

## SHAPING UP FOR E-COMMERCE: INSTITUTIONAL ENABLERS OF THE ORGANIZATIONAL ASSIMILATION OF WEB TECHNOLOGIES<sup>1</sup>

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### Abstract

*The global reach of the Web technological platform, along with the range of services that it supports, makes it a powerful business resource. However, realization of operational and strategic benefits is contingent on effective assimilation of this type III IS innovation. This paper draws upon institutional theory and the conceptual lens of structuring and metastructuring actions to explain the importance of three factors—top management championship, strategic investment rationale, and extent of coordination—in achieving higher levels of Web assimilation within an organization. Survey data are utilized to test a nomological network of relationships among these factors and the extent of organizational assimilation of Web technologies.*

**Keywords:** Web technology, Web implementation, IT management, innovation assimilation, structuring actions, metastructuring actions

**ISRL Categories:** UF, AI 0104, DA, GA

### Introduction

The potential of Web technologies to transform business models, organizational structures and

<sup>1</sup>Ilze Zigurs was the accepting senior editor for this paper.

processes, and the ecosystem of inter-firm relationships with customers, suppliers, and other business partners is now universally acknowledged (Burdick 2000; Chatterjee and Segars 2001; Roberts 1999). E-commerce, or the application of Web technologies for understanding customer needs, marketing products, services, and product-market solutions, and taking customer orders, has emerged as a significant imperative in contemporary firms. As exemplars of success, firms such as Cisco, Charles Schwab, General Electric, USAA, and Cemex have sensitized incumbent firms to the strategic value and the competitive necessity of assimilating Web technologies in their salient business strategies and value chain activities.

However, not all firms have been uniformly successful in assimilating Web technologies for shaping their e-commerce initiatives (Brews 2000; Haley et al. 1996). Web technologies are complex and offer a variety of functionalities ranging from the static presentation of content to the dynamic capture of transactions with provisions for security and personalization (Chatterjee and Sambamurthy 1999; Cronin 1996). Therefore, firms must make sense of these technologies and decide how to draw upon their functionalities for developing e-commerce initiatives. These initiatives could range from static product catalogs to active, dynamic, and interactive solution development and virtual community networking and marketing. The assimilation of Web technologies requires a deep understanding of technology capabilities; such in-depth understanding is critical to identifying novel Web-enabled marketing and customer relationship management practices.

Further, the effective assimilation of Web technologies requires their integration into existing organizational work processes and this might necessitate changes to current technologies and work processes (Chatterjee and Segars 2001; Keen and McDonald 2000). Actions by senior management or technology champions to unfreeze the prevailing institutional structures, introduce complementary structures to facilitate technology use, and reinforce norms that value the use of the technology are all likely to

encourage the use of the technology (Kwon and Zmud 1987). However, not many firms succeed in orchestrating the co-evolutionary changes to their technologies-in-use, organizational structures, processes, and incentive and reward systems to successfully assimilate Web technologies into their e-commerce initiatives.

Therefore, concerted institutional efforts are required to blend technology, marketing, and business strategy knowledge and mutually adapt the organizational processes and technology features in shaping e-commerce initiatives. Given a wide range of experiences with the assimilation of Web technologies, there is a need to discover how firms can institutionally encourage the managerial activities that will result in greater levels of technology assimilation. Our research is motivated by the goal of examining what organizational factors influence the assimilation of Web technologies for e-commerce initiatives in firms. Adopting the firm as the unit of analysis, we examine the impacts of specific institutional factors on the extent of assimilation of Web technologies into e-commerce strategies and activities in firms. The next section describes the theoretical foundations and develops the study's research hypotheses. Then, the methodology and results are described. Finally, the article concludes with a discussion of the study's limitations and future research implications.

## Theoretical Development

### Perspectives on Assimilation

Assimilation is defined as the extent to which the use of a technology diffuses across organizational work processes and becomes routinized in the activities associated with those processes (Cooper and Zmud 1990; Fichman and Kemerer 1997; Tornatzky and Klein 1982). Assimilation is an important construct in the causal chain of influence from the organizational adoption of an information technology to the evidence of its impacts on business performance (DeLone and McLean 1992; Jarvenpaa and Ives 1991;

Mahmood and Soon 1991; Sethi and King 1994). Our phenomenon of interest is the extent to which Web technologies are incorporated into e-commerce strategies and activities aimed at marketing, advertising, and selling products and services to customers.

Theories of technology assimilation suggest that most information technologies exhibit an "assimilation gap"—i.e., their rates of organizational assimilation and use lag far behind their rates of organizational adoption (Fichman and Kemerer 1999). Therefore, lessons learned about the assimilation of prior information technologies, such as CASE, object-oriented development, and relational databases, could be extended toward understanding how firms promote the assimilation of Web technologies. However, the assimilation of Web technologies is more challenging in contrast with other information technologies because of differences in the dynamics of their organizational assimilation.

Swanson's (1994) taxonomy of IS innovations suggests that information technologies undergo three distinct pathways of organizational adoption and use. He describes Type I innovations as process innovations within the IS function, where information technologies are assimilated to enhance the efficiency or effectiveness of the IS function. For example, firms have invested in CASE, relational database, and object-oriented technologies to enhance the effectiveness of the IS function in systems delivery. Type II innovations refer to the use of IS products and services for enhancing the administrative work processes of firms. The assimilation of office productivity, groupware, or decision support tools in specific organizational tasks is an instance of Type II innovations. Finally, Swanson describes Type III innovations as information technologies that have strategic relevance for firms because their integration into the core business processes or strategies could directly impact financial performance. The introduction of MRP systems, airline reservation systems, and computer integrated manufacturing solutions are examples of such Type III innovations. Consistent with Swanson's taxonomy, the assimilation of Web technologies

for e-commerce initiatives is a Type III innovation, where the focus is upon the integration of Web technologies in customer-facing strategies and activities.

Prior IS research has sought to examine antecedents of the assimilation of Type I IS innovations (for example, Purvis et al. 2001) and Type II IS innovations (for example, Agarwal and Karahanna 2000; Taylor and Todd 1995). In contrast, limited attention has been devoted toward the assimilation of Type III IS innovations. We conjecture that there are two distinct reasons why the assimilation of Type III innovations such as Web technologies deserves investigation. First, each one of the types of IS innovation operates at a different unit of analysis: whereas Type I innovations occur within the IS function, Type II innovations are exhibited at the individual user or work group level. In contrast, Type III innovations occur at the organizational level of analysis because they reflect firm-wide actions in integrating the information technology into strategies, activities, and processes.

