing uncertainty,[14] but is also a means to increase communication between specialists and a means for efficient and effective postimplementation (treatment) evaluation (in hospital or educational establishment). Problem incorporation is thus a tool for both cost reduction and value creation. Degree of problem incorporation is related to the degree of business value system scope. This is because benefiting from strong problem incorporation requires that the shop has access to the full range of relevant specialists.

THE VALUE NETWORK

Value networks—a short form for 'firms that can be modeled as value networks'—rely on a *mediating technology* (Thompson, 1967) to link clients or customers who are or wish to be interdependent. The mediating technology facilitates exchange relationships among customers distributed in space and time. The firm itself is not the network. It provides a networking service.

Examples of firms that rely on a mediating technology are telephone companies, retail banks, insurance companies, and postal services. The term value 'network' underlines that a critical determinant of value to any particular customer is the set, or network, of customers that are connected. Stated in communication terms, the value of a communication service depends on whom it enables the customer to communicate with.

Value creation logic

Modern society is characterized by a complex set of actual and potential relationships between actors, people, and organizations. Linking, and thus value creation, in value networks is the organization and facilitation of exchange between customers. The linking can be direct as in a telephone service, linking two or more parties in a call, or indirect as in retail banking where one customer is not linked directly to another customer, but a group of customers is linked through a common pool of funds.

Mediators act as club managers. One can think of managing a mediating firm as managing a club. The mediating firm admits members that complement each other, and in some cases exclude those that don't. The firm establishes, monitors, and terminates direct or indirect

[13] Consider consulting and professional service firms, independent professionals.

[14] According to Thompson (1967) problem incorporation is a positioning alternative equivalent to scale in the network (to balance potential random demand) and vertical integration (in order to control supply and demand uncertainty) in the chain.

relationships among members. Supplier–customer relationships may exist between the members of the club, but to the mediating firm they are all customers. Depositors are not bank suppliers, they are just as much bank customers as those borrowing money. By acting as an intermediary, bilateral interactions between the mediator and its customers are used to enable multilateral interactions between customers.

A set of *customer contracts* commit both the customer and the company operating the network to a mutual set of obligations. Contracts are required to be able to service efficiently on demand mediation requests, randomly distributed in time and space. Contracts specify price and mutual obligations of service provider and customer.

Service value is a function of positive network demand side externalities. Adding one more customer to a network directly affects the value of the service to other customers (Katz and Shapiro, 1985).

Positive network externalities introduce unique strategic challenges. A new service has relatively low value to its first customers, whereas the costs typically are the highest in the introduction phase. This leads to distinct life cycle phases.

Value is derived from service, service capacity, and service opportunity. The customer may receive value from the value network without ever actually invoking the mediation services. For example, a bank customer may pay for a credit account in order to secure access to funds, if necessary.

Mediators typically charge customers separately for the linking opportunity and the actual use of linking services in terms of activities performed and capacity utilized. A subscription fee implies a commitment to servicing potential customer requests for the mediation services. Some banks have fixed monthly charges associated with accounts in addition to per transaction charges. Interest spread is payment for funding and placement capacity utilized.

Mediation activities are performed simultaneously at multiple levels. A concurrent and layered set of activities is required to service efficiently a random need for mediation services between a large number of customers. Servicing individual customer transactions clearly involves a sequential set of activities as, for example, initiation, validity checking, and posting for an account withdrawal transaction in banking. Such a transaction, however, is only possible within a network of contracts with other customers and an infrastructure that hosts the mediation between them. Each requires a distinct set of activities with different cost and value economics.

The simultaneous and layered performance of activites implies strong reciprocal as opposed to sequential interdependence between primary activities. Failure to synchronize activities may lead to a breakdown of the system. An insurance company with insufficient reinsurance infrastructure may bankrupt on major accidents, whereas a telephone system may break down due to exceptional communication events if it fails to reroute traffic.

Standards are critical for the coordination of this reciprocity or, as noted by Thompson, 'standardization makes possible the operation of the mediating technology over time and through space by assuring each segment of the organization that the other segments are operating in compatible ways' (1967: 17).

Standardization facilitates matching and monitoring. Standardization enables the mediator to match compatible customers and to effectively maintain and monitor the interaction between them. The retail bank uses standard customer categories to qualify loan applicants or to set terms for borrowers and depositors. Standardized account numbers are further used to direct payments to accounts appropriately and to monitor the interaction by way of bookkeeping and accounting.

