

Enterprise Information Systems Strategy and Planning

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ABSTRACT

In order to gain competitive advantage in the knowledge-based economy, businesses are focusing on the value creation along the demand and supply chains. Information systems strategies have also evolved from the focus of automation of discrete transactions to the enablement of the optimization of the value chain. The new paradigm requires the alignment of information systems strategies with business strategies across the entire value chain. An integrated model is required to allow the coordination of activities and sharing of information amongst different organizations and systems through various processes across the extended enterprise. This paper proposes an enterprise framework for the development of information systems strategies and plans. It further presents an approach for IS planning that has been practiced and refined through many IS/IT planning projects.

INTRODUCTION

Information systems (IS) have long played a critical role in the creation of competitive advantages for businesses. They range from automation to business process reengineering to the paradigm shift of creating completely new business models. Notable examples include the automation of production processes using computer assisted manufacturing systems and robotics, the streamlining of business processes by electronic work flow systems, and the creation of new business models in vendor-managed inventory using the extranets. While technology helps improve efficiency and reduce transactional costs, disparate systems across an enterprise are inadequate to support business strategies of the new economy in the 21st century where the focus of production efficiency is replaced by the value creation throughout the demand and supply chains. Porter (2001) described the five overlapping stages in the evolution of technologies in business: automation of discrete transactions, functional enhancement of activities, cross-activity integration, integration of the entire value chain, and the optimization of various activities in the value chain in real time. In order to facilitate the integration and optimization of the value chain, information systems strategies need to incorporate the extended enterprise view to include the firm's customers, suppliers, distributors and alliance partners as a business system. This paper proposes a framework for IS strategies driven by the business requirements of integration and optimization of the value chain.

NOT JUST TECHNOLOGY

While technology is a key factor in any information systems strategy, it is a means to the end. An effective IS strategy must be driven by organizational goals that can sustain the change of technologies over time. Aligning information technology strategy with business strategy is a critical objective of IS planning (Lederer et al. 1998 and Lilley 2004). Information systems strategies need also take into consideration an integrated view of information and business processes across the extended enterprise.

THE VALUE CHAIN PERSPECTIVE

The new paradigm of value creation in the knowledge-based economy requires business strategies that integrate and optimize the value chains in the extended enterprise. Businesses need to be adaptive and responsive to the rapidly changing customer demands. Effective management of the movements of materials, information and cash along the demand and supply chains is critical to the firm's competitive advantage. Doonan et al. (2002) pointed out that the new IT strategy that spans across the buy-side procurement and sell-side customer interface creates a paradigm shift in the process of optimizing business operations and drives fundamental organizational transformation. The use of IT in the support of various stages of a firm's value chain can be characterized by the value chain information intensity (Teo et al. 1997, Busch et al. 1991 and Porter et al. 1985). An effective information systems strategy that supports the value creation paradigm needs to consider the various entities in the value chain as an integrated system that share critical information and business processes.

THE INTEGRATED FRAMEWORK

Chan (2004b) described a conceptual enterprise model for the demand and supply value chains that ties business processes and technologies across the extended enterprise. According to Chan (2004b), the extended

enterprise along the value chain can be described by its external view, conceptual view and the internal view. The external view of the enterprise consists of user applications, operational and analytical processes, and organizational structures. The conceptual view of the enterprise consists of conceptual data and function models supporting operational and analytical requirements. The internal view of the enterprise consists of the technical implementation of data storage, software modules, hardware platforms and telecommunications networks. These layers are logically connected through the construct of the enterprise information roadmap, which consists of the mappings and rules of associations between different components of the enterprise model. Figure 1 illustrates Chan's construct of the enterprise model for the value chain. The enterprise model serves as the blue-print for the construct of processes and technologies across the value chain, tying information technology strategies to business strategies.

