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INTEGRATING WEB SERVICES WITH COMPETITIVE STRATEGIES: THE BALANCED SCORECARD APPROACH

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ABSTRACT

The significance of aligning IT with corporate strategy is widely recognized, but the lack of appropriate methodologies prevented practitioners from integrating IT projects with competitive strategies effectively. This article addresses the issue of deploying Web services strategically using the concept of a widely accepted management tool, the balanced scorecard. A framework is developed to match potential benefits of Web services with corporate strategy in four business dimensions: innovation and learning, internal business process, customer, and financial. It is argued that the strategic benefits of implementing Web services can only be realized if the Web services initiatives are planned and implemented within the framework of an IT strategy that is designed to support the business strategy of a firm.

Keywords: Strategic alignment, Web services, balanced scorecard, organizational agility, IT infrastructure, IT strategy.

I. INTRODUCTION

During the IT downturn following the Internet and telecommunications bubbles in the late 1990s, few technologies garnered more attention from industries, user communities, and academia than Web services. Much of the attention focused on the value that the technology brings to firms that adopt it [Hagel and Brown, 2001; Hagel, 2002; Lim and Wen, 2003]. Given the numerous benefits, many of which are considered strategic, that Web services potentially offer to an adopting firm, it is important for management, when making investment decisions, to be able to integrate this technology into the firm's competitive strategy. Practitioners long recognized that most, if not all, traditional methodologies proposed by academic researchers for analyzing IT investments concentrate on the operational aspect of IT projects, while the strategic implication of the investment decision is ignored or addressed inadequately at best [Ward et al., 1996; Counihan et al., 2002]. This lack of appropriate methodologies to integrate technologies with a firm's competitive strategy often forces the decision on IT to be made as an "act of faith" [Irani and Love, 2001; Farbey et al., 1999], and may hamper the development and acceptance of such strategic technologies as Web services in the long run.

Because Web services emerged only recently, the strategic implications of this technology are not yet adequately researched. Instead, the published academic studies and most of the trade

journal articles on Web services focused on operational and infrastructure capabilities, such as reducing the cost of applications development and systems integration, and increasing interoperability among heterogeneous software components, applications, and platforms [Iyer et al., 2003; Astor, 2003; Blank, 2002; Pulier, 2003]. Before firms rush to adopt Web services in their software development and enterprise integration projects to take advantage of these benefits, we argue that the greatest potential of this technology lies in its integration with competitive strategies. Like many other innovative technologies, Web services can only generate sustainable competitive advantage for the adopting firm if the technology is used to support core competence and to add value to the execution of the corporate strategy. The technology's full potential is unlikely to be realized if it is used only for improving the operational efficiency of existing IT and business processes.

To fill the research gap, this study addresses the main research question: how would Web services be deployed for a firm's competitive advantage? Building and expanding on previous efforts [Sambamurthy et al., 2003; Weill, et al., 2002; Kaplan and Norton, 1996b; Martinsons et al., 1999; Hasan and Tibbits, 2000], we address this question from the perspective of the alignment between IT and business strategies and enlist the help of a popular strategic management tool, the balanced scorecard [Kaplan and Norton, 1992, 1993, 1996a]. Our research objective is to establish a conceptual framework that can be used as a guideline for identifying and deploying Web services for a firm's strategic gains, based on the potential benefits of this technology.

This paper is structured as follows. First, we provide an overview of Web services technology and why it is different from other IT innovations in the past, and discuss its potential benefits to a firm (Section II). In Section III, we present the theoretical underpinning of this study—aligning investments in IT innovations such as Web services with corporate strategies—and the research model used. We introduce the theory of the balanced scorecard, and discuss its role as a tool for implementing corporate strategy through technology resources (Section IV). Based on the theory of balanced scorecard, we present a model to use the balanced scorecard concept as the guideline for implementing Web services to enhance a firm's competitive advantage (Section V). Management implications and directions for future studies are discussed in the Conclusions (Section VI).

II. WEB SERVICES

OVERVIEW OF WEB SERVICES TECHNOLOGY

Web services refer to a set of software applications or components developed using a specific set of application programming interface (API) standards and Internet-based communication protocols. The objective is to enable these applications or components to invoke function calls and exchange data among themselves over the standard Internet infrastructure. Three standards form the foundation of the Web services technology:

- Simple Object Access Protocol (SOAP) for invoking functions and procedures on remote systems and exchanging data between processes,
- Web services Description Language (WSDL) for describing the specific services a software component or application provides and the interface binding details, and
- Universal Description, Discovery, and Integration (UDDI) for publishing and searching Web services over the Internet by creating public and private Web services registries that enable service discovery and interface binding.

What makes Web services unique compared to other software integration technologies and compelling to firms is that it reduces complexity (and hence cost) of heterogeneous applications and systems integration regardless of location, programming language, and computing platform. A firm can use Web services to create a loosely-coupled, distributed, and service-oriented

architecture (SOA) for its global IT infrastructure with lower cost and greater flexibility than other comparable technologies such as the Distributed Component Object Model (DCOM), Common Object Request Broker Architecture (CORBA), and Java Remote Method Invocation (RMI). Much of this capability can be attributed to two important factors:

1. Web services technology is based on widely accepted and public-domain Internet standards such as HTTP and XML.

2. For the first time, all technology vendors across industries agree on a common messaging format — SOAP — for inter-application communications.

Major software vendors provide Web services support to their products for interoperability with applications and components from other vendors [Blank, 2003]. For example, the two dominant applications platforms, J2EE from Sun Microsystems and .NET from Microsoft, both accepted Web services standards, thus eliminating the most significant barrier in cross-platform applications integration. As a result, the first wave of Web services applications came from firms where the challenges of systems and applications integration were greatest [Hagel, 2002].

Another unique feature of this technology, and key for enabling cross-platform integration, is that all its operational standards (SOAP, WSDL, and UDDI) are defined in the standard XML syntax. With Web services, for example, an online shopping application written in Microsoft C# running on an Internet Information Server (IIS) hosted on a Windows server can request a credit authorization from a Java-based credit card processing application running on an Apache Web server hosted on a LINUX server without difficulty. The messages passed between the two systems are written in the same SOAP format and XML syntax that both applications understand. The use of HTTP and other standard Internet communications protocols such as SMTP and FTP as the underlying data communication carriers also facilitate interoperability and virtually eliminate extra cost in establishing inter-systems communications. Communications is one of the main barriers in other types of inter-organizational systems such as Electronic Data Interchange (EDI) networks.

The fundamental idea of Web services—enabling heterogeneous applications to communicate with one another across different platforms—is neither new nor unique. Systems integration and, more recently, Enterprise Application Integration (EAI) served as a “gold mine” for IT service providers and consultants, but they were also the “black hole” of corporate IT spending. Almost 65% of EAI projects run behind schedules and significantly over budget, with an estimated average of $6.4 million per project [Pulier, 2003]. With the open standard of XML and the Internet, Web services promise to “tame the beast” of the systems integration complexity. Because the increasingly competitive global economy makes geographically distributed and seamlessly interconnected IT infrastructure a strategic necessity, Web services technology was pushed to the forefront of corporate IT strategy and, for that matter, of corporate competitive strategy. Pulier [2003] found that almost all firms with more than $1 billion in revenues declared a Web services-based architecture as their goal and more than 70% of them rolled out initial Web services pilots. If this trend continues, Web services technology is likely to change the way business applications are designed, built, deployed, and integrated, and, ultimately, the way business is conducted.