Distinct life cycle phases of rollout and operation. Customers may be willing to pay a premium price for a new service. However, as the value of the service is dependent on who else adopts it, it may be difficult to target these customers on an individual basis. Stated differently, the value of the service is managed by the rollout process for the service. It follows that in many cases it is impossible to charge for service or required equipment in this initial phase, leading to 'give-away strategies' that have been observed in areas such as cellular and videotext telecommunications, browsers for the Internet and free

cash balances for initial users of electronic payment cards. Following a successful rollout, mediators may be in a position to charge for membership, service, and equipment in a potentially long-term operations phase in which contracts, infrastructure, and service activities are performed concurrently.

Layered and interconnected industry structure. The business value system relationships between industry actors is not as suppliers and customers in an industry value chain, but as simultaneously coperforming levels of mediation service. For example, network operators deliver the infrastructure for service providers in telecommunication, who in turn serve as the communication infrastructure for payment services. Exchange relationships offered by a mediation service can also extend beyond its immediate customers to customers of other mediation service providers. This gives rise to a structure of interconnected mediation networks.

In telecommunication the distinction is made between access networks typically organizing local networks of end users and carrier networks providing communication between local networks. Communication between local subscribers is handled by the local switch, while international phone calls are routed from the local switch through a complex web of multiple lines and switches to connect with a subscriber at a local switch in another country. As a result, a large number of telephone companies specializing in local, regional, and international traffic are involved in coproducing the phone call.

In summary, the business value system in a mediation industry is potentially a set of coproducing, layered and interconnected networks that enhance the range and reach of the services provided.

Representation of value creation

The object of mediation distinguishes mediators. There are, however, strong similarities between the activities of various value networks even if the nomenclature used to describe them differs from industry to industry.

Primary activities

The primary activity description is inspired by that used in telecommunication because telecommunication is a rather generic form of mediation and because explicit activity decomposition models are well established both at the micro level of peer-to-peer communication and at the industry level in delineating industry actors.

The primary activities of the value network are as follows:

- *Network promotion and contract management* consists of activities associated with inviting potential customers to join the network, selection of customers that are allowed to join and the initialization, management, and termination of contracts governing service provisioning and charging.
- *Service provisioning* consists of activities associated with establishing, maintaining, and terminating links between customers and billing for value received. The links can be synchronous as in telephone service, or asynchronous as in electronic mail service or banking. Billing requires measuring customers' use of network capacity both in volume and time.
- *Network infrastructure operation* consists of activities associated with maintaining and running a physical and information infrastructure. The activities keep the network in an alert status, ready to service customer requests.

Contracts and contracting activities vary across networks. Greater commitment between mediator and customer leads to more extensive contracts and contracting process. Qualification for a house loan is more extensive than for a telephone service. Network promotion differs from sales and marketing in the value chain in that selection of customers is as important as attraction.

Service provisioning depends on the nature of the mediation. Establishing a network link, be it a bank transaction or a telephone call, requires some form of feasibility check which includes clarifying the nature of the transaction, availability of linking possibilities and the eligibility of the customer in making the link.

The specific network infrastructure operation activities depend on the nature of infrastructure used. In telephone and other public utility companies the key infrastructure is switches or distribution centers; in banks and insurance companies it is the branch offices and financial assets; while in transportation and distribution companies it is the vehicles and warehouses.

Support activities

Among the support activities of the value network, two distinct, but related technology development activies are of special interest: network infrastructure development and service development. Network infrastructure development includes activities associated with the design, development, and implementation of network infrastructure. Service development includes everything from the modification of a large set of possible customer contract terms, e.g. interest and time schedules in a bank, to the development of brand new services, e.g., voice mail services in a telephone company. It also includes modifications to the company—customer interface through modifications of procedures, forms, and self-service computer interfaces.

Procurement is heavily linked to network infrastructure and service development, and is often specialized for these activities. Similarly, human resource management is often quite different for infrastructure development and service development, relative to primary activities.

Firm infrastructure, i.e., general management, financing, and management information systems, should not be confused with the value network infrastructure. The former facilitates operating the company, while the latter is at the heart of value creation for customers.

Value configuration diagram

Figure 6 shows the generic value network diagram. The three primary activity categories overlap in order to underline the concurrent interactivity relationship across primary activity categories.[15] The lack of direction of value creation where no arrow identifies the final customer underlines that the work creates value by mediating between customers.