Figure 1: The Enterprise Model Framework

External Enterprise View				
OEM (Operational Enterprise Model)	User Applications		AEM (Analytic Enterprise Model)	User Applications
	Business Processes			Analytic Processes
	Organization Structures			Decision Structures
Conceptual Enterprise View				
CEM (Conceptual Enterprise Model)	EDM Enterprise Data Model		ADM Analytic Data Model	
	OFM Operational Function Model		AFM Analytic Function Model	
Internal Enterprise View				
TEM (Technical Enterprise Model)	Physical Data Storage & Structure	Software Components & Tools	Hardware Platforms	Communications Networks
EIR (Enterprise Information Roadmap) = {RELATIONS between the components of OEM, AEM, CEM & TEM}				

ENTERPRISE INFORMATION SYSTEMS PLANNING APPROACH

An effective information systems strategy can be developed to support the value chain leveraging the enterprise model framework. In the following, an approach to IS planning is presented. The approach summarizes key concepts that have been practiced and refined by the author through many IS/IT planning projects. The key phases include:

- Identify business objectives and strategies
- Establish and evaluate the baseline architecture
- Develop the conceptual enterprise model
- Develop the target architecture
- Develop the migration strategy and implementation plans

Business Objectives and Strategies

The notion of business strategies driving systems strategies has been supported throughout the literature (Teo et al. 1997, King 1978, Reich et al. 1996 and Zviran 1990). For example, Schaffir (1985) described the transformation of the business objectives of cost leadership, quality and product differentiation to IT strategies of automation of the manufacturing operations, the mechanization of drafting engineering functions, linking the company's information processing to those of customers and suppliers, and enhancing the company's production planning and control systems. While practitioners may adopt different techniques, the fundament concept has been well accepted in the industry. During this phase, business objectives are identified and consolidated with senior management. These goals are described in measurable terms with performance metrics defined. SWOT analysis may be conducted to evaluate the company's strengths, weaknesses, opportunities and threats. Strategic solutions are developed that may include areas in information technologies, training, process enhancements, organization or cultural changes. The metrics defined for each business objective can be used for the measurement of performance and ROI for subsequent implementation of these solutions. While different techniques can be deployed in this phase to consolidate business objectives and strategies, the author has found in his practice the use of an objective matrix to facilitate the discussion with senior management very useful. The first dimension of the matrix consists of the stated business objectives. Typically three to five key objectives are listed. The other dimension consists of the definition of metrics, the respective current measurements if any, and the target measurements for the future. It also consists of the identification of issues and obstacles that would prevent the firm to achieve these goals. Strategic solutions are identified. These strategic solutions can be grouped and prioritized in the implementation phase. Figure

2 provides an example of the use of an objective matrix to document business objectives, performance metrics, issues and strategic solutions.