VALUE PROPOSITIONS OF WEB SERVICES

The discussion of the technology leads to the logical question: What business benefits do Web services bring to a firm as part of corporate IT? Based on the review of the existing literature, we conclude that Web services can create value for the adopting firm in three dimensions:

- infrastructure,
- operations, and
- strategic.

These benefits are summarized in Table1.

Table 1. Value Propositions of Web services

Dimensions of Value	Description of Benefits
Infrastructure	Web services decouple service interfaces from implementations and platform considerations, while supporting an industry-agreed common method to access remote resources across heterogeneous networks and systems [Ferris and Farrell, 2003].
	Web services can integrate previously incompatible computer systems, achieving better data integration and allowing applications to be shared internally and externally [Iyer et al., 2003; Lim and Wen, 2003].
	Using Web services as the integration medium, firms can streamline the middleware technologies that they employ, and reduce the number of proprietary interfaces in the disjoint systems [Samtani and Sadhwani, 2002]. As such, Web services provide a cost efficient way to integrate many computing resources at the applications level.
Operations	Applications developed for one project may be usable as a plug-and-play architecture by another project, ending duplication of software code in different groups or systems [Samtani and Sadhwani, 2002].
	Because of the nature of the loosely coupled services, firms can tinker with applications without major changes to the interface, thus avoiding affecting other systems or applications [Hagel, 2002].
	The decoupling of services and systems also affords firms with added operational flexibility. With Web services, firms do not have to be stuck with particular systems or applications; instead, firms can identify software applications or services with essential processes, allowing them to pursue business process reengineering [Hagel, 2002].
	It is also easier for firms to outsource those processes deemed “non-core” to outside providers offering those services using Web services protocols [Hagel, 2002]. And it is even possible to do this dynamically: a firm can choose providers and applications best suited to its need on a real-time basis, reducing the risk of bad sourcing decisions [Iyer et al., 2003].
	For firms going through mergers and acquisitions, Web services can be deployed to help integrate different systems from multiple acquired companies [Hagel, 2002].
Strategic	Electing to use Web services expands the amount and kind of data the trading partners can exchange [Hagel, 2002]. This enhances the collaborative activities among trading companies, allowing them to participate in a dynamic business relationship where mutually beneficial information can be shared [Samtani and Sadhwani, 2002].
	Web services allow the IT department to support flexible designs demanded by a dynamic business network environment, where firms have greater flexibility in choosing suppliers and partners, depending on particular customer requirements [Hagel, 2002; Iyer et al., 2003].
	In addition to linking up trading partners dynamically, Web services allow firms to sell their internal service applications to other firms needing similar services, thus generating new revenues [Lim and Wen, 2003].
	By unlocking business information from inside each “information silos” within a firm, Web services can expand the value of goods and services delivered to its customers [Hagel, 2002; Lim and Wen, 2003], or create new products and services using Web services [Hagle and Brown, 2001].

Sources of Web services Benefits

Examination of the unique features of the Web services technology and the infrastructural, operational, and strategic benefits that Web services bring to an adopting firm show the key attributes of Web services as the sources for these benefits (Table 2).

Table 2. Sources of Web services Benefits

Dimensions of Value	Sources of Benefits
Infrastructure	Industry-accepted standards and protocols ensure interoperability among diverse systems.
Operations	Standard-based applications allow efficient applications development and applications reuse.
Strategic	Service-oriented architecture facilitates the adaptation of IT functions based on changing external and internal requirements.

III. THEORETICAL FOUNDATION AND RESEARCH MODEL

It is our central argument that the benefits and values of Web services (Tables 1 and 2) cannot be fully realized by a firm unless the Web services technology is used to create or enhance an IT strategy that is aligned with the competitive strategy of the firm. To develop a research framework that embodies the argument, we turn to two streams of literature:

1. The literature on the strategic management of IT. This literature offers insight into the alignment of IT and business strategies [Henderson and Venkatraman, 1993; Luftman et al., 1993; Chan et al., 1997; Sabherwal and Chan, 2001; Reich and Benbasat, 2000].

2. The literature on IT and firm competitive advantage. This literature contributes ideas about the interrelationship between IT infrastructure and organizational capabilities [Broadbent and Weill, 1997; Broadbent, et al., 1999; Weill et al., 2002; Sambamurthy et al., 2003].

Building on these previous studies, we develop our research model of integrating Web services with business strategy.

ALIGNMENT BETWEEN IT AND BUSINESS STRATEGIES

Each year large and small businesses invest in IT to improve their competitive advantage and ultimately their business performance. The average United States enterprise spent more than 4.2% of its annual revenues on IT, which accounts for over 50% of total capital investment [Weill, et al., 2002]. More often than not, however, the anticipated benefits of IT investments fail to pan out. While no single factor should take the blame for the failures — the relationship between IT investments and business performance is complex and multifaceted — misalignment, or the lack of alignment, between IT and business strategies is one of the main culprits [Henderson and Venkatraman, 1993; Luftman et al., 1993; Chan, et al., 1997]. Thus it is only natural that the alignment between business strategy and IT strategy is consistently one of the top concerns of business executives and IT managers around the world [Broadbent and Weill, 1993; Luftman et al., 1993; Reich and Benbasat, 2000; Sabherwal and Chan, 2001]. For example, Luftman et al. [1993] argue that in the increasingly competitive global markets, business success depends on the harmony of business strategy, IT strategy, organizational structure and processes, and IT infrastructure and processes. Given the extent to which IT is embedded in business processes, products and services, and the information requirements in the current fast-changing market conditions, it is not sufficient to work on any of these areas in isolation. They further argue that

firms should focus their attention on the objective of building an organizational structure and a set of business processes that reflect the interdependence of enterprise strategies and information technology capabilities. Case studies by Broadbent and Weill [1993] on Australian banks and Reich and Benbasat [2000] on Canadian insurance companies show how specific organizations managed to accomplish successful alignment between IT and business strategies, which was conjectured to have led to overall better business performance.

The causal relationship hypothesized between the strategic alignment of IT and business strategies and business performance is strongly supported in many empirical studies. Based on a survey of 170 U.S. and Canadian companies across multiple industries responding, Chan et al. [1997] found that the alignment between IT strategies and business strategies is a much stronger predictor of perceived business performance than either IT strategy or business strategy alone. In a later study, Sabherwal and Chan [2001] examined the impact of the IT and business strategic alignment on the business performance of 234 companies in North America across multiple industries, and found that the alignment between business strategy and IT strategy indeed improves business success in firms that are innovative and growth-oriented. Croteau and Bergeron [2001], based on a survey of 223 Canadian firms, concluded that the information technology deployment by firms is specific to the type of business strategy employed.

Given the importance of aligning IT with business strategy to the overall business performance and the difficulties that firms encounter in achieving alignment [Baets, 1992; Chan et al., 1997], it is surprising that only a few studies address the issue of how IT-business alignment can be attained. Pyburn [1983] approached this issue from the MIS planning perspective, and Luftman et al. [1999] tested and enlisted key factors for achieving alignment. However, we are not aware of any prescriptive methodology offered to date.

