Information Systems Orientation and Business Use of the Internet: An Empirical Study

Thompson S.H. Teo and Bee Lian Too

ABSTRACT: A research model based on the concept of a strategic grid was developed to examine the relationship between the role of information systems (IS) and organizational use of the Internet to achieve business competitiveness. A survey questionnaire was sent to 650 companies in Singapore, and 225 usable responses were obtained. The results indicated that firms with a more strategic view of IS make the most use of the Internet to achieve business competitiveness (in terms of the customer-to-business, intrabusiness, and business-to-business dimensions). In particular, achieving market responsiveness (construct within the customer-to-business dimension) was the most significant differentiating variable in the extent of Internet usage among organizations in which IS plays different roles. Although other performance measures are important in designing an Internet strategy, this suggests that market responsiveness should receive special emphasis, since the Internet's global nature enhances access to new markets.

KEY WORDS AND PHRASES: Electronic commerce strategy, Internet, information systems strategy.

The evolution of the information systems (IS) function in organizations has been documented extensively [4, 41, 42]. IS management today is more complex than in the 1970s and 1980s, when the emphasis was on operational needs. One reason for this is the recognition that IS plays different roles in different firms [2]. For example, in firms where new IS development is critical to the introduction of new products and the achievement of major operating efficiencies or accelerated competitive response times, senior management must devote more time to overseeing IS strategy and operations than in firms where such activities are not as significant. Furthermore, the evolution toward a more ubiquitous networked world requires the establishment of a set of common standards and disciplines to ensure flexible, yet cost-effective, interconnectivity.

Specifically, the emergence of the Internet has posed a host of new organizational challenges, both technological and managerial. It is critical to understand the role of information systems in the organization (i.e., the firm's IS orientation) in order to develop appropriate strategies and plans for effectively deploying and managing the use of the Internet. For example, if a firm's top management and its IS planners have different views of the role of IS, it may not be appropriate for the IS personnel to aggressively champion new Internet-based information technology (IT) applications that require substantial investments, because such applications may not be congruent with management's view on how the company should compete. Management and the IS personnel need to agree on the role of IS if the firm is to develop strategies that effectively leverage the potential of the Internet. Without a unified understanding of information systems, business and IS strategies are less likely to be congruent, thereby reducing synergy and wasting resources.

Given the Internet's potential to revolutionize business operations, compa-

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nies worldwide have embarked on plans to leverage this new technological infrastructure [6]. This study examines the use of the Internet to achieve business competitiveness in relation to organizational IS orientation. Specifically, it examines the relationship between IS orientation and business use of the Internet in three areas: customer-to-business, intrabusiness, and business-to-business.

Literature Review

IS Orientation

IS orientation refers to the role of information systems in organizational strategies: in other words, the role of IS in the firm in terms of whether it is viewed as supporting or strategic to achieving the firm's business strategies and objectives. In line with this definition, a review of research pertaining to how the IS function evolves over time will illustrate that changes in the role of information systems can be expected over time with consequent requirements for different managerial strategies congruent with how important IS is to the organization.

Traditionally, information systems were used to support operational functions, with the emphasis on achieving IS efficiency rather than IS effectiveness. With the rapid development of information technology (coupled with an increasingly competitive business environment), however, the role of IS has changed. From its conventional function of supporting business operations, it has emerged as a strategic tool in the past two decades. This new role is highlighted in several studies [8, 46].

As business has become more aware of the importance of information technology in maintaining long-term competitiveness, strategic visions have been developed to guide firms in their deployment of IT-based innovations. Schein has identified four categories of strategic IT visions [54]:

1. Automate: the use of IT to replace expensive, unreliable human labor.
2. Informate up: the use of IT to provide information and support top management's organizational control and coordination functions.
3. Informate down: the use of IT to empower lower-level management with relevant knowledge and information through information distribution.
4. Transform: the use of IT as a vehicle to alter the existing industry structure.

A firm's strategic IT vision evolves in stages from *automate* to *informate* and, finally, to *transform*. Thus firms progress along an evolutionary path as their deployment of IT matures.

Organizational approaches to IT fall into one of three categories [4]:

1. Exploiter/innovator (EI). IT is vital to the firm's overall competitive strategy. Management is proactive in the use of cutting-edge technologies.

2. Competitor/early adopter (CEA). IT is only used to support certain strategic business units. New IT is adopted only when proven effective by exploiter/innovators (EI).
3. Participant/effective or efficient follower (PEEF). IT is used in support of operational and functional needs. New innovations are introduced only when really necessary.

This triune framework helps researchers to understand how organizations manage and control the assimilation of information technology into their processes and functions.