Second, the assimilation of Type III innovations requires the mobilization of attention and coordination of actions across a wider group of stakeholders than is the case for Type I or Type II innovations. With Type I innovations, the key stakeholders are mostly the members of the IS function. With Type II innovations, the key stakeholders are members of a work group or department. The assimilation of Type III innovations, such as Web technologies for e-commerce activities, appears to be guided by a distributed leadership model (Agarwal and Sambamurthy 2002; Cronin 1996). Senior management, business executives, and IS executives are collectively responsible for shaping e-commerce initiatives. The needed intensity of interactions and collaborations among these managers is much more severe in the case of the assimilation of Web technologies for e-commerce initiatives.

Therefore, the prevailing perspectives on technology assimilation have two implications for our research. First, consistent with the perspective of Type III innovations as related to integration of IT

into organizational strategies and processes, we conceptualize web assimilation along two dimensions: e-commerce strategies and e-commerce activities. The strategies dimension refers to the extent of use of web technologies to enable and shape marketing and customer-oriented strategies (for example, attracting new customers). In contrast, the activities dimension refers to the use of Web technologies for specific marketing or customer-facing activities (for example, disseminating product/service information or managing online payments by customers). Together, these two dimensions reflect the extent of organizational assimilation of Web technologies in e-commerce initiatives. Higher assimilation of Web technologies refers to greater use of these technologies in e-commerce strategies and activities.

Second, consistent with Purvis et al., we propose that the organizational assimilation of Type III innovations such as Web technologies is a cumulative consequence of the actions of managers and departments across the enterprise. Higher levels of organizational assimilation will be achieved when a larger proportion of the individual assimilation initiatives are targeted at the enterprise business strategies and value chain activities. Therefore, organizations can foster higher levels of technology assimilation by shaping, influencing, and motivating individual managerial attention, cognition, and behaviors toward more assimilation initiatives across the enterprise (Van de Ven 1986). Whereas assimilation itself is the cumulative result of actions by individuals and units within the firm, these actions are stimulated by an organizational milieu of norms, values, and rules.

### **Structuration Theory of Technology Assimilation**

The structuration theory of technology assimilation provides an appropriate foundation for our investigation of how institutional or organizational factors influence individual initiatives and, thereby, the assimilation of Web technologies. The roots of this theory lie in the basic institutional theory that describes how firms act as institutions in

shaping the behaviors and cognitions of individuals within. Institutional theory (Scott 1995; see also Orlikowski 1992) identifies three ways in which the organizations influence individual cognition and behaviors:

1. Structures of signification, whereby prevailing institutional structures yield meaning and understanding. Individuals apply these structures as cognitive guides to understand how they should behave/act with respect to new technology assimilation.
2. Structures of legitimization, whereby prevailing institutional structures validate specific behaviors as being appropriate in the organization and consistent with the goals and values of the organization. Individuals draw upon these structures as normative templates to reassure themselves about the organizational legitimacy of their assimilation actions.
3. Structures of domination, whereby institutional structures regulate individual actions and behaviors. Individuals draw upon these structures to ensure that their assimilation actions do not violate institutional rules and to avoid being the target of organizational sanctions.

Orlikowski et al. (1995) argue that individuals utilize these institutional structures of signification, legitimization, and domination to make sense of the technology, garner the resources needed to infuse it into work processes, business activities, and strategies, and undertake the improvisational actions needed to assimilate the technology. These assimilation actions are referred to as structuring actions.

Orlikowski et al. also argue that senior management can manipulate the institutional structures of signification, legitimization, and domination and, thereby, influence, guide, motivate, or alter individual structuring actions. These organizational actions are called metastructuring actions



because they either reinforce the existing institutional structures or alter those structures to create conditions more conducive to technology assimilation. Examples of metastructuring actions include senior management advocacy, incentives and rewards, and explicitly articulated visions and mandates for technology use (Orlikowski et al. 1995; Purvis et al. 2001). For example, through advocacy, senior management can articulate a new organizational vision that regards information technology to be strategic. This in turn, introduces a new structure of signification whereby individuals start recognizing the strategic connections between the technology and business initiatives. Similarly, by articulating their views about the risks and benefits of an information technology, senior management can legitimize assimilation behaviors toward a new information technology. If senior management focuses attention primarily on the risks, then they are signaling their skepticism about the technology. This signal, in turn, is likely to dampen structuring actions and, thereby, lower assimilation. Finally, by mandating rules and policies about the assimilation of a technology, senior management can alter the prevailing structures of domination and either encourage or deter individual structuring actions.

Drawing upon these ideas in the structural theory of technology use, we propose that assimilation is the outcome of individual structuring actions. Further, we identify three significant metastructuring actions—top management championship, strategic investment rationale, and extent of coordination—as institutional enablers of the technology structuring actions of individuals and, thereby, the assimilation of Web technologies.<sup>2</sup> The specific institutional structures of signification, legitimization, and domination

provide the theoretical connection between the metastructuring actions and the individual structuring actions and, thereby, the extent of assimilation. Through their influence on these institutional structures, metastructuring actions are anticipated to impact the level of Web assimilation.

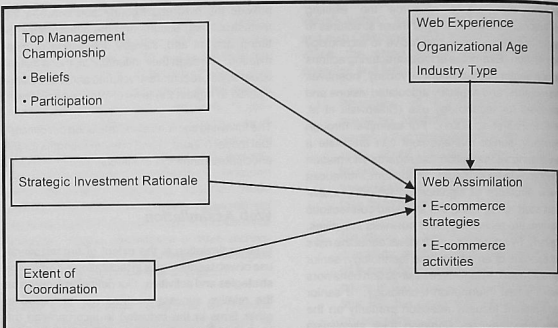
The following sections elaborate upon our conceptual model (Figure 1) and present rationale for the anticipated pathways of effects.