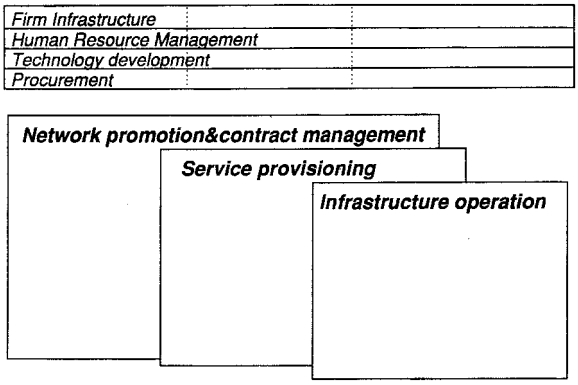

Figure 6. The value network diagram

Figure 7 shows an example of the instantiated value network diagram for a retail banking firm. Network promotion and contract management include promotion of sale of services, risk evaluation, contracting, and monitoring of contracts. The bank both attracts and selects among customers. Contracts govern explicitly the relationship between the customers and the bank and implicitly between the customers. The contracts of a retail bank govern the implicit exchange relationship between the customers. The retail bank is the agent of its customers and as such it assumes the financial risk involvement in the exchange relationship between depositors and lenders.[16]

Service provisioning includes deposit, withdrawal, funds transfer, maintaining account balances, and interest calculation. These activities are governed by the contracts managed by network promotion and contract management activities. Breach of the contract agreements, e.g., by overdraft of a savings account or default on loan

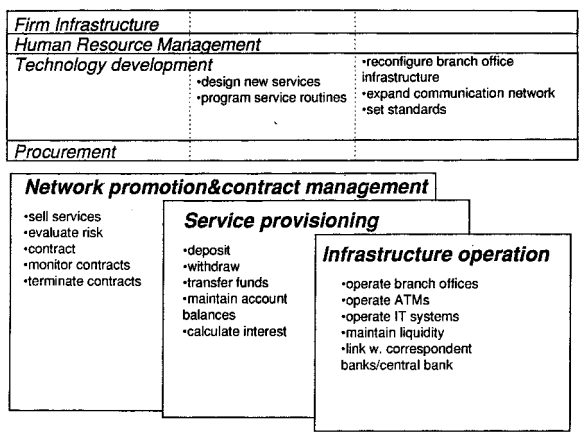

Figure 7. Value network diagram for a retail bank

[15] Interaction is often modeled as taking place at several levels or in layers to capture the simultaneous performance of activities (Tanenbaum, 1981; Alderferer, 1987).

[16] Note that in the case of an investment bank the contracts may be established directly between customers, and the bank's main involvement is in establishing the contract. This, however, may require financial exposure for the bank, as exemplified, by the billion-dollar bridge loan extended by First Boston in the restructuring of 'Union Carbide Deal' Case (1988).

payments, reciprocally impacts the contract activities and may lead to contract modifications or termination.

Infrastructure operation consists in part of operating a physical infrastructure for storing and transmitting funds. This includes branch offices, automated tellers, and IT systems. However, a vital part of the infrastructure is also the financial infrastructure that provides mediative capacity. This consists of maintaining liquid assets and links with other sources of liquid assets such as central banks and the money market through managing the bank's rating.

Diagnosis competitive advantage

Drivers of cost and value

As mediating firms offer value to their customers both through the access option and the actual use of services, cost and value must be associated with both.

Scale and composition. Scale is a potential driver of both cost and value in the value network. Value network services are characterized by demand-side economies of scale resulting from positive network externalities (Katz and Shapiro, 1985). The value of the service to existing customers increases with each new customer added to the network. Positive externalities exist for a variety of products. Examples are microprocessors, consumer electronics, and software (Wade, 1995). Mediation services offered by value networks represent the extreme case because the dependency among customers is the main product delivered. Stated differently, in value networks, the other customers are the key part of the product. The services of a value network mainly deliver the customers' opportunities to exercise those dependencies. Size and composition of the customer base are therefore the critical driver of value in the value network.

Consider an insurance company. If the customer network is unbalanced, in the sense that a subset of customers systematically receive as disproportionate part of the claims, then the cost of insurance will either be too high for the rest of the customers or the insurance company's profits will be below industry average.