IT INFRASTRUCTURE FOR STRATEGIC AGILITY

Organizational agility is defined as the ability to detect and seize opportunities for innovation by assembling requisite assets, knowledge, and relationships with speed and surprise [Sambamurthy et al., 2003]. Sambamurthy et al. further refined organizational agility into three interrelated organizational capabilities:

- customer agility, defined as the co-opting of customers in the exploration and exploitation of opportunities for innovation and competitive action;
- partner agility, defined as the ability to leverage the assets, knowledge, and competencies of suppliers, distributors, contract manufacturers, and logistic providers through alliances, partnerships, and joint ventures; and
- operational agility, defined as the ability of a firms' business processes to accomplish speed, accuracy, and cost economy in the exploitation of opportunities for innovation and competitive action.

They argue that firms that develop all three agility dimensions are in a better position to take more competitive actions and perform complex action repertories, which ultimately translate into competitive advantage. In dynamic and fast-changing industries and markets, organizational agility provides firms' competitive advantage [Eisenhardt and Sull, 2001; Zaheer and Zaheer, 1997].

Studies consistently link IT investments with organizational agility. Weill et al. [2002] argue that senior executives make few choices more critical than deciding which IT investments will be needed for future strategic agility. After examining 180 electronically based business initiatives in 118 businesses, they found that, in leading enterprises, each type of strategic agility requires distinct patterns of IT infrastructure capabilities, and the firms that can determine the type of agility they need for specific business initiatives are more likely to make sensible infrastructure investments. Sambamurthy et al. [2003] argue that IT is a platform for agility, because firms are

integrating IT with processes, knowledge, and relationships to nurture innovation in customer relationships, manufacturing, procurement, supply chains, and many other key business activities. Such integration forms the digital platform that enables firms to adapt to changing market conditions more quickly by offering information-based value propositions, forging value-chain collaborations with partners that competitors cannot easily duplicate, and rapidly exploiting emerging market niches. Supporting that argument, Broadbent et al. [1999] find that more extensive IT infrastructure capabilities are associated with firms whose products and services changed quickly. IT infrastructure flexibility (the degree to which its resources are shareable and reusable [Duncan, 1995]) and the speed and cost with which a firm can respond to changes in the marketplace [Broadbent, et al., 1999] are considered a major business resource [Keen, 1991; McKenney, 1995; Broadbent et al., 1999]. We argue that Web services technology enables the creation of a flexible, service-oriented enterprise IT infrastructure, and, hence, can be a source for sustainable competitive advantage through organizational agility.

RESEARCH MODEL

The objective of this study is to develop a framework for aligning Web services deployment with the competitive strategy of the adopting firm to maximize the impact of the technology on business performance. Drawing on the literature on the IT and business strategy alignment, we argue that the strategic benefits of implementing Web services can only be realized if the deployment is planned and implemented within the framework of an IT strategy designed to support the business strategy of a firm.

In Table 2 (Section II) we showed that three features of Web services contribute to the business benefits of this technology:

- Industry accepted standards and protocols,
- Standards based applications, and
- Service oriented architecture.

Industry-accepted standards and protocols lead to interoperability, allowing information sharing and knowledge transfer within and across firms. Standard-based applications facilitate an IT platform for applications development, resulting in efficient and effective business operations. And service-oriented architecture is the basis for a flexible IT infrastructure that can enhance organizational agility. Figure 1 shows our conceptual framework of this study.

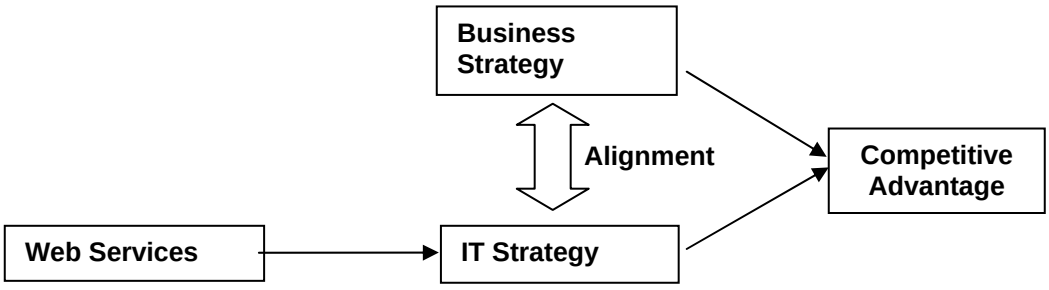

Figure 1. Conceptual Framework

Key to the conceptual framework is the critical issue, and the focus of our research, of how to align the value propositions of Web services with corporate strategy to bring about competitive advantage. To address that, we resort to the constructs and the philosophy of the balanced scorecard, developed by Kaplan and Norton [1992, 1993, 1996a].

IV. BALANCED SCORECARD APPROACH TO STRATEGIC INTEGRATION

A strategy is a

> *"deliberate search for a plan of action that will develop a business's competitive advantage and compound it"* [Henderson, 1989, p. 5].

Operationally, strategy can be thought of as a roadmap that links the origins or starting points (the resources), through a series of paths (the tactics), to the destination (the business goals). To execute a business strategy successfully, management needs to:

- identify the intended outcomes and the performance drivers that effect the outcomes,
- establish a set of cause-and-effect relationships among these factors, and
- set up explicit linkage to financials as the ultimate success indicators [Kaplan and Norton, 1996b].

The balanced scorecard [Kaplan and Norton, 1992] serves as a tool for this purpose.

In its original form, the balanced scorecard was designed to be a performance measurement tool, using four interrelated business perspectives—financial, customer, internal business process, and innovation and learning (Appendix I). In the heart of the balanced scorecard concept is its "theory of business": firms that continuously improve their capabilities for learning and innovation achieve better performance in their internal business processes which, in turn, leads to more effective execution of their customer value propositions and eventually result in sustained competitive advantage and improved financial performance [Kaplan and Norton, 2000; Sim and Koh, 2001]. The balanced scorecard requires firms to identify [Kaplan and Norton, 1992, 2000]:

- the knowledge, skills, and systems needed to improve the business continually (innovation and learning perspective),
- necessary factors to build strategic capabilities and efficiencies (internal process perspective),
- values that customers seek (customer perspective), and
- financial performance to maximize the shareholder value (financial perspective).

These components should all be derived from the firm's vision and strategy [Otley, 1999]. The components are not isolated; for example, "a failure to convert improved operational performance, as measured in the scorecard, into improved financial performance should send executives back to their drawing board to rethink the company's strategy or its implementation plan" [Kaplan and Norton, 1992, p. 77]. Based on the balanced scorecard theory of business, these four factors are linked in a causal relationship (or, as some argued [Norreklit, 2000], a logic or interdependent relationship) that leads, directly or indirectly, to the financial performance of the firm (Figure 2). With all the components identified based on the vision and strategy and the causal relationship leading to the strategy execution evidenced by financial performance, a plan for implementing the corporate strategy is complete [Kaplan 2000, 2001a].