## Web Assimilation

Web assimilation is the extent of organizational use of web technologies in facilitating e-commerce strategies and activities. Our definition focuses on the relative success of firms (as compared to other firms in the industry) in incorporating the Web technology into its e-commerce strategies and activities. This definition is consistent with perspectives on Type III IS innovations, with earlier treatments of IT assimilation at the organizational level (Armstrong and Sambamurthy 1999), and reflects our interest in understanding firms as innovation systems for attaining differential levels of technology assimilation success (Fichman 2001). We regard the level of assimilation to be one of the visible outcomes of the stream of structuring actions across the firm. Further, we anticipate the differential level of assimilation success across firms to be linked to the nature of the institutional enablers or the metastructuring actions within those firms.

**E-commerce strategy assimilation** is a visible consequence of structuring behaviors to utilize the web technologies in strategies for attracting new customers, creating new distribution channels, and offering value-added customer services. The global reach of web technologies enables cost efficient means of reaching out to new markets, attracting new customers, and delivering products and services. As an illustration, LIGHTNING Instrumentation SA, a Swiss networking equipment manufacturer, was able to raise its sales by about 20% after establishing a Web site, all of which came from outside its domestic market (Quelch and Klein 1996). News and information services

<sup>2</sup>Readers should note that we describe structuring and metastructuring actions as theoretical concepts that undergird our research model. The model itself shows constructs that are visible manifestations of these theoretical concepts: assimilation (for structuring actions) and top management advocacy, strategic investment rationale, and extent of coordination (for metastructuring actions). This approach is consistent with Purvis et al. (2001).



**Figure 1. The Conceptual Model for this Research**

companies, such as Dow Jones Inc. and Hoover Inc., are using web technologies to deliver customized news services to their customers. Firms are also trying to differentiate themselves by utilizing the Web technologies' transactional support capabilities to provide value added customer support services. Federal Express and United Parcel Service (UPS) provide interactive customer support, whereby customers have direct access to real-time information. Customers are able to determine transit times and pricing details, place orders, make payments, and track delivery of the shipment (Radosevich 1996).

Web technologies also offer companies an opportunity to make a positive impression on their existing and future customers. Companies are seizing this opportunity to create and enhance their corporate image. For instance, automotive manufacturers such as Ford and Honda present information relating to various community-support activities on their Web site.

**E-commerce activity assimilation** describes the use of web technologies for enabling customer-

facing activities, including product or service sales, distribution, and after-sales support, and product testing, and market research (Chatterjee and Sambamurthy 1999). While e-commerce strategy provides the guiding vision for use of Web technologies, these strategies are executed through specific activities. Therefore, the assimilation of Web technologies in specific activities is another important aspect of e-commerce initiatives in firms.

### **Top Management Championship**

Drawing upon the work of Barki and Hartwick (1989) and Jarvenpaa and Ives (1991), we define top management championship in terms of managerial beliefs about Web initiatives and participation in those initiatives. Top management championship is a metastructuring action because it defines institutional norms and values regarding how managers should engage in structuring actions related to the Web technology. Through their beliefs, top management can offer visions and guidelines to managers in departments and

business units about the opportunities and risks in assimilating the Web technologies (structures of signification). In firms where top managers believe that Web technologies offer a strategic opportunity, their beliefs serve as powerful signals to the rest of the managerial community about the importance placed on web assimilation. Further, through their beliefs and participation, top management can legitimize the willingness of managers to expend their time and energy in making sense of the Web technology, exploring ways in which the technology's functionality could be leveraged into the business processes and activities, and justifying the viability of specific Web-oriented projects (i.e., structures of legitimation). When top management actively participates in shaping the vision and strategies for the use of the web technologies, their actions serve as powerful signals to the rest of the managerial community. Together, these beliefs and participation actions shape the institutional structures of signification and legitimization influence the structuring actions of individual managers, groups, and departments.

The IT literature is replete with studies that reinforce the importance of top management support for IT assimilation. Studies have demonstrated the significance of both executive beliefs (Bean et al. 1975; Meador et al. 1984) and executive participation for IT assimilation (Garrrity 1963; Lane 1985; Vanlommel and De Brabander 1975). Purvis et al. proposed and found evidence for the significant role of top management championship as a metastructuring enabler of IT assimilation. Therefore, we propose the following hypothesis:

- H1 Top management championship will positively influence extent of organizational assimilation of Web technologies in e-commerce strategies and activities.*

## **Strategic Investment Rationale for Web Projects**

Another metastructuring action is the articulation of a strategic investment rationale for Web initia-

tives. Strategic investment rationale is defined as value propositions that will guide the identification of promising organizational opportunities and justification of resource commitments toward the implementation of those projects. The strategic investment rationale provides an institutional perspective on how Web-oriented projects should be justified, funded, and legitimized. Particularly in the case of Type III IS innovations such as Web technologies, a well-developed strategic rationale not only signals the importance of applying explicit justification logic but also identifies a variety of criteria through which the projects could be justified. The existence of a well-developed strategic investment rationale provides powerful templates of signification to guide managerial attention toward different projects that could leverage the functionalities of Web technologies in business processes and strategies. Such a rationale is formulated and articulated by senior management as a means for directing the attention of the rest of the managerial community toward appropriate ways of assimilation of Web technologies in the firm. By stating explicit investment criteria, senior management can influence the prevailing structures of legitimization and domination. Studies in both the organization innovation and IT literature have found that a well-developed rationale is more likely to enable firms to assimilate technological innovations (Dougherty and Hardy 1996; Sambamurthy and Zmud 1996; Van De Ven 1986). According to Dougherty and Hardy, organizations that assign a strategic value to their innovation efforts are likely to succeed in effectively managing their innovation process (see also Dougherty and Heller 1994).