Insurance companies may try to attract special customer groups to achieve their targeted network composition, because individual risk assessment and pricing are sometimes too costly. In fact, some insurance companies make it their explicit strategy to attract only 'low-risk' customers by providing special terms to good drivers or life insurance to employees of companies in low health hazard industries. It is possible to operate an insurance company for almost any kind of risk group, given that they are willing to pay the required premiums. But the network composition given a particular customer segment is key to both pricing and profitability within that segment.

Telephone service represents an extreme case of positive network externalities. Each new customer added to the network allows for one more possible connection. For trade exchanges scale contributes directly to value by increasing market liquidity (Domowitz, 1995). The externalities are less obvious in deposit banking where although scale allows risk sharing or deposit insurance, it also provides variety in risk–interest options. When network externalities are present, the value of the service provided is affected by the characteristics of customers that join the network (Bental and Speigel, 1995).

Scale is also important to the extent that it affects accessibility. A geographically extended network requires an extended infrastructure. This contributes to an additional size effect on value because the number of access points available to the customer increases (Domowitz, 1995). Thus while the externality effect of scale increases directly the value of the network to the customer, the size effect in the form of increased accessibility affects the customer's cost of using the mediation service.

Scale advantages may, however, not be observable at the level of individual firms (Forestieri, 1993). A single bank, for example, by the nature of banking, extends its network through other banks using strategic alliances or correspondent arrangements and the money market. Inter-network alliances or agreements directly affect the value of the individual customer's network membership.

Common industry standards are a prerequisite for inter-network connections. The evolution and diffusion of standards are therefore critical in the exploitation of demand side scale economies.

Capacity utilization. Capacity utilization is closely related to scale. As in the value chain,

capacity utilization reduces unit costs. High-capacity utilization, however, may also reduce service levels.

Consider the case of heavy load for a communication service: it becomes difficult to get a line. Applied to banking load increases the probability that a bank is not able to service its contracts; in the extreme case load increases the probability of a bank run. Hence, in the value network, capacity utilization is both a cost and value driver, while it is primarily a cost driver in the chain.

Linkages. In the value network there is reciprocal interdependence across primary activity categories due to the need for synchronization and dimensioning of simultaneous activities. Important linkages arise from this reciprocity. Both geographical coverage and capacity must reflect the composition of customers who are members of the network. Adjustments are done on a continuous basis. A case in point from banking is the pool of funds. This pool has to be dimensioned to reflect the liquidity demand patterns of the customer network. Service provisioning capacity must be coordinated with customer recruitment and diffusion of new services. The pool of funds thus affects the nature of the service that can be provided and the costs for the bank. Similarly, the switching and line capacity of a telephone company must reflect the customer base.

Learning. The key areas for learning in primary activities is in membership selection and service monitoring. The two are reciprocally related as can be illustrated from banking. Credit qualification provides information for monitoring activities, while monitoring can assure both improved contract execution and information for the improvement of credit qualification activites. In addition, interfirm learning (spillovers) is critical in the diffusion of standards as the ability to interconnect value networks increases size and hence value.

Strategic positioning options

Unique strategic positioning options in terms of value system scope in mediative industries needs to consider both vertical and horizontal integration. These options mirror the layered and interconnected nature of the corresponding business value system.

Vertical scope. A mediation exchange requires multiple levels of coproducing mediation activites. The activities of one mediator build on the activities of another. Vertical scope in mediation industries describes to what extent a firm controls all levels of coproducing activities required to complete mediation exchanges. Choice of scope depends on whether suitable lower-level mediation services covering the relevant customers are available.

Consider an electronic payment clearance service. It requires the operation of a communication infrastructure by which transactions can be carried and a transaction processing infrastructure by which transactions can be cleared. A service provider may choose to operate both or the provider may choose to base its service on the communication service of, for example, a telecommunication company. The choice is one of vertical value system scope.

In the case where the provider of the payment mediation service chooses to use the communication service of the telephone company, the two companies are coproducing the service. The customers, e.g., banks or end users, may be customers of both companies and may be paying separately for the communication and clearing components of the service to the telephone company and the electronic payment service provider respectively.

Horizontal scope. A firm that delivers a mediation service can extend its customer segment scope either by increasing its own customer base or by exchange agreements with other mediating firms that extend the set of exchanges that the firms provide for their customers. At one extreme the firm may limit exchanges to those that can be completed within its own customer (contract) base and hence be fully horizontally integrated relative to this market segment. At the other extreme the firm may specialize on one side of the exchange, e.g., origination of loans that are securitized and exchanged in a market (Crane et al., 1996).