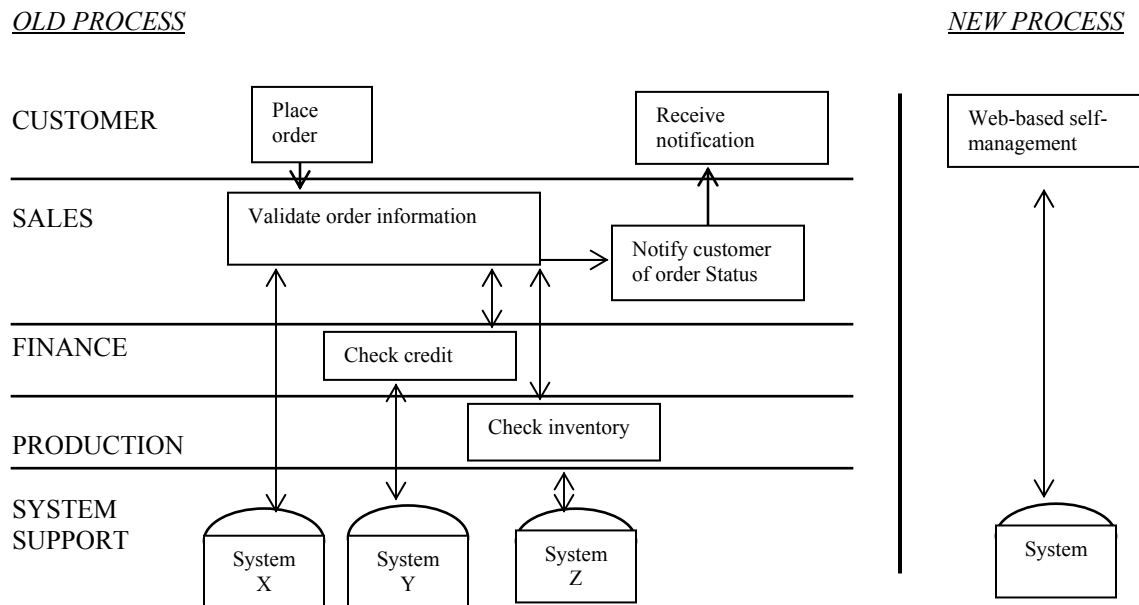
Figure 2: An Objective Matrix

Objective	Metric	Current Measure	Goal	Issues	Strategy
Customer Satisfaction					
	No. of Complaints	No measure	Low	Lack of tracking tools, cannot tie relevant information for quick resolution	Create customer complaint tracking, create an integrated customer profile
	Customer Feedback	No measure	High	Lack of feedback mechanism, cannot tie feedback to target marketing, and product improvement	Create mechanisms to better track and use customer feedback to enhance customer intelligence
	% of returned goods	20%	5%	Cannot track returned goods to sales and invoicing, cannot capture reasons for returns	Integrate return information to sales and invoicing, capture and codify reasons for returns
	Customer Churn Ratio	15%	3%	Inadequate customer service and lack of churn information	Provide better customer service and care by utilizing enhanced customer intelligence
	Marketing Program Success	No measure	90%	Cannot tie marketing programs with customers and sales performance	Integrate marketing, customer and sales data, better use of marketing analytics for sales projection

The Baseline Architecture

The baseline architecture represents the current state of the enterprise in various dimensions including organizational structure, business processes, and technical architectures for databases, software, hardware and networks. During this phase, the effectiveness of organizations and processes are being evaluated and documented. Design tools may be used to document process diagrams. It is recommended that the 80/20 rule be applied in process evaluation to avoid over documentation of detailed processes which may not be improvement opportunities. The priority is focused on the solutions to the top 20% of critical issues that can yield 80% of the benefits to the organization. Cycle time, the number of hand-offs from one business entity to another, redundancy, the level of systems support, and other metrics can be used for process evaluation. Organizational issues and deficiency of systems support are identified. Figure 3 illustrates the use of the “swim lane” process diagram to facilitate current process evaluation. Each lane in the diagram represents a business entity and the rectangles represent activities in the process performed by the respective business entity. The bottom lane represents system support. Evaluation of the process effectiveness can be done by using various metrics across the diagram. For example, cycle time evaluation can be done by examining the horizontal flow of the activities. The number of hand-offs can be evaluated by examining the vertical flow of the activities. Manual processes, the lack of system support and process bottlenecks can be identified. Notice that the same technique can be deployed to design the new and enhanced process. The process diagrams can be used for the comparison of old and new processes illustrating the areas for improvement. The baseline technical architectures can be developed in conjunction with respective IT personnel. A portfolio should be developed describing the types, configurations and usage of these technical components. For example, a detailed application portfolio should consist of the identification of the application, the technologies used, the hardware platform, functional descriptions, data requirements, interfaces, usage, and other relevant statistics. Architectural diagrams can be used to illustrate the various technical components and their relationships. The baseline architecture is used to evaluate the effectiveness of the current state of the enterprise. It also provides the baseline for the development of migration strategies to the future state.

Figure 3: Process Evaluation



The Conceptual Enterprise Model

The conceptual enterprise model represents the requirements of the enterprise independent of process and technology implementations. It includes the data and function models supporting the operational and analytical requirements for the enterprise. The data model can be constructed using Entity Relationship Modeling techniques (Chen 1976). Analytic data models can be developed using dimensional modeling techniques (Todman 2001). Functional decomposition can be used to develop the function models. Model cross-check is an important activity during this phase to ensure that the data and function models are accurate and complete. Joint application design (JAD) sessions are effective ways to facilitate the information gathering and modeling process. It is important that the JAD sessions involve cross-functional management and operational staff to ensure that an enterprise view is developed in the model. The construction of the enterprise model is incremental and common elements are identified and leveraged throughout the modeling process. Designer tools can be used for proper documentation of the models. See Chan (2004a, b) for a detailed description of the conceptual enterprise model and respective techniques required in its development. The conceptual enterprise model serves as the blueprint for information and functional sharing for process and technology implementations across the extended enterprise.