Van De Ven (1986) also emphasizes the importance of such strategic value creation in the context of building an organization culture that supports and fosters innovation efforts. Sambamurthy and Zmud (1996) found that firms succeeded in assimilating IT innovations by deliberately articulating and promulgating a rich, diverse, and explicit strategic rationale to guide their managers' sense-making actions. Therefore, we offer the following hypotheses:

- H2: A well-developed explicit strategic investment rationale will positively*

*influence extent of organizational assimilation of Web technologies in e-commerce strategies and activities.*

## Extent of Coordination

Earlier, we identified a distributed leadership model for shaping e-commerce initiatives in firms, particularly for Type III IS innovations. Since multiple managers influence e-commerce assimilation and they are likely to possess varying interpretations about the role and value of Web technologies, firms must shape consensus around applications or projects that will focus Web deployments on strategic drivers and priorities. Coordination theory suggests that managerial judgments and actions across the enterprise can be linked through the use of a variety of coordination mechanisms, ranging from standard operating procedures, liaison roles, and task forces to oversight teams (Galbraith 1974; Mohrman 1993). Each one of these mechanisms has its unique strengths, and frequently an organization is found to use a combination of formal and informal integrative mechanisms to manage its work activities (Galbraith 1974; Tushman and Nadler 1978; Van De Ven et al. 1976). We consider the implementation and use of these coordination mechanisms to be meta-structuring actions because their use promotes values of collaboration, sharing of risks, and partnering (Brown and Sambamurthy 2001; Henderson 1990). Grant (1996) argues that these mechanisms are vital to the sharing and integration of distributed knowledge and cognition across firms. Such knowledge integration is a distinct organizational capability underlying the differential success enjoyed by firms in technology assimilation. Particularly in the context of Web assimilation, coordination is required to blend business and IT knowledge as well as the knowledge resident in different functional units of the firm. Without such knowledge integration, firms are unlikely to attain differential success in technology assimilation. Studies of IT assimilation point to the significant role of business and IT knowledge integration and partnerships between

managers across the firm (Armstrong and Sambamurthy 1999; Boynton et al. 1994; Nelson and Coopridge 1996).

We anticipate the assimilation of Web technologies to be influenced by use of coordination mechanisms. For instance, the use of a liaison department to coordinate Web implementation activities across organizational sub-units has proven to be effective in Sony Inc. More specifically, the Sony Technologies Division is responsible for providing Web-related infrastructure services—like maintenance of servers, updating of Web contents, etc.—to the individual product divisions (Cronin 1996). According to Marken (1995, p. 36), "for a Web site to be a strategic and tactical tool, the organization needs to establish a Web team and not just a Webmaster. The team needs to involve IS (information services), marketing, engineering, advertising, public relations, and customer service." This team-based approach to managing the innovation process also finds theoretical support in the literature. Van De Ven (1986) suggests that the best way of managing complexity associated with the innovation process is to create synergy by involving the best-qualified people to perform certain specific tasks and then to integrate their activities to establish a certain redundancy. Clark and Wheelwright (1996) found that the use of certain types of team structures predominated when it came to facilitating new process and product development activities.

Finally, in reference to our theoretical view of the use of coordination mechanisms as meta-structuring actions, the implementation of coordination mechanisms alters the structures of significance by allowing for greater coupling of marketing and business knowledge. These coordination mechanisms allow managers to develop integrative knowledge necessary for undertaking structuring actions aimed at assimilating the Web technologies in e-commerce strategies and activities. Further, the implementation of these coordination mechanisms legitimizes collaboration and sharing of knowledge and perspectives among executives with marketing, customer, and technology knowledge (i.e., structures of legiti-

mization). As a consequence, these altered structures influence assimilation actions of individual managers. Collectively, we hypothesize that:

- H3: Extent of use of coordination mechanisms will positively influence extent of organizational assimilation of Web technologies in e-commerce strategies and activities.*

## Control Variables

Beyond the constructs depicted in our research model in Figure 1, other contextual factors could also influence organizational IT assimilation. Among the salient ones are organizational age, industry type, and the extent of experience in using Web technologies (Web experience). Organizational age could have a negative impact on web assimilation because older firms have entrenched structures of signification, legitimization, and domination. Metastructuring actions to promote cognitions, norms, and rules that promote web assimilation might be less effective because of the structural inertia associated with organizational age. Older organizations are likely to favor status quo (DiMaggio and Powell 1983; Hannan and Freeman 1984). Therefore, a negative relationship is expected between the age of the organization and Web assimilation.

Industry type represents another important control variable affecting the level of Web assimilation. Although Web technologies provide opportunities to conduct many of the traditional physical value chain activities in cyberspace, the extent of substitution potential differs between manufacturing and service-oriented industries (Rayport and Sviokla 1995). For instance, while the manufacturer of a physical product such as an automobile or apparel can conduct only certain value chain activities (like marketing, customer support services, and recruiting) over the Web, a financial services firm is able to conduct a more extensive set of activities that include marketing, sales, order processing, delivery, customer support services, and recruiting. Thus, service-oriented firms seem to be at an advantage when it comes to making extensive use of this new business platform.

Finally, Web experience (i.e., extent of experience in using the Web technology) represents another influence on web assimilation. The assimilation of web technologies is influenced by cumulative organizational learning and experience (Fichman 2001). Firms that have maintained a web presence for a prolonged period of time are likely to have gained the experience and insight about how to effectively use this new technological platform. In other words, the greater the time since Web adoption, the greater the likelihood of achieving a high level of maturity in using the technology. The importance of prior experience with IT is well documented in the literature (Karimi et al. 1996; Weill and Olson 1989). Therefore, extent of web experience is likely to be positively associated with web assimilation.

## Research Design

We adopted a field survey methodology for our study. The unit of analysis is the firm with the assimilation of Web into e-commerce strategies and activities being the phenomenon of inquiry. The sampling frame comprises all the corporate Web sites listed in the Hoover Inc.'s On-Line Directory of Corporate Web Sites ([www.hoovers.com](http://www.hoovers.com)). This particular database was selected because it provided links to over 2,000 corporate Web sites across 50 or more industries and because it has clearly defined selection criteria—all U.S. public companies and all U.S. private companies with sales over \$500 million—for listing the company Web sites. Firms in both the manufacturing and the services sectors were represented in our sample. From this database, we excluded companies that are in the business of developing information technologies: manufacturers of computer hardware, computer software, and telecommunications equipment. This was done since the purpose of the study is to understand and to explain the variance in web assimilation among organizations that are primarily IT users and not providers. As a net result, about 525 companies formed the sampling frame for the study.

**Table 1. Summary Of Data Collection Methods And Data Sources**

Research Variables	Data Collection Method	Data Source
Web Assimilation – E-Commerce Activities	Questionnaire B	IS Executive
Web Assimilation – E-Commerce Strategies		Senior Business Executive
Top Management Championship	Questionnaire A	Senior Business Executive
Strategic Investment Rationale	Questionnaire A	Senior Business Executive
Extent of Coordination	Questionnaire A	Senior Business Executive
Organizational Age	Questionnaire A	Senior Business Executive
Industry Type		Hoover's Company Profile
Web Experience	Questionnaire B	IS Executive

**Note:** Two separate questionnaires were designed: Questionnaire A was designed to gather data from a senior business executive, while Questionnaire B was designed to elicit responses from an IS executive. In each firm, these two executives were identified as being closely allied with the firms' Web use efforts.