Exchange relationships offered by a mediation service provider and extend beyond its immediate customers to customers of other mediation service

providers gives rise to a structure of interconnected mediation networks.

DISCUSSION

We have proposed three alternative value configurations as a foundation for a theory of value configuring for competitive advantage. The theory is an extension of Michael Porter's original value chain framework (1985) and uses Thompson's typology of long-linked, intensive and mediating technologies (1967). Although the set of three distinctive value creation technologies is the critical reference point, the focus of our contribution in this paper is on the development of the representation, logic, and strategic implications of the corresponding value configurations.

The unique characteristics of each value configuration are summarized in Table 1. Here we will expand on the configurations by contrasting them.

We first note that all three configurations have in common a focus on critical value activities, the distinction between primary and support activities, and the analysis of cost and value drivers as a means to translate a value configuration analysis into a competitive strategy. The primary activity categories capture the main differences between the configurations, while the set of support activity categories is not a distinctive attribute of the three alternative value configurations.

The long-linked technology transforms objects according to a predefined set and sequence of activities. The intensive technology solves problems by a custom combination of activities. The mediative technology is provided by a standard combination of activities at multiple levels. The distinctive dimensions are thus to what extent the technologies rely on standard or custom combinations of activities and to what extent the value creation logic is transformative or mediative. A customized mediative service has elements of both the shop and network. Firm strategy might involve choosing what value creation logic to emphasize.

Coordination of distinct value creation logics is the concern of organizational design and administrative theory. Thompson's (1967) primary concern was how organizations dealt with uncertainty. He proposed three distinct approaches to deal with uncertainty in what we have labeled respectively chains, shops, and networks: by vertical extension up and down the chain, by incorporation of the problem in the shop, and by increasing the size of network served. All three provide a means to deal with uncertainty and buffer the core technology of the organization from environmental uncertainties.

A key concept of contingency theory (see, for example, Lawrence and Lorsch, 1967) is that different kinds of businesses need to be managed differently. According to Porter (1985: 23), the main implication of value chain analysis is the need for different degrees of differentiation and integration across activites and functions. The distinction between chain, shop and network extends this argument by suggesting that there are distinct configurations based on the logic of coodination (Mintzberg, 1979).

Although it is beyond the scope of this paper to develop the ideas in detail, referring to Mintzberg's design alternatives (1979), we suggest that while the value chain requires a machine bureaucracy organization of primary activities, the value shop is organized according to either the professional bureacuracy or the operational adhocracy. The value network is often organized according to an administrative adhocracy, particularly when the technology of the infrastructure is complex and requires highly specialized development activites such as is the case with modern telecommunications.

The link to alternative organizational designs and configurations reinforces the notion that the alternative value configurations are quite distinct. The link to the organizational design literature is also potentially important in that it integrates strategy and structure—by providing a common framework for the development of a competitive strategy and the organizational structure required to implement the strategy.

Differences in value creation logic reflect different economics. These relate to three important and distinct traditions in the study of the economics of the firm: the cost economics of scale literature for the value chain, the positive network value externalities literature for the value network, and the value-signalling literature for the value shop. As shown in Table 1, the logics differ in terms of a cost or value focus. While the chain has a cost orientation, the shop is oriented towards value. The value network—where synch-

ronization of simultaneous, parallel primary activites is the foundation of value creation—needs to balance cost and value as scale and capacity utilization are drivers of both.

Thus there are distinct scale logics. Scale is a cost driver in the chain. Scale is a cost and value driver in the network. In the shop scale primarily affects value to the extent that it signals success.

The distinct economics can be further illustrated by the role of queues and the nature of contracts across the three configurations. Queues, in terms of input and output buffers, assure high capacity utilization in the chain. Queues represent potential service and value degradation in the network when they lead to excessive capacity utilization, whereas 'external' queues signal potential service quality in the value shop.

Simplified, contracts in the chain are linked to the actual exchange of products, are often implicit and are largely governed by general rules for market-based transactions. Contracts in the network are explicit and govern both access to the mediation service and the actual use of the service. Contracts in the shop are mainly implicit, but often policed and enforced by a profession given the information asymmetry in the relationship between the firm and the client.