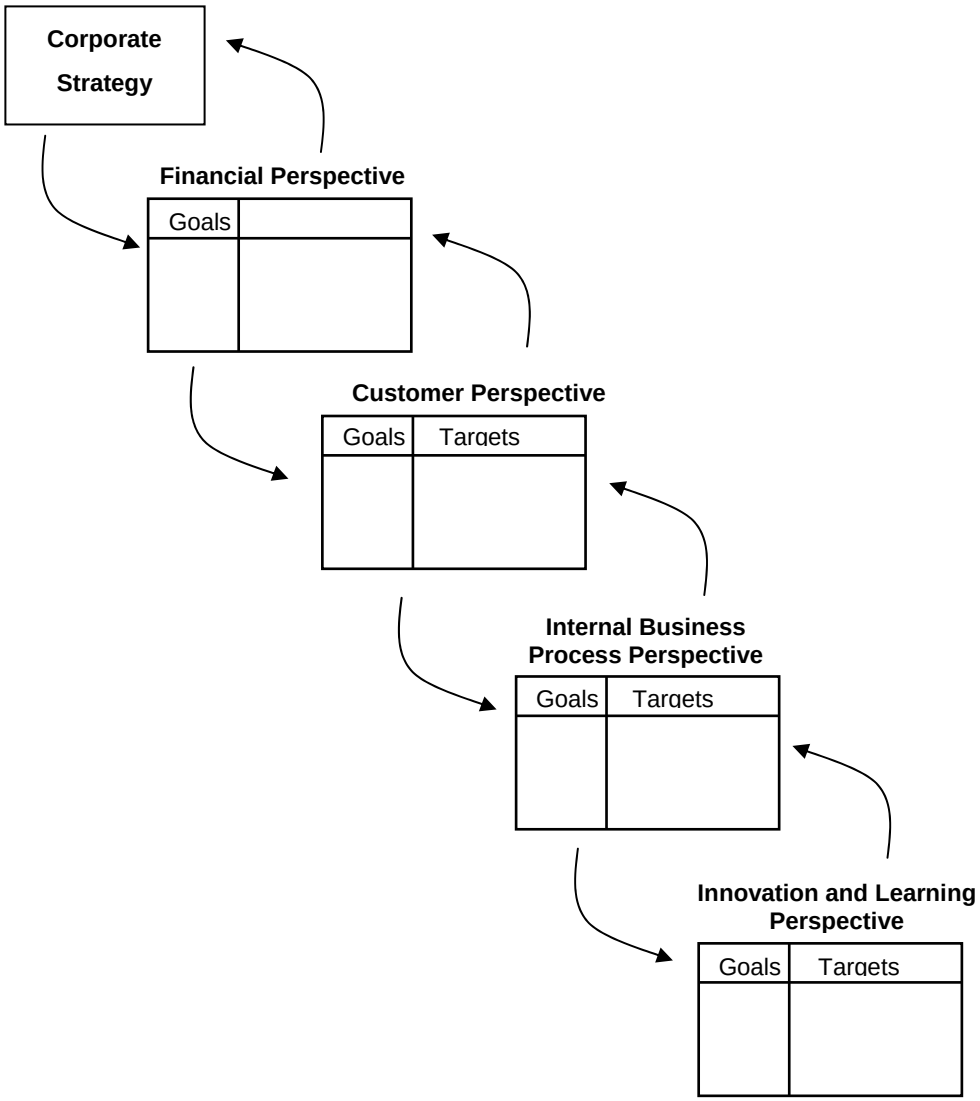

Figure 2. Balanced Scorecard's Causal Relationship with Corporate Strategy (Adopted from [Kaplan and Norton, 2001a])

The balanced scorecard theory of business and the practice of using a balanced scorecard for strategic management are supported by numerous case studies and empirical analyses since the concept's inception [Kaplan and Norton, 1996b, 1996c, 2001a, 2001b; Butler et al., 1997; Hepworth, 1998; Robinson, 2000; Sim and Koh, 2001]. In our view, this tool is particularly useful for aligning the deployment of a critical technology, such as Web services, with corporate strategies. The balanced scorecard identifies the strategic impacts of Web services in four perspectives. Management can see how the technology can be used to enhance or generate firm's competitive advantage.

V. INTEGRATING WEB SERVICES WITH COMPETITIVE STRATEGIES

WEB SERVICES BALANCED SCORECARD FRAMEWORK

To build a framework for integrating Web services with a firm's competitive strategy using the concept of balanced scorecard, our proposal starts with the recognition that

1. Web services investments should support an IT strategy that is, in turn, driven by business strategy, and

2. the four perspectives of the balanced scorecard provide a conceptual framework for aligning particular Web services initiatives to intended strategic outcome.

Our proposed framework of integrating Web services with corporate strategy is summarized in Figure 3.

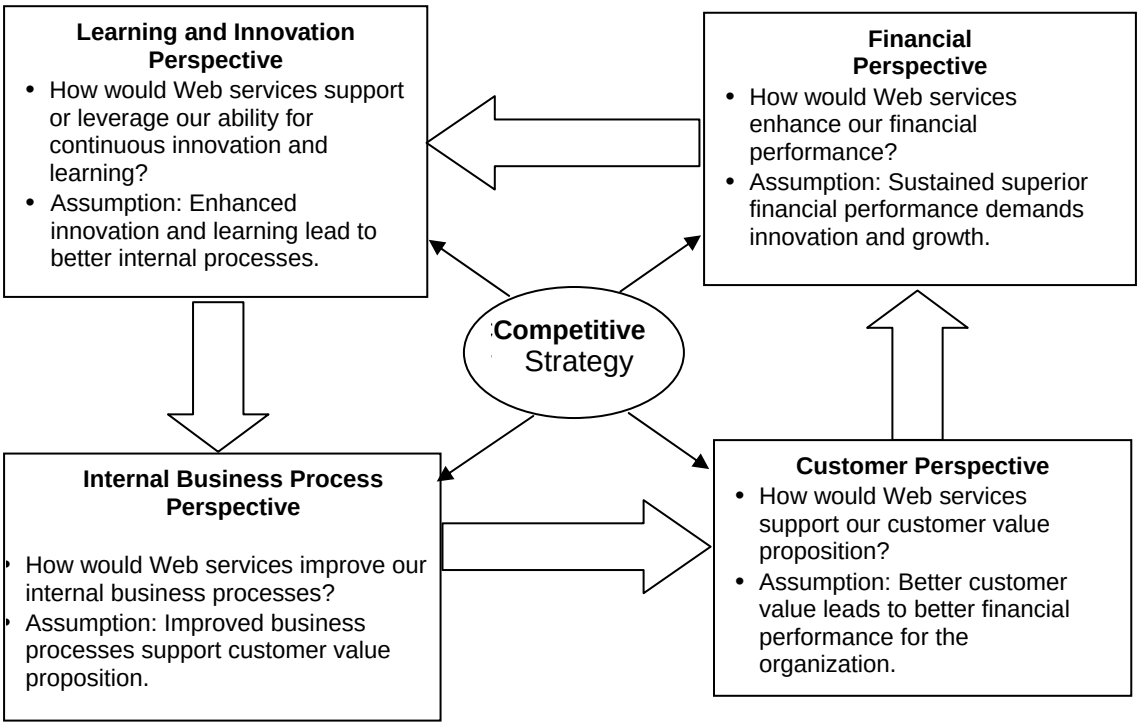

Figure 3. Web Services Balanced Scorecard Framework

This Web services Balanced Scorecard (WS-BSC) framework, subscribing to the balanced scorecard theory of business, focuses on the critical issue of how the Web services technology can be integrated into a firm's competitive strategy to deliver results where they are desirable, measurable, and beneficial to the firm's strategy. WS-BSC maps the potential infrastructural, operational, and strategic benefits of Web services, discussed in Section II, into the four business perspectives and, conversely, translates business strategy into actionable Web services initiatives by helping managers address four basic questions:

- How would Web services support our corporate strategy by improving our capabilities of continuous learning and innovation?
- How would Web services support our corporate strategy by enabling us to improve the efficiency, effectiveness, and flexibility of our internal business processes?
- How would Web services support our corporate strategy by helping us realize our customer value propositions?
- How would Web services support our corporate strategy to deliver sustainable growth of shareholder value?