As illustrated in Table 1, two different respondents were tapped at each firm. One of the questionnaires was designed to gather data from a senior business executive, whereas the other questionnaire solicited responses from an IS executive. In each firm, these two executives were identified as being closely allied with the firms' Web use efforts. Table 1 shows how we used the two respondents to gather data about the specific constructs in our research model. Most of the data was collected during the five-month period from January 1997 to May 1997.

Prior to the study, knowledgeable academics and practitioners reviewed the questionnaires. We used these reviews to ensure that our items unambiguously captured the appropriate constructs in our research model. The instruments were also pilot-tested to ensure that the questions were being properly interpreted and that the survey format was in order. HTML versions of the questionnaires were also developed to give potential respondents the option of responding electronically. Incidentally, 85% of the responses were

received electronically. The overall response rate was about 14%, with a total of 75 pairs of responses being available for our analyses. However, because of missing values, only 62 pairs of responses were used for analyses.

Tables 2 and 3 show the types of businesses represented in the sample and the respondent demographics. Of the firms in the sample, 88% were publicly held companies. The average sales of the sampled firms were about \$3.3 billion and the average number of employees was 21,235. Most of these firms have been in business for more than 15 years. In other words, this sample comprises relatively large organizations that have been in business for quite some time. As shown in Table 3, the titles borne by the respondents varied from company to company. While Director and Vice President were the most common titles for the Questionnaire A respondents, Webmaster was the most common title for the respondents to Questionnaire B. Collectively, these respondents can be viewed as being appropriate sources of data on the constructs of interest in this study.

**Table 2. Types Of Participating Firms**

<b>Manufacturing Firms</b>		<b>N</b>
Apparel		5
Automotive		5
Beverage		2
Furniture		2
<b>Service-Oriented Firms</b>		
Banks		7
Financial services		6
Hotels		1
Publishing		15
Retail		6
Transportation services (both air and ground)		13

**Table 3. Respondent Demographics**

<b>Questionnaire Type</b>	<b>Respondent Title</b>	<b>Percentage</b>
<b>A</b>	Director	27
	Vice President	23
	Marketing Manager	17
	Chief Executive Officer	10
	Corporate Communications Manager	13
	Others	10
<b>B</b>	Webmaster	41
	Internet Manager	21
	IS Manager	20
	Others	18

### **Construct Operationalization**

**Web Assimilation.** E-commerce activity assimilation was measured by asking respondents to rate the relative success of their firm (relative to its rivals) in using Web technologies for different e-commerce activities. These activities included the creation of a demand for a product/service to its sales, delivery, and after-sales support. Other activities included product testing, market

research, and recruiting of personnel. In all, seven items were used to operationalize this construct (see the Appendix). E-commerce strategy assimilation was measured through five items to capture the extent to which companies were using Web technologies in shaping specific strategies (Appendix). These operationalizations are consistent with those used by other researchers (Armstrong and Sambamurthy 1999; Boynton et al. 1994; Sethi and King 1994). Both

scales were found to be highly reliable (Cronbach's Alpha = 0.80 for the strategy assimilation and .79 for activity assimilation).

**Top Management Championship** was evaluated along the dimensions of executive beliefs and participation (Barki and Hartwick 1989; Jarvenpaa and Ives 1991). Top management beliefs were measured by asking respondents to rate the extent to which they believed in the potential of the Web to realize operational and strategic benefits. Considering that security and consumer access issues are likely to impede the effectiveness of Web usage, top management were also asked about their beliefs regarding these issues. A four-item scale was used to tap executive beliefs about the potential usefulness of the Web (Appendix). Executive participation was operationalized by asking respondents to rate the extent to which senior management actively participated in the management of Web initiatives. The practitioner literature suggests that senior management must be actively involved in Web planning-related activities—ranging from envisioning potential Web usage to formulating plans and strategies to translating such visions into reality. They should also set standards and goals to monitor Web projects (Engler 1997; LaPlante 1997). Therefore, participation was operationalized by asking the respondents to rate on a five point Likert scale the extent to which the senior management of the firm actively participated in the following planning and monitoring activities: (1) articulating a vision for the organizational use of the web technologies, (2) formulating a strategy for the organizational use of the web technologies, and (3) establishing goals and standards to monitor web projects. Both scales were found to be highly reliable (Cronbach's Alpha = .93 for participation and .80 for beliefs). Taken together, we view executive beliefs and participation as reflective indicators of top management championship because the existence of favorable beliefs and high levels of participation together are indicative of high levels of championship.

**Strategic Investment Rationale** was measured by identifying a variety of economic and non-economic indicators for justifying IT investments (Sambamurthy and Zmud 1996). Sambamurthy

and Zmud found project champions of innovative IT applications selling their projects by linking them to specific strategic drivers like customer response time and reputation management. Other studies in both the organization innovation and IT literature have found that those organizations, which are driven by strategic rationale to invest in innovations, are likely to be more successful in exploiting them (Dougherty and Hardy 1996; Van De Ven 1986). Therefore, respondents were asked to rate the importance placed on each criterion for justifying web-related projects (refer to the Appendix). Consistent with our conceptualization, this construct was viewed as a formative construct.

**Extent of Coordination** was measured in terms of the use of different types of coordination mechanisms to manage Web initiatives. As discussed earlier, these mechanisms can take the form of processes, roles, or structural arrangements to manage the Web initiatives. For instance, designating an organizational member to assume the role of Webmaster—and being responsible for coordinating the cross-functional development of business applications—is an example of a formal role-based mechanism for coordinating Web efforts. Organizations can also establish a formal group such as a steering committee to monitor web-related activities. Moreover, to facilitate monitoring efforts, goals, plans and procedures might also be set by the senior executives of the organization. In addition to formal structural arrangements such as teams, informal linking roles, like those of change agents, can be effective in securing organization-wide support and cooperation in the diffusion of innovation (Rogers 1983). Brown and Sambamurthy (2001) found that higher levels of coordination are related to the use of many coordination mechanisms in conjunction with each other. Further, individual mechanisms possess strengths and weaknesses in facilitating knowledge integration; therefore, the use of a variety of mechanisms together is reflective of higher levels of coordination.