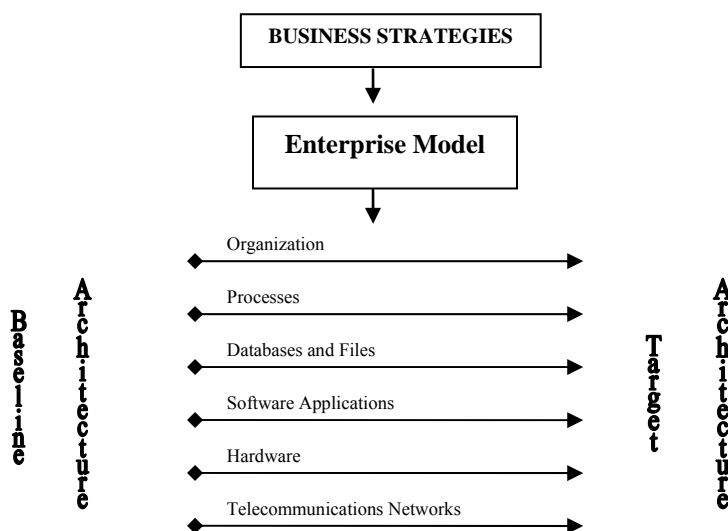
The Target Architecture

The target architecture is developed for the future state of the enterprise based on the requirements developed in the conceptual enterprise model driven by the business strategies. The architecture covers each of the dimensions in organizational structure, business processes and technical architectures. In this phase, new and enhanced business processes are designed. Figure 3 illustrates the comparison of a new process to the old process using the swim lane process diagrams. In this example, a Web-based self-management process eliminates all the intermediate steps of the old process model. Various processes can be used to implement functions defined in the conceptual model utilizing different technologies. For example, a customer service function can be implemented by multiple processes in the future state which may include a call center operation and a Web-based self-service operation using different technologies. A new B2B process may be used to implement a vendor-managed inventory strategy. Technical requirements and capacity plans can be derived from the conceptual requirements in the data and function models. For example, volumetric and data usage information in the data model can be used to determine database requirements. Frequency information in the function model can be used to determine transactional requirements for the hardware. Analytical requirements in the conceptual model can be used to evaluate the analytic tools and models. The target technical architecture will address the future states of databases, software, hardware and networks supporting the new processes designed to implement future business strategies.

Migration Strategy and Implementation plans

The migration strategy is put in place to describe how the firm can move from the baseline architecture to the target architecture. This includes the definition of initiatives and their prioritization based on the strategies developed in the business objective phase. It describes the methods to be deployed for organizational changes, process enhancements and reengineering, and the technical infrastructure migration of databases, software, hardware and networking platforms. The migration strategy will also address critical IT strategies such as make vs. buy vs. utility computing, and outsourcing vs. insourcing. These strategies will affect the implementation plans concerning technology evaluation, vendor selection, training and change management. Various implementation options can be evaluated based on the business objectives, constraints and measures on the return on investments. Implementation can take a phased approach with interim deliverables. Detailed technical implementation plans are developed to include plans for new system design and development; data and system conversion; installation of databases, software, hardware and networking components; training and rollout. Financial and human resource requirements and impacts are evaluated. The enterprise model serves as the roadmap for migration planning as illustrated in Figure 4.

Figure 4: Migration Planning via the Enterprise Model



RE-EVALUATING THE IS/IT ORGANIZATION

As new IS strategies are developed by aligning information technologies with business strategies, the IS/IT organization itself needs to be re-evaluated. A wide-range of roles that can be assumed by an IS/IT organization may include support, data center operations, maintenance, development, consultancy, management of IT strategies and architectures, and the management of vendor relationships. These roles are rapidly changing in this economy driven by global forces. Strategies in multi-sourcing and utility computing change the roles of IT in many organizations. Organizations may take totally different approaches based on different business strategies. For example, Best Buy's decision to outsource the entire IT operation to Accenture will cause IT head count to drop from 820 to 40 (Sliwa 2004). On the other hand, J. P. Morgan's decision to end its projected \$5 billion outsourcing accord with IBM will bring in 4,000 IBM employees and contractors to J. P. Morgan (Forelle 2004). It is important that the roles and structures of the IS/IT organization be aligned to support the new business strategies.

CONCLUSION

Porter (2001)'s proposition of the evolution of technologies in business emphasizes the need for information systems strategies to enable the real-time optimization of the value chain. It is echoed throughout the literature that information technology strategies need to be aligned with business strategies. This paper proposes a framework for the development of information systems strategies and plans driven by business objectives and strategies. It provides an integrated framework for the development of technology architectures and business processes across the value chain. A systematic approach to enterprise information system planning is presented.

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