The objective of the WS-BSC framework is to provide a systematic and structured approach for managers to identify the specific Web services initiatives that fit into one or more of these categories.

In the next four subsections, we present the four propositions that constitute the foundation of the WS-BSC framework and provide arguments and evidence from case studies to support these propositions.

WEB SERVICES FOR IMPROVING LEARNING AND INNOVATION CAPABILITIES

Proposition 1. Use of Web services technologies can improve a firm's capability for continuous learning and innovation through increased level of information sharing and collaboration and strengthened organizational agility.

In the balanced scorecard theory of business, innovation and learning capability is the fundamental driver of business performance and, thus, serves as the foundation of the firm's competitive strategy. Kaplan and Norton [1996c] argue that businesses are unlikely to meet their long-term targets for customers and internal processes by sticking to current technologies and capabilities. Instead, firms must continually improve employee skills, organization environment, and technology capability to survive the intense global competition. We argue that to improve the capability of learning and innovation of a firm, Web services can be deployed to facilitate information sharing and collaboration among employees and business units, and to increase organizational agility. Table 3 summarizes the potentials of Web services for improving innovation and learning. Case examples are presented in Appendix II.

Table 3. Improving Innovation and Learning Using Web services

Benefits	Description
Information Sharing and Collaboration	Efficient information sharing and effective collaboration are fundamental to learning and innovation. With industry-accepted standards and protocols, Web services provide standard interface allowing integration among heterogeneous platforms, thus facilitating efficient and effective collaboration between departments that use different IT systems.
Organizational Agility	Through the orchestration of modular, loosely coupled software components, Web services enable an "assemble line approach" to software development, resulting in a responsive IT infrastructure for designing and building faster application development and enterprise applications. And Web services' service-oriented architecture allows firms to build a flexible IT infrastructure that enables faster decision-making and response to market changes.
	To improve partnering and customer agility, Web services' industry-accepted standards and protocols can be the basis for facilitating inter-firm communication and collaboration. Standards and protocols are often cited as strategic value that Web services bring [Hagel, 2002; Hagel and Brown, 2001].

WEB SERVICES FOR IMPROVING INTERNAL BUSINESS PROCESSES

Proposition 2. Use of Web services technology can lead to more efficient and effective internal business processes through process automation and acceleration, increased interoperability and integration, and improved process design.

The internal business process perspective captures key organizational activities such as research and development, customer relationship management, and supply chain management. Business

processes often involve more than one department in a firm, and information and knowledge sharing becomes a precursor to effective business processes. We argue that Web services technology, with its industry-accepted standards and protocols, can enhance internal business operations by enabling process automation, increasing interoperability and reducing integration complexity, and improving process design. Table 4 summarizes the potentials of Web services for improving internal business processes. Case examples are presented in Appendix II.

Table 4. Improving Internal Business Processes using Web Services

Benefits	Description
Process Automation and Acceleration	Manual and batched business processes are often the result of inefficient use of information resources in a firm. In such instances, Web services can be deployed to increase the level of information sharing (as in the learning and innovation perspective (Section III)) and automate previously manual processes.
Interoperability and Integration	Most, if not all, corporations deploy multiple computing platforms, and interoperability and integration of these platforms often become problematic, time consuming, and costly. Compared to other alternatives such as middleware and EAI, Web services technology is ideal in making heterogeneous systems interoperable, enhancing business process integration.
Process Design	Effective information flow is a precursor to the design of efficient business processes. A well-managed supply chain, for example, calls for full knowledge of inventory and plant utilization. Implementation of Web services alleviates internal and external information barriers that hamper efficient business processes, and the result can be significant.
	With the ability of systems and applications integration, Web services can also be used to build an "enterprise portal" to integrate diverse data sources. Such an integration scheme would enhance internal business processes by making back-office applications and services centrally available.

WEB SERVICES FOR IMPROVING CUSTOMER VALUE

Proposition 3. Use of Web services technology can lead to effective execution of the customer value proposition through enhanced customer intimacy, improved customer retention, and better customer value.

The customer perspective is where the core of the business strategy—the customer value proposition—resides. Firms endeavor to excel in unique customer propositions while maintaining competitive parity in other areas. These unique customer value propositions are supported by appropriately determined underlying business processes, and well-executed value proposition will lead to excellent financial performance [Kaplan and Norton, 2000]. We believe that key attributes of Web services can advance specific customer value propositions through enhanced customer intimacy, improved customer retention, and better customer value. Table 5 summarizes the potentials of Web services for improving internal business processes. Case examples are presented in Appendix II.

Table 5. Improving Customer Value Using Web Services

Benefits	Description
Customer Intimacy	To deal effectively with customers, firms strive for "single point of contact" and "single face to the customer." With its service-oriented architecture and industry-accepted standards and protocols, a single Web service facing the customers can be utilized to trigger a complex business process that touches several systems and data sources, while the intricacies of the back-end systems remain transparent to the customers.
Customer Retention	Partnering with the customers is among the broad spectrum of customer retention tactics, and tight collaboration and sharing of information enhance partnership. Allowing and facilitating customer access to crucial product and service information using Web services would be an important draw to attract customers, while the linkage itself can serve as a "switching cost" to prevent customers from moving to competitors' products and services.
Customer Value	Beyond the quality and specifications of its products and services, a firm needs to be able to satisfy customers' specific requirements to increase the (perceived) value that customers receive from the transactions. Because of its service-oriented architecture, Web services make a firm's IT infrastructure more flexible and adaptable, affording the organizational agility to meet customers' changing requirements.

WEB SERVICES FOR IMPROVING SHAREHOLDER VALUE

Proposition 4. Use of Web services technologies can lead to better financial performance and shareholder value through reduced operational cost and increased revenue.

Balanced scorecard theory posits that improved capability of learning and innovation, better internal business processes, and the enhanced customer value serve as performance drivers that eventually lead to increased return to shareholder value. In addition to these indirect impacts on financial performance, we argue that Web services can directly influence shareholder value by facilitating the two levers of a firm's financial strategy, productivity and revenue growth [Kaplan and Norton, 2000]. Table 6 summarizes the potentials of Web services for improving shareholder value. Case examples are presented in Appendix II.

WEB SERVICES FOR SUSTAINABLE COMPETITIVE ADVANTAGE

Given the multitude of ways to implement Web services to increase competitive advantage, firms need not, and indeed should not, adopt all the options. The WS-BSC framework provides a guideline for deploying Web services based on a firm's strategy using the balanced scorecard's four business perspectives. The key Web services features that give rise to business values are matched with strategic initiatives a firm might have in each of the business perspectives. In this fashion, Web services can drive an IT strategy so that it is fully aligned with overall business strategy and can focus on key organizational capabilities such as agility and knowledge sharing, thereby attaining a firm's sustainable competitive advantage.