Respondents were presented with descriptions of the different types of formal and informal coordination mechanisms and asked to rate the



extent to which each one of these types was used to manage Web initiatives (Appendix). The scale exhibited good reliability (Cronbach's Alpha of 0.74).

**Control Variables.** Organizational age was measured by asking the respondent to indicate the number of years the firm had been in business (Appendix). A five-point scale (0—0 to 5 years; 1—6 to 10 years; 2—11 to 15 years; 3—more than 15 years) was used for the measures. Industry type was coded as a dummy variable by identifying the nature of a firm's business (manufacturing or service) and then coding it as 0 for manufacturing and 1 for service. This information was gathered from Hoover's On-line Directory of Corporate Web sites ([www.hoovers.com](http://www.hoovers.com)). Finally, Web experience was measured by asking respondents to indicate the length of time the company web site has been on the Internet (refer to the Appendix). A five-point scale (0—6 months; 7—12 months; 1—2 years; 2—3 years; more than 3 years) was used.

## Data Analysis and Results

We used the two-step approach recommended by Anderson and Gerbing (1988) to first assess the quality of our measures and then test the hypotheses. Since the sample size is small compared to the scholarly recommendation to use a 10:1 ratio of sample-size to number of parameters estimated, we estimated a separate confirmatory factor analytic model for each latent construct (Bollen 1989; Nunnally and Bernstein 1994). Discriminant validity was assessed through confirmatory factor analytic models with every pair of latent constructs (Anderson and Gerbing 1988).

In order to maintain the recommended bounds for the ratio of sample size to number of parameters estimated, we estimated four confirmatory analysis models (the scales that had three items were estimated with other scales to obtain the required error degrees of freedom): (1) web assimilation—e-commerce activities, (2) web assimilation—e-commerce strategies and strategic investment

rationale, (3) top management beliefs and participation, and (4) extent of coordination. Low factor loadings, high standardized residuals, and high modification indices were used for measure purification (Kline 1998). Table 4 summarizes the results from the four measurement models. For the items retained in the model, the factor loadings were in the acceptable range (Nunnally and Bernstein 1994) and the goodness of fit indicators showed reasonable fit (Hair et al. 1995). The goodness of fit index, the normed fit index, comparative fit index, and the incremental fit index all show acceptable level of fitness for our measurement models. We carried out tests to verify whether the root mean square error of approximation (RMSEA) values for our measurement models were statistically equal to or less than 0.05 as evidence of good model fit (Hair et al. 1995). As illustrated in Table 4, our results do not reject this null hypothesis concerning the RMSEA. Overall, we are satisfied that our measures exhibit acceptable levels of internal consistency.

Table 5 represents the means and standard deviations of the different constructs. To establish discriminant validity for the six constructs, we estimated 15 ( $^6C_2$ ) confirmatory factor analytic models with two constructs in each model. None of the 15  $\phi$ 's was statistically equal to 1, thereby suggesting discriminant validity among the constructs (Anderson and Gerbing 1988). To assess non-response bias, we compared early respondents with late respondents for all constructs, including the control variables (Armstrong and Overton 1977). None of the t-statistics was statistically significant ( $p > 0.10$ , two-tail tests), thereby suggesting that non-response bias may not exist.

## Hypothesis Testing

As we have both formative (e.g., strategic investment rationale) and reflective (e.g., top management beliefs) indicators for constructs in the model, we used Partial Least Squares (PLS) (Sambamurthy and Chin 1994). PLS is also recommended for small sample size models, like ours. Figure 2 presents the estimates obtained from PLS. The  $R^2$  value of 0.54 ( $p < 0.01$ ) demon-

**Table 4. Measurement Models: Confirmatory Factor Analysis**

Measurement Model	Range of Standardized Factor Loadings	GFI	NFI	CFI	IFI	RMSEA <sup>a</sup>	$\chi^2$ (d.f., p-val)
Web Assimilation—E-Commerce Activities	0.45-0.75	0.94	0.89	0.97	0.97	0.07 (p > 0.32)	$\chi^2_{(9, p = 0.22)} = 11.86$
Web Assimilation—E-Commerce Strategies and Strategic Investment Rationale	0.62-0.82	0.90	0.83	0.92	0.92	0.11 (p > 0.10)	$\chi^2_{(13, p = 0.04)} = 22.65$
Top Management Beliefs and Top Management Participation	0.42-0.99	0.96	0.97	0.99	0.99	0.01 (p > 0.84)	$\chi^2_{(13, p = 0.76)} = 9.11$
Extent of Coordination	0.58-0.71	0.97	0.94	0.99	0.99	0.01 (p > 0.59)	$\chi^2_{(5, p = 0.51)} = 4.29$

GFI—Goodness of Fit Index; NFI—Normed Fit Index; CFI—Comparative Fit Index; IFI—Incremental Fit Index; RMSEA—Root Mean Square Error of Approximation.

<sup>a</sup>We report p-values for the null hypotheses of  $RMSEA \leq .05$  in parentheses. For our data, all RMSEA values are statistically equal to 0.05 at 10% significance level.

strates that the model explains a good amount of variance in Web assimilation. We find support for H1, wherein we expected top management championship to positively affect Web assimilations ( $b = 0.394, p < 0.01$ ). As evident from the loadings for top management beliefs and participation (Figure 2), both dimensions of top management championship were significant in the relationship. H2 is also supported such that a well-developed strategic investment rationale leads to greater assimilation of the web ( $b = 0.176, p < 0.10$ ). Interestingly, of the three indicators for this formative construct, the cost savings focus was the dominant indicator (weight = .97,  $p < .01$ ) and the new opportunities focus was moderately important (weight = .40,  $p < .10$ ) (Figure 2). However, the third indicator, ROI, was not significant. This implies that the assimilation levels were primarily influenced by a well-

developed rationale that emphasized cost savings from Web technologies.

Finally, we find support for H3 where we hypothesized that extent of coordination would positively impact Web assimilation ( $b = 0.270, p < 0.01$ ). Examining the loadings for the indicators in Figure 2, it is evident that all of the indicators are significant. Thus, we find support for all our hypotheses.