Another approach to understanding the organizational role of the IS function classifies companies into three categories based on how thoroughly IT is integrated into their strategy [23]:

1. Traditional: IT supports operations and is not strategy related.
2. Evolving: IT supports strategy.
3. Integral: IT is integral to strategy.

Along the same area of research, McFarlan et al. found that the level of information system activities in an organization is dependent on the role of information systems, that is, whether IS is of great strategic importance or is a supportive and cost-effective function [36]. Which of the four quadrants of the strategic grid an organization is placed in is determined by the impact of present and future IS (*see Figure 1*):

- Strategic organizations place heavy emphasis on the role of IS because IS activities are critical to their present operations and planned IS applications are critical for future success.
- Turnaround organizations are not totally dependent upon current IS, but new IS developments are vital for reaching organizational objectives.
- Factory organizations are dependent on IS for their day-to-day operations, but will not gain significant competitive advantage from further IS development.
- Support organizations are not highly dependent on IS, and new IS applications will not be critical in the future.

McFarlan et al. expanded on the idea that information system management tools, such as IS planning, should be chosen as appropriate to the organizational context based on the role of IS.

Raghunathan and Raghunathan found that firms in the four cells of the strategic grid differ in respect to level of IS planning [53]. Their findings emphasize the contingent nature of IS planning and the need to match the planning characteristics of IS with its organizational role. The results are in line with those of an earlier study, which explores changes in the IS planning executive's

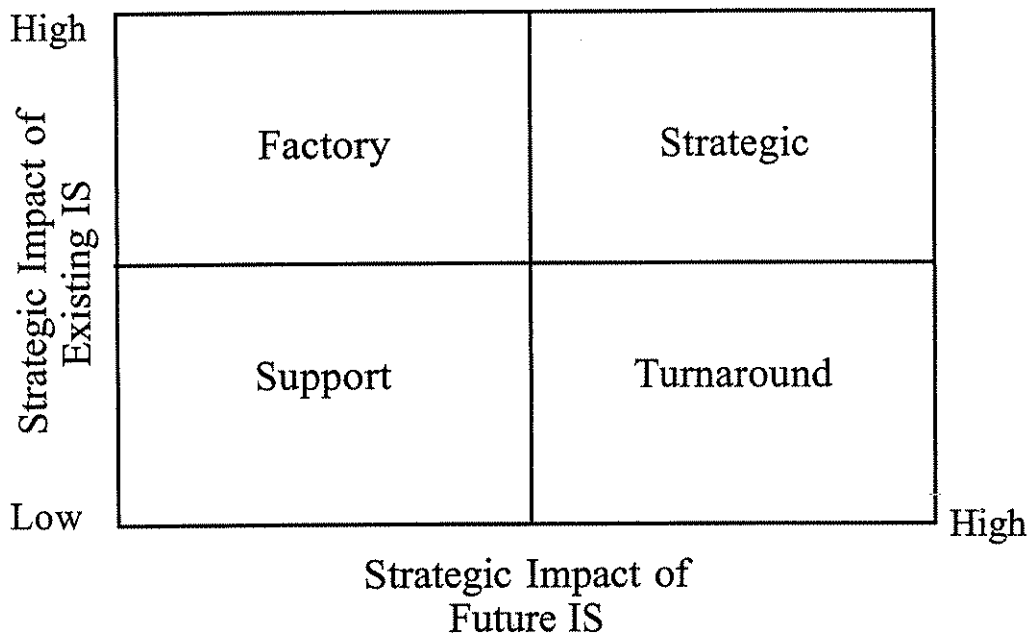

Figure 1. Information Systems Strategic Grid (adopted and modified from [5])

role in the context of changes in the orientation of the organizational IS [52]. The results further suggest that the need to recognize the increasingly important role of the IS planner may be greater for firms whose current operations and future growth are strategically tied to their IS resources.

The predictions implicit in the strategic grid are also validated by Premkumar and King, who found that there was a significant relationship between two of the performance measures, planning effectiveness and IS contribution to organizational performance, and the "fit" between the role of IS and the quality of the planning process [47].

The Internet

The Internet has received tremendous publicity in recent years, and researchers have explored such diverse subjects as the demographic profile of Internet users, usage patterns, uses of the Internet, factors making an Internet experience enjoyable [60, 61], the use of the Internet in education and research [22], adoption and diffusion of the Internet [18, 58, 62], issues in electronic commerce [38, 56], Internet marketing and retailing [16, 57, 66], and the link between information strategy and electronic commerce [29, 65]. Research studies on the impact of the Internet on businesses have generally concentrated on the benefits firms derive from the Internet and how Internet use has improved their business operations and competitiveness [25, 31, 45].