Table 6. Improving Shareholder Value Using Web Services

Benefits	Description
Operating Costs	The use of open standard greatly reduced the complexity of Web services implementation. Web services allow software components reuse in other business applications—firms can build business service hubs that aggregate individual application capabilities into coarsely grained business services that are for use by multiple systems. The resulting cost savings in application development can be significant.
Revenues	Web services technology enables firms to transform their rigid and tightly coupled IT functionality and infrastructure into a flexible and loosely coupled service-oriented architecture. As a result, individual "services" can be isolated from general IT functions, and many valuable internal services may be made available to external customers, thus creating new revenue streams.

VI. CONCLUDING REMARKS

The significance of aligning IT with corporate strategy is well noted by academics, but the lack of rigorous methodologies prevented practitioners from integrating IT projects effectively with competitive strategies. As a result, a new and promising technology such as Web services may be deployed based on "gut feelings" or "act of faith" without appropriate strategic management tools, and the outcome may be marginal or even undesirable. Our proposal for the WS-BSC framework is intended to address this issue. The WS-BSC framework can guide managers to identify the most valuable and appropriate Web services initiatives for their specific competitive strategies and provide a basis for justifying and evaluating Web services investment initiatives. In addition, this framework provides an example of how other IT investment initiatives could be aligned and integrated with a firm's business strategy.

LIMITATIONS

Although the proposed WS-BSC is a novel idea that applies the balanced scorecard concept to the management of a technological innovation, Web services, it does not extend or alter the nature of the balanced scorecard framework. Further, even though the balanced scorecard is a powerful management tool, it is subject to certain limitations. Being a hierarchical top-down model driven by vision and strategy, the balanced scorecard cannot be adopted easily for strategic control in a dynamic environment or firm [Norrelit, 2000], nor can it be used for formulating strategy. Another weakness is the lack of any direct relationship between the balanced scorecard and the market [van Veen-Dirks and Wijn, 2002]. Finally, the balanced scorecard inadequately addresses the values of stakeholders—such as employees and suppliers—and the two-way process that they are engaged in with the firm [Atkinson et al., 1997; Maltz et al., 2003]. These shortcomings, however, do not affect the validity of our framework. WS-BSC assumes the existence of corporate strategy, which should already have market and stakeholder components in it. The balanced scorecard in our framework is used for implementing that strategy, not formulating it.

A NEW WAY TO USE THE BALANCED SCORECARD

Our approach to using the balanced scorecard for Web services differs from previous attempts to apply the scorecard in the IT discipline, such as Martinson et al., [1999] and Rosemann [2001]:

1. We construct a strategic management roadmap for Web services based on the balanced scorecard concept, while previous studies concentrated on building evaluation systems for IT using the balanced scorecard as a tool.

2. Past research focused on building an "IT balanced scorecard" for the IT project or IT department [Martinson et al., 1999, Hasan and Tibbits, 2000, Rosemann, 2001], and on the relationship between the IT balanced scorecard and that of the firm's [Grembergen and Saull, 2001]. This type of construct may create a seemingly more appropriate evaluation system for IT specifically, but it also isolates the IT function from the corporate strategy. Reflecting our philosophy that IT investment should be part of the overall firm's strategy, our methodology is intended to integrate Web services into the corporate strategy, not separating from it.

FUTURE RESEARCH

As the first study in the attempt to use the balanced scorecard as the tool to integrate Web services technology with corporate strategy, we offer two directions for future research.

1. To verify and enhance the framework, empirical studies in the form of case studies and action research should be undertaken to determine how firms deploy Web services strategically as measured by the balanced scorecard.

2. We believe that the WS-BSC framework can be generalized to apply to IT investments in general. To that end, a systematic approach to aligning IT benefits and business metrics, as well as further development of the balanced scorecard theory of business, is needed.

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APPENDIX I. BALANCED SCORECARD AS A PERFORMANCE MEASUREMENT TOOL

Kaplan and Norton [1992] first presented the concept of a balanced scorecard system for measuring firm performance from a holistic perspective. A series of their articles thereafter further enhanced its concepts and applications, gradually transforming it from a performance measurement tool to a strategic management system [Kaplan and Norton, 1993, 1996a, 1996b, 1996c, 2001a, 2001b]. They argued that traditional financial accounting measures, such as return on investment, only can give limited or even misleading signals for competitive business activities because they are lagging indicators of business health. Instead, the balanced scorecard depicts and measures both a firm's current operating performance and the drivers of future performance, by tracking and measuring four dimensions of business: financial, customer, internal process, and innovation and learning (Figure A1-1).

Financial measures indicate whether and how the firm's strategies and operations contribute to business improvement. Commonly used include financial measures include revenue growth and mix (growth indicator), return on investment, operating income, gross margin (prosperity indicators), and cash flow (survival indicator).

From the customer perspective, the balanced scorecard helps managers translate their concept of customer service, satisfaction, and value into specific measures that reflect the factors that really matter to customers. The appropriate measures stem from customer's usual concerns, such as time, quality, service, and cost.

To deliver on the value propositions of customers and to satisfy shareholder expectations, managers need to identify those critical internal processes in which the firm must excel. The internal business process measures for the balanced scorecard are derived from the business processes with the greatest impact on customer satisfaction and financial performance, such as cycle time, quality, and productivity.

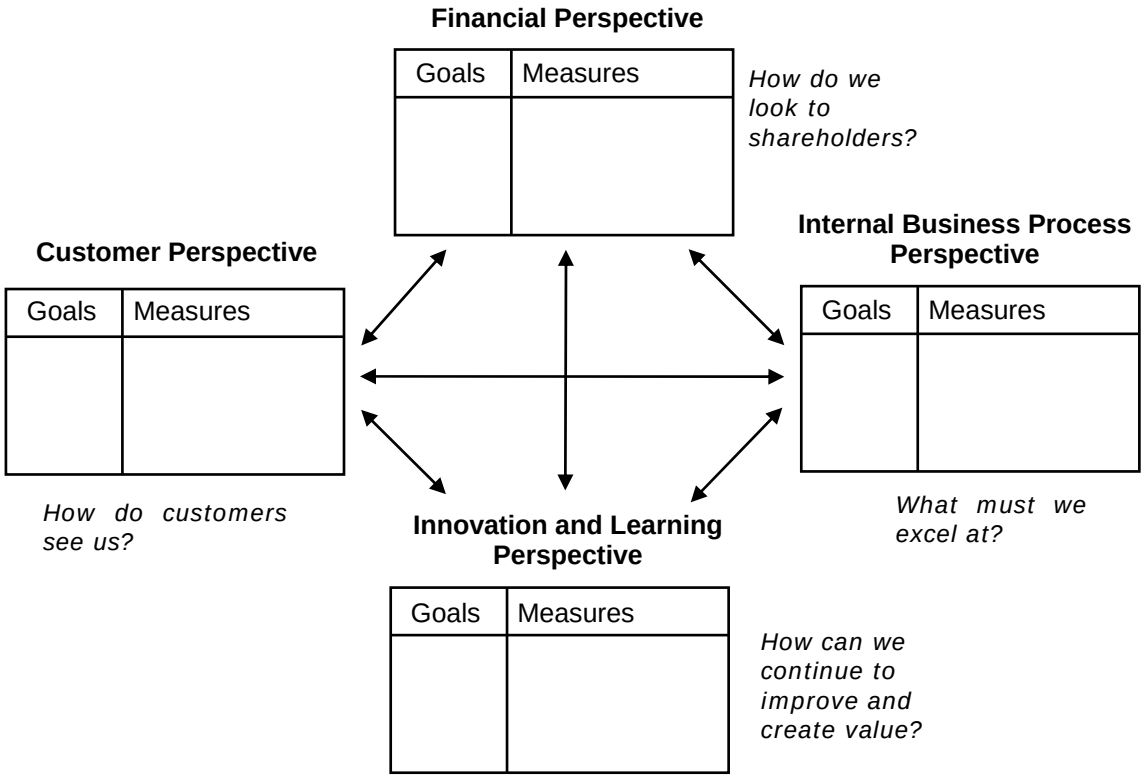

Figure A1-1. The Balanced Scorecard (adopted from [Kaplan and Norton,1992])

The balanced scorecard uses the innovation and learning perspective to address the drivers of future business. The ever-changing market, technology, and competitive landscape mean that a firm must build an infrastructure for long-term growth and improvement and track its ability to innovate and learn. Commonly used measures for learning and innovation include patent productivity, rate of new product development, and strategic personnel availability.

Since its inception, the balanced scorecard was widely adopted by firms and claimed an important role as a performance management tool for business [Lipe and Salterio, 2002; Ahn, 2001; Sim and Koh, 2001; Hepworth, 1998; Kaplan and Norton, 1996c]. In addition to applying the balanced scorecard to the organization as a whole, attempts were also made to revise the balanced scorecard to the task of performance measurement in more narrowly defined corporate functions such as the IT department [Martinsons, 1999; Grembergen and Saul, 2001], project management [Eickelmann, 2001], electronic commerce [Hasan and Tibbits, 2000], and quality management [Solano et al., 2003].

APPENDIX II. CASE EVIDENCE SUPPORTING THE WS-BSC FRAMEWORK

WEB SERVICES FOR IMPROVING LEARNING AND INNOVATION CAPABILITIES

In the balanced scorecard theory of business, the innovation and learning capability is the fundamental driver of business performance and, thus, serves as the foundation of the competitive strategy. Kaplan and Norton [1996c] argue that businesses are unlikely to meet their long-term targets for customers and internal processes by sticking to current technologies and capabilities. Instead, firms must continually improve employee skills, the organization

environment, and their technology capability to survive intense global competition. We contend that to improve the capability of learning and innovation of a firm, Web services can be deployed to facilitate information sharing and collaboration among employees and business units, and to increase the degree of organizational agility.

Using Web services to Increase Information Sharing and Collaboration

Efficient information sharing and effective collaboration are fundamental to learning and innovation. Quite often, parties—be they project teams, departments, branch offices, or trading partners—on either side of a communication channel use different applications hosted on different platforms, making the information sharing expensive and time consuming, if possible at all. With industry-accepted standards and protocols, Web services provide standard interfaces that allow integration among heterogeneous platforms, thus facilitating collaboration between departments that use different IT systems.

For example, at Infinity Pharmaceuticals, thousands of chemical compounds are evaluated regularly for their drug potential in the laboratories across the company. With multiple platforms deployed in various laboratories, the company implemented a Web services-based notification system to inform all groups instantly as soon as a compound is recognized as no longer worth pursuing, so that other labs would not waste time on unpromising compounds [Astor, 2003].

Using Web services for Organizational Agility

As discussed in Section III, organizational agility, a source of competitive advantage, is the ability to detect and seize opportunities for innovation by assembling required assets, knowledge, and relationships. Organizational agility is composed of three capabilities: customer agility, partnering agility, and operational agility. Service-oriented architecture and standards-based applications, key features of Web services, contribute to operational agility. Through the orchestration of modular, loosely coupled software components, Web services enable an "assemble line approach" to software development, resulting in a responsive IT infrastructure for designing and building enterprise applications. Such an IT infrastructure affords cheaper and faster application development and deployment. And Web services' service-oriented architecture allows firms to build a flexible IT infrastructure that enables faster decision-making and response to market changes. For example, a large brokerage firm recognized the need for the ability to deploy applications quickly based on rapidly changing market conditions. To achieve this goal, the company organized its applications into elemental business services, using Web services technology, that could be rapidly snapped together to provide flexible products and services to the customers [Astor, 2003].

To improve partnering and customer agility, Web services' industry-accepted standards and protocols can be the basis for facilitating inter-firm communication and collaboration. This capability is, in fact, an often-cited strategic value that Web services bring [Hagel, 2002; Hagel and Brown, 2001]. Travelers Property Casualty, for example , uses Web services to link up with its network of auto glass shops. The glass dealers can verify coverage with Traveler over the web, do the repair, and then post the repair cost back to Travelers and be paid electronically. With Web services, Traveler claimed it accomplished an efficiency improvement of 30% for handling claims [Microsoft, 2002b]. Another example is Buy.com, which uses Web services to distribute content to its affiliate sites. Changes made on Buy.com, such as the "deal of the day," can then be automatically reflected on the sites of those affiliates, complete with product description, pricing, picture, and even an up-to-the-minute indication of remaining quantity on hand [Microsoft, 2002a].

WEB SERVICES FOR IMPROVING INTERNAL BUSINESS PROCESSES

The internal business process perspective captures key organizational activities such as research and development processes, customer relationship management, and supply chain management. Business processes often involve more than one department in a firm, and information and

knowledge sharing becomes a precursor to effective business processes. We present examples that Web services technology, with its industry-accepted standards and protocols, can enhance internal business operations by enabling process automation, increasing interoperability and reducing integration complexity, and improving process design.

Using Web services for Process Automation and Acceleration

Manual and batched business processes are often the result of inefficient use of information resources in a firm. In such instances, Web services can be deployed to increase the level of information sharing (as in the learning and innovation perspective) and automate previously manual processes. For example, an athletic footwear manufacturer discovered that their sales force spent significant amount of time on assisting the smallest accounts to place orders manually, because these accounts were not EDI capable. Using Web services, the company was able to provide the automated order processing capability to these smaller customers without the use of costly EDI technology, freeing up the sales force to pursue other account management activities [Astor, 2003].

Using Web services for Increasing Interoperability and Integration

Most, if not all, corporations deploy multiple computing platforms. Interoperability and integration of these platforms often become problematic, time consuming, and costly. Compared to other alternatives such as middleware and EAI, Web services technology is ideal in making heterogeneous systems interoperable, enhancing business process integration. An example is Nordstrom.com. Using Web services, Nordstrom.com links its disparate systems—web site built on a Microsoft platform, ERP system on HP Unix server, and inventory information stored on an IBM mainframe—to provide real-time information across different platforms. Unlike middleware, where each application data exchange must be custom-built, Nordstrom found that Web services accomplish the integration with less time and money [Patton, 2002].

With the ability of systems and applications integration, Web services can also be used to build an "enterprise portal" to integrate diverse data sources. Such an integration scheme would enhance internal business processes by making back-office applications and services centrally available. For example, Centrala StudieStodsnamnden, the Swedish government agency for higher education financial aid, deployed Web services in 2002 for this purpose.

> *"[I]n the early days, before the [Web services] platform, it could take weeks before we could integrate a common object… Today, …[I]t takes us one day to publish a new service instead of ten."* Chief IT architect [IBM, 2003].

At Future Electronics, orders come in via different channels, such as phone, web, email, and fax. When the company deployed multiple back-end systems to process orders from these diverse channels, it turned out to be costly and difficult to manage. Future Electronics solved this problem by using a set of Web services that convert these orders when they arrive into a common form and send them into the appropriate internal processes [Astor, 2003].

Using Web services for Improving Process Design

Effective information flow is a precursor to the design of efficient business processes. A well-managed supply chain, for example, calls for the full knowledge of inventory and plant utilization. Implementation of Web services alleviates internal and external information barriers that hamper efficient business processes. The result can be significant. Dell Computer deploys Web services to integrate its supply chain virtually with its vendors' systems. Instead of distributing a 52-week demand forecast to all its suppliers, Dell publishes real-time manufacturing schedule every two hours as a Web service via its extranet. A supplier can satisfy Dell's materials requirements in a timely fashion without maintaining excessive inventory. This integrated supply chain management system helps Dell cut its inventory buffer at its assembly plants to just three to five hours [Lim and Wen, 2003].

WEB SERVICES FOR IMPROVING CUSTOMER VALUE

The customer perspective is where the core of the business strategy—the customer value proposition—resides. Firms endeavor to excel in unique customer propositions while maintaining competitive parity in other areas. These unique customer value propositions are supported by appropriately determined underlying business processes, and well-executed value proposition will lead to excellent financial performance [Kaplan and Norton, 2000]. We believe that key attributes of Web services can advance specific customer value propositions through enhanced customer intimacy, improved customer retention, and better customer value.

Using Web services for Enhanced Customer Intimacy

To deal with customers effectively, firms strive for a "single point of contact" and a "single face to the customer." Building an IT infrastructure that can handle customer-related data, which may reside in various places within a firm, in a reliable and integrated fashion is a crucial first step. A consistent and friendly customer interface that is capable of handling all customer requests but hides the complexity of back-office operations is another significant feature. With its service-oriented architecture and industry-accepted standards and protocols, a single Web service facing the customers can be used to trigger a complex business process that touches several systems and data sources, while the intricacies of the back-end systems are transparent to the customers.

For example, with dozens of back-end systems necessary to support multiple customer applications, a large financial services firm consolidated the front office operations into a simple set of Web services. In this way, one Web service operation may set off a string of business processes, sending data to and receiving information from many different systems, greatly speeding the customer service process, and improving the effectiveness of the service. However, to the customers, all of this complexity is invisible when the service is being performed [Blank, 2003]. At NEC Electronics America, an internal system provides real-time access to inventory and production information from multiple plants. Using Web services, the company allows customers to tap into this system securely to receive complete production and inventory data, significantly reducing the time to delivery and enhancing customers' planning ability [Astor, 2003].

Using Web services for Customer Retention

Partnering with the customers is among the broad spectrum of customer retention tactics, and tight collaboration and sharing of information enhance partnership. Compared with traditional technologies such as EDI for linking customers and trading partners, Web services appear to be a superior tool, because no proprietary technology or dedicated communications network is required. Allowing and facilitating customer access to crucial product and service information can be an important draw to attract customers, while the linkage itself can serve as a "switching cost" to prevent customers from moving to competitors' products and services.

For example, a logistic and transportation company wanted to allow its partners and customers to access shipping information by calling the company's shipping functionality remotely from within their own applications. The company tried distributing software development kits (SDKs) for different platforms to its customers and partners but failed to gain any traction, because the developers in those companies wanted to use their own development tools. It was difficult to coordinate and maintain the interfaces. The company then deployed Web services for this purpose and, in so doing, made its shipping functionality ubiquitous to its partners and customers without forcing them to use different development tools. The company believed that its transition to Web services helped retain existing customers and acquire new ones [Blank, 2003].

Using Web services for Increasing Customer Value

Beyond the quality and specifications of its products and services, a firm needs to be able to satisfy customers' specific requirements to increase the (perceived) value that customers receive from the transactions. Because of its service-oriented architecture, Web services make a firm's

IT infrastructure more flexible and adaptable, affording the organizational agility to meet customers' changing requirements. For example, a large rental car company in Europe discovered that some customers want to pick up a car in, say, France and drop it off in Germany. The firm's CIO was faced with the difficulty task of integrating multiple legacy reservation systems in different countries. He developed a Web services application and a company-wide standard interface to coordinate the customer reservation function across countries, without tinkering with the different systems or technologies that each franchise chose to use [Blank, 2003].

WEB SERVICES FOR IMPROVING SHAREHOLDER VALUE

The balanced scorecard theory of business posits that improved capability of learning and innovation, better internal business processes, and the enhanced customer value serve as performance drivers that eventually lead to increased return to shareholder value. In addition to these indirect impacts on financial performance, we believe that Web services can directly influence shareholder value by facilitating the two levers of a firm's financial strategy, productivity and revenue growth [Kaplan and Norton, 2000].

Using Web services for Reducing Operating Cost

The use of open standard greatly reduced the complexity of Web services implementation. Web services allow software components reusable in other business applications—firms can build business service hubs that aggregate individual application capabilities into coarsely grained business services that are used by multiple systems. The resulting cost savings in application development can be significant. For example, Infinity Pharmaceuticals claims that it no longer needed expensive programmers to implement Web services projects:

> *"Our team of technical analysts was able to deliver the project without having to get the engineering team involved. This helps save time and money"* [Blank, 2003].

Using Web services for Increasing Revenues

Web services technology enables firms to transform their rigid and tightly coupled IT functionality and infrastructure into a flexible and loosely coupled service-oriented architecture. As a result, individual "services" can be isolated from general IT functions, and many valuable internal services can be made available to external customers, thus creating new revenue streams. Danske Bank, for example, made a quote service available to customers in November 2002 using Web services [Micorsoft, 2003].

In addition, a flexible IT architecture can enhance a firm's ability to create new products or services. For example, Standard & Poor's uses Web services to break up its half dozen large, complex e-commerce sites, originally designed for institutional investors only, into 50 to 60 individual services. By doing so, Standard & Poor's not only reduces the sales cycles for those web sites by making their service value more explicit, but also generates more revenues by selling more granular products to a wider customer base [Wagner, 2001].

LIST OF ACRONYMS

Acronyms	Definition or Description
.NET	Microsoft platform for building, deploying, and running Web services and applications.
API	Application Programming Interface
CIO	Chief Information Officer
CORBA	Common Object Request Broker Architecture
DCOM	Distributed Component Object Model
EAI	Enterprise Application Integration
EDI	Electronic Data Interchange
FTP	File Transfer Protocol
ERP	Enterprise Resource Planning
HTTP	HyperText Tranfer Protocol
IIS	Internet Information Server
J2EE	Java 2 Enterprise Edition
LINUX	An open source operating system
RMI	Remote Method Invocation (Java)
SDK	Software Development Kit
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SMTP	Simple Mail Tranfer Protocol
WSDL	Web services Description Language
UDDI	Universal Description, Discovery, and Integration
WS-BSC	Web services Balanced Scorecard
XML	Extensible Markup Language

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