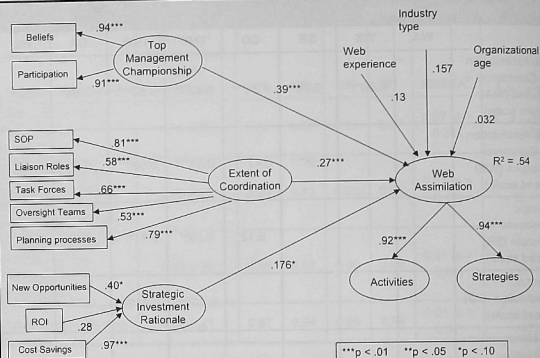
## Discussion

Although Web technologies possess a variety of functionalities for understanding customer needs, marketing products, services, and product-market solutions, and taking customer orders, not many

Table 5. Descriptive Statistics

	WA	WS	SR	CO	TMP	TMB	OA	WE
Web Assimilation – E-Commerce Activities (WA) (9 point scale)	--	0.60***	0.20	0.34***	0.42***	0.53***	-0.04	0.21
Web Assimilation – E-Commerce Strategies (WS) (9 point scale)			0.38***	0.47***	0.53***	0.58***	-0.20	0.29**
Strategic Investment Rationale (SR) (5 point scale)				0.12	0.29**	0.31***	-0.11	0.43***
Extent of Coordination (CO) (5 point scale)					0.30***	0.41***	0.07	0.04
Top Management Participation (TMP) (5 point scale)						0.72***	-0.15	0.17*
Top Management Beliefs (TMB) (5 point scale)							-0.28**	0.29***
Organization Age (OA) (4 point scale)								0.01
Web Experience (WE) (5 point scale)								--
N	62	62	62	62	62	62	62	62
Minimum	0.33	1.25	0.00	0.00	0.00	0.50	0.00	0.00
Maximum	8.35	9.00	3.66	3.40	4.00	4.00	3.00	4.00
Mean	3.56	5.97	1.94	2.00	2.31	2.51	2.72	2.08
Standard Deviation	1.86	1.86	0.83	0.76	1.11	0.78	0.75	1.08

\*p &lt; .10; \*\*p &lt; .05; \*\*\*p &lt; .01; two-tail tests.



**Figure 2. The Results**

firms have succeeded in fully leveraging these functionalities in their e-commerce activities. Drawing upon Swanson's (1994) typology of IS innovations, we have argued that the assimilation of Web technologies in shaping e-commerce activities is an instance of Type III innovations. In such innovations, the assimilation goal lies in integrating information technologies within key organizational processes and activities. One of the primary organizational challenges in realizing these goals includes the mobilization of enterprise-wide attention and action toward the use of Web technologies in different customer-facing e-commerce activities. Our research seeks to examine what factors are likely to facilitate higher levels of assimilation of Web technologies in shaping e-commerce activities in firms.

We adopted an institutional perspective to develop our research model where assimilation is the cumulative result of myriads of structuring actions by individuals and units throughout the

enterprise. The structural theory of technology assimilation argues that firms can influence these structuring actions and enhance assimilation through meta-structuring actions and structures. Drawing upon prior theory and research, we examined the impacts of three organizational factors upon the level of organizational assimilation of Web technologies in shaping e-commerce activities: top management championship, strategic investment rationale, and the extent of coordination. The results of our study suggest that each one of these three factors is important for nurturing high levels of assimilation. Before discussing the implications of our research, a brief consideration of its limitations is appropriate.

First, the relatively small sample size is one limitation of this study. Given that we succeeded in obtaining complete data only from 62 firms, questions might be raised about the generalizability of the findings. However, our ability to capture data from multiple respondents should be

viewed as compensating for the limited sample size. A second limitation of our study is its cross-sectional design. As a result, we are able to only test associations between constructs and not their causal relationships. Another limitation of the study is that it focused on examining specific institutional enablers. There could be other contextual factors influencing Web assimilation (Grover 1993; Kwon and Zmud 1987; Meyer and Goes 1988). Future research could expand upon our findings by examining the influence of these alternative factors.

Notwithstanding these limitations, we believe that our study makes significant contributions to research and practice. First, although prior research has examined the factors impacting the assimilation of Type I or Type II innovations, there has been a paucity of research on the assimilation of Type III innovations. Prior research has demonstrated the significance of top management championship for Type I or Type II IS innovations (e.g., Lewis et al. 2002; Purvis et al. 2001). Our research suggests that top management championship continues to be important in encouraging the assimilation of Type III innovations such as Web technologies. However, two other factors that have not been examined in prior research have been found to be significant antecedents: strategic investment rationale and the extent of coordination.

Our research suggests that the use of a strategic investment rationale has a significant influence on the level of assimilation of Web technologies in e-commerce activities. As we argued, a strategic investment rationale provides powerful templates for individual managers or units to apply as they attempt to make sense of how the functionalities of Web technologies could be used in the firm. We found an emphasis on the use of the Web for cost savings in activities such like marketing, taking customer orders, and understanding customer needs. Interestingly, an ROI rationale did not prove to be significant. We would expect an ROI rationale to direct managerial attention toward quantification of benefits for any proposed application of the technology. When dealing with a complex technology and encountering ambiguity

about its potential benefits, an ROI rationale might be less appropriate and desirable compared to an emphasis on cost savings or new opportunities (Sambamurthy and Zmud 1996).

Further, our research found that higher levels of coordination are significant in promoting the assimilation of Web technologies in e-commerce activities. We argued that the requisite expertise and authority for higher levels of assimilation of Web technologies in e-commerce strategies is distributed across firms. Coordination mechanisms are needed to blend the expertise of multiple executives from different departments and locations across the enterprise. However, individual coordination mechanisms have merits and weaknesses in facilitating the blending of expertise (Brown and Sambamurthy 2001). Therefore, the use of a portfolio of coordination mechanisms would be beneficial for promoting assimilation. Our results testify to the importance of using roles (e.g., liaison roles), groups (e.g., task forces and oversight teams), and processes (standard operating procedures and planning) together as portfolios in enhancing assimilation.

Overall, these findings tend to emphasize the importance of a planned and coordinated approach toward assimilation of Web technologies in e-commerce activities and strategies.