The Internet is a technology that can make a significant contribution to a company's value chain [7, 33]. It can improve a company's relationships with vendors and suppliers, its internal operations, and its customer relations, and, as well, offers the prospect of reaching an expanding user base. The Internet

also promises to dramatically lower communication costs by eliminating obstacles created by geography, time zones, and location.

Aside from all this, the Internet makes it possible for businesses to serve as market makers, helping buyers and sellers to locate one another, negotiate terms of trade, and execute secure transactions. On the firm level, intranets and other Internet technologies help organizations to improve service quality by facilitating communications and transactions among employees, suppliers, independent suppliers, and distributors [50].

Along with its vast benefits, the Internet presents many challenges to the organizations implementing it. For example, the Internet must provide meaning and quality to a variety of users in different contexts [32]. Moreover, as with other IS applications, a firm's use of the Internet must be linked with its business strategy [26]. Unless there is a supportive strategic context, the installation of the Internet or any other new technology in an organization is unlikely to bring the planned benefits [14].

Several researchers have studied the effect of the Internet. Birch and Young used the "five forces model" proposed by Porter and Millar to examine its impact on the financial industry [3, 46]. Feher and Towell used an impact-value framework to study the business use and effect of the Internet [13]. They considered three major categories of business value—compression of time, overcoming geographical restrictions, restructuring relationships—in terms of three strategic goals: efficiency, effectiveness, and innovation.

In summary, the use of the Internet to support business strategies is an area of rising interest, but researchers are only beginning to examine it. The present study contributes to the existing literature by examining the relationship between information system orientation and business use of the Internet.

Research Model

The present study uses the strategic grid proposed by McFarlan et al. [36] and Cash et al. [5] to operationalize information system orientation (*see Figure 1*). The strategic grid model was adopted for two reasons. First, it considers the impact of both existing and future IS to determine the organizational role of the IS function. This means that it considers the evolving role of IS as senior management changes its views about the strategic importance of information technology [52]. Cash et al. proposed that IS management tools should "fit" with the organizational context, which is dependent on the firm's position on the strategic grid [5]. Second, the strategic grid has been used successfully in previous research to establish a link between IS orientation and planning [47, 53] and between IS orientation and the strategic use of IT [14].

Since firms located in different cells of the strategic grid give a different degree of emphasis to information technology, they will also differ in respect to how much the Internet (as an IT application) is used to achieve strategic business goals. The strategic grid therefore provides a useful way to categorize firms according to IT role. Generally, as IT becomes more important, firms move from the factory/support side of the grid to the strategic/turnaround side. Since the Internet is increasing in importance, firms with high strategic impact of

future IS can be expected to use the Internet to a greater extent than firms where the future impact of IS is low. This leads to the following proposition:

> *Organizations with a more strategic and long-term view of the IS function (i.e., in the strategic/turnaround groups) will make more use of the Internet to achieve business competitiveness than firms in the factory/support groups of the strategic grid.*

This line of reasoning agrees with Grover and Segars's finding that the deployment of IT applications is positively related to the role of IS in supporting corporate strategies, that is, an organization's recognition of the strategic role of IT potentially leads to a more strategic deployment of the resource [19]. In a similar vein, Diamond highlights that organizations more proactive in the use of IS are using the Internet to a greater extent [9].

In Figure 2, the relationship described above is examined in the light of the Internet's role in three business dimensions: customer-to-business, intrabusiness, and business-to-business [24].

Hypotheses

Customer-to-Business Dimension

In the customer-to-business dimension, consumers have more channel power and firms have less channel power [17]. As a result, instead of passively receiving information, consumers can select customized information best suited to their needs. The most appropriate communication effort is "collaborative" rather than "autonomous" [37]. The increasing interactivity of the Internet is apparently the fundamental reason for the shift in channel power in favor of consumers, for the Internet's ability to permit interactivity satisfies the three basic objectives of marketing communications: inform, remind, and persuade [1]. Hence, a steadily growing number of businesses are setting up Web sites to market their products and services. The use of the Internet enables organizations to be both customer- and market-responsive in the customer-to-business dimension.

Customer Responsiveness

The Internet offers new opportunities for companies to interact with customers around the world. The ability to link and connect to multiple information files from a single screen facilitates the integration of corporate information in one readily accessible interactive location. The Internet enhances customer support by allowing direct interactions with customers to be spread through many divisions of a company, enabling organizations to address problems and provide consumer support as a team [7].

In effect, firms can use the Internet to provide for total service quality to customers. Customer-support information, including updates on new products and services, as well as corporate developments, can be disseminated