Even though our analysis appears to provide extensive support for both the strategic importance and the analytical significance of the three value creation logics, the issue of alternatives to the proposed primary activity decomposition remains. What are possible alternative generic decompositions?

We have already suggested that instantiation of the generic models raises the issues of distinct repertoires of primary activity configurations within the three main alterantive value creation logics. This is obviously an issue for future research. We can, however, comment on to what extent one might capture the alternative value creation logics with the generic value chain representation.

Recollect that problems in applying the value chain motivated the development of the alternative representations. For certain types of intensive technology, such as oil exploration and product development, one alternative would be to represent shop as an 'information refinery' that transforms data into client solutions (discoveries and new products). This representation loses the problem-contingent characteristics of value creation, is most suited to capture sequential flow-dependent cost economics, and sees value as primarily a function of data quality and transformative quality of the process.

Applying the value chain representation to mediation, we either need to introduce an artificial distinction between clients as being either supliers or customers, or end up with all activities in operations. Stated differently, the proposed primary activity categories of the value network are a decomposition of what would be defined as operations in an equivalent value chain representation. The value network activity decomposition avoids the artificial distinction between client roles.

Most firms are not pure instances of a single distinct value configuration. A single firm may employ more than one technology and hence have more than one configuration. A particular telephone company (consider the old AT&T) employs a mediating technology for operations of its telephone services and a long-linked technology in the production of equipment. A manufacturing company employs a long-linked technology to produce its products whereas product development relies on an intensive technology. The recent argument of Normann and Ramirez (1993) on value constellations and interactive strategies can perhaps be understood as an argument for combining several value-creating logics, where the production of goods (chain) is supplemented by both assisting customers in their problem-solving (shop) activities and by value-adding new services and products on the distribution infrastructure (value network) developed by, for example, a firm such as IKEA. In short, hybrids might have distinct logics in primary activities and support activities. Hybrids might also have an overall primary activity logic, but where decomposition of activities requires the application of other value creation logics. The challenges of effective integration and coordination across different value creation logics present unique opportunites for competitive advantage (Lawrence and Lorsch, 1967).

The business value systems reflect the activity interrelationships and drivers of the respective underlying value configurations. Value chains form sequentially interrelated value systems of suppliers, producers, and distributors, each adding value to the output from the preceding chain. Value shops are linked and referred in a wheels-

outside-wheels relationship to specialized problem-solving and implementation activities. Value networks form coproducing layers of mediators where one network may use a lower-level network as a subnetwork. In addition value networks form horizontal interconnected value systems of similar firms that extend the scope of the network by virtual mergers to gain mutual benefits from network externalities. The resulting scope is equivalent to the horizontal union of the vertical intersection of customer contracts. Most business value systems include firms representing all value creation logics.

Our analysis suggests that there are distinct strategic business system-level implications of the different firm-level value configurations when they aggregate and interact in the business value system. Although this is an interesting issue for further research, we already noted that for both shops and networks the business value system must include competitive and cooperative relationships. The simultaneous, coproducing nature of a system value of networks requires common standards. Similarly, the knowledge standards of professions facilitate relationships between firms in a system of value shops.

CONCLUDING COMMENTS

Strategy can be defined as the art of creating value (Normann and Ramirez, 1993). Although we agree that strategy is and will largely remain an art, our project is directed at contributing to the development of the science of value creation.

By introducing two additional value configurations, we have aruged that the concepts promoted in value chain analysis are adaptable beyond the traditional manufacturing context to which its description and sequencing of activities are best suited. We are also suggesting that choice of (emphasis of) value configuration is an additional dimension or third option beyond Porter's two basic strategies of cost advantage and differentiation (1980, 1985).

The notion of alternative value configurations is in part motivated by the problems of applying value chain analysis, both as an effective conceptual tool and as a means to benchmark and improve a firm's competitive position. As noted by Porter, problems of assessing costs imply also a potential opportunity for competitive advantage. The challenge for further research is to demonstrate that the three configurations give a better handle on competitive cost and value analyses. Equally important, such research on the use and usefulness of the proposed value configuration models needs to be supplemented and based on research that develops the structural properties of alternative value creation technologies. Although a vast amount of research exists that might be used to illuminate these issues, there is probably a need for a new look and additional empirical work that explores the issues from a firm-level strategy and strategic perspective, both in terms of pure forms and more hybrid forms. Finally, there are perhaps equally interesting challenges in considering the implications at the business value system level.

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