### ***Contributions to Practice***

Our findings also have important implications for managers involved in efforts to introduce complex technologies—such as Web technologies—into their firms. They reinforce the importance of institutional factors such as top management advocacy, strategic investment rationale, and extent of coordination on the heightened levels of technology assimilation. These findings testify to the collective responsibility of senior management, business executives, and IS executives in heightening their firms' technology assimilation success. While numerous advocates have prescribed such a collective responsibility as a normative guideline, our research provides empirical support for this prescription. Beyond senior management

advocacy, we also demonstrate the importance of articulating an explicit investment rationale and implementing coordination mechanisms to facilitate the assimilation of Web technologies.

## Future Research Implications

This research sets the stage for future research in understanding the assimilation of Web technology. Since this study was conducted during the early stages of Web diffusion, it would be interesting to reexamine the hypothesized relationships at different points in time to see whether there are any changes in the nature of the relationships. Thus, using a longitudinal design to examine the relationships among the identified research variables might be a useful extension to the current study. Considering the logistical difficulties of collecting longitudinal data from senior business executives, a more feasible strategy would be to focus on a few companies and to gather data over a period of time. Such data could be collected through personal interviews and case analyses. Further, to control for industry effects, it would be advisable to focus the study on a specific industry.

Other potential extensions of this study would include examining the effects of other contextual factors on the assimilation of Web technologies. As mentioned earlier, apart from organization-specific factors, there are other contextual factors (such as technological, user, and industry characteristics) that could influence the extent of assimilation of Web technologies.

## Conclusion

As more contemporary firms seek to transform their value chain activities and business strategies through the assimilation of Web technologies, there is a desire to understand what factors are likely to promote heightened levels of technology assimilation. Drawing upon the institutional theory perspectives, this research examines the significance of senior management advocacy, strategic investment rationale, and extent of coordination in

promoting greater assimilation. As one of the earliest studies to examine the factors contributing to the assimilation of Web technologies, this study serves to provide timely knowledge to researchers and practitioners interested in learning how firms can facilitate more effective transformations to the Web-enabled business environments. We hope that our theoretical perspective and findings will stimulate and encourage more research into this important phenomenon.

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# Appendix

## Variable Measurement Scales

### Web Assimilation (Dependent Variable)—E-Commerce Activities Dimension

More and more companies are setting up their Web sites on the Internet to conduct business activities with their external stakeholders like customers, suppliers, and stockholders. Through these Web based business initiatives, companies are also able to support and shape their business strategies. Questions 1 and 2 are designed to tap into such organizational uses of the WWW.

Please indicate how extensively your corporate Web site ([http://\\_\\_\\_\\_\\_](http://_____)) is being used for the following business activities:

	Not Applicable	Significantly below industry average			Above industry average			Significantly above industry average		
*a. Publishing company specific facts/figures	0	1	2	3	4	5	6	7	8	9
b. Disseminating product/service information	0	1	2	3	4	5	6	7	8	9
c. Receiving payments from customers	0	1	2	3	4	5	6	7	8	9
d. Delivering products/services to customers	0	1	2	3	4	5	6	7	8	9
e. Providing customer service support	0	1	2	3	4	5	6	7	8	9
f. Testing products/services	0	1	2	3	4	5	6	7	8	9
g. Conducting marketing surveys	0	1	2	3	4	5	6	7	8	9

\*Items deleted after confirmatory factor analysis

**Web Assimilation (Dependent Variable)—E-Commerce Strategies Dimension**

2. Please indicate how extensively your corporate Web site (<http://>) is being used to support each of the following business strategies:

	Not Applicable	Significantly below industry average			Above industry average			Significantly above industry average		
a. Enhancing company image	0	1	2	3	4	5	6	7	8	9
b. Attracting new customers	0	1	2	3	4	5	6	7	8	9
c. Offering value-added customer services	0	1	2	3	4	5	6	7	8	9
d. Creating a new advertising channel	0	1	2	3	4	5	6	7	8	9
*e. Creating a new distribution channel	0	1	2	3	4	5	6	7	8	9

\*Items deleted after confirmatory factor analysis.

**Top Management Championship (Independent Variable)—Participation Dimension**

3. Please indicate the extent to which the senior management of your firm actively participates in:

a. articulating a vision for the organizational use of the WWW	None	Little	Some	Great Extent	Very Great Extent
b. formulating a strategy for the organizational use of the WWW	None	Little	Some	Great Extent	Very Great Extent
c. establishing goals and standards to monitor Web projects	None	Little	Some	Great Extent	Very Great Extent

**Top Management Championship (Independent Variable)—Beliefs Dimension**

4. Please indicate the extent to which the senior management of your firm believes in the following:

a. The WWW has the potential of providing significant business benefits to the firm	None	Little	Some	Great	Very Great
b. The WWW will create a significant competitive arena for firms	None	Little	Some	Great	Very Great
c. The WWW is not a very secure medium to conduct business activities	None	Little	Some	Great	Very Great
d. The WWW is not easily accessible to the existing and potential customers of firm	None	Little	Some	Great	Very Great

**Strategic Investment Rationale (Independent Variable)**

How are web related expenses justified in your organization? Please indicate the extent of importance placed on the following in justifying web related expenses in your organization.

a. meeting return on investment (ROI) criteria	None	Little	Some	Great	Very Great
b. new business opportunities rationale	None	Little	Some	Great	Very Great
c. realizing cost savings	None	Little	Some	Great	Very Great

**Extent of Coordination (Independent Variable)**

Organizations often use a variety of coordination mechanisms to manage key business initiatives. Some examples of such mechanisms are task forces, planning processes, etc.

Please indicate the extent to which existing coordination mechanisms of the following types are used to manage the Web initiative:

a. <b>Standard Operating Procedures</b> (e.g., goals, policies, and plans)	None	Little	Some	Great Extent	Very Great Extent
b. <b>Liaison Roles</b> (e.g., Web page managers)	None	Little	Some	Great Extent	Very Great Extent
c. <b>Task Forces</b>	None	Little	Some	Great Extent	Very Great Extent
d. <b>Oversight Teams</b> (e.g., Business advisory council)	None	Little	Some	Great Extent	Very Great Extent
e. <b>Planning Processes</b>	None	Little	Some	Great Extent	Very Great Extent

**Organizational Age (Control Variable)**

Please indicate for how long has your company been in business:

0-5 years      6-10 years      11-15 years      more than 15 years

**Web Experience (Control Variable)**

Please indicate for how long have you had the company Web site on the Internet.

0-6 months      7-12 months      1-2 years      2-3 years      more than 3 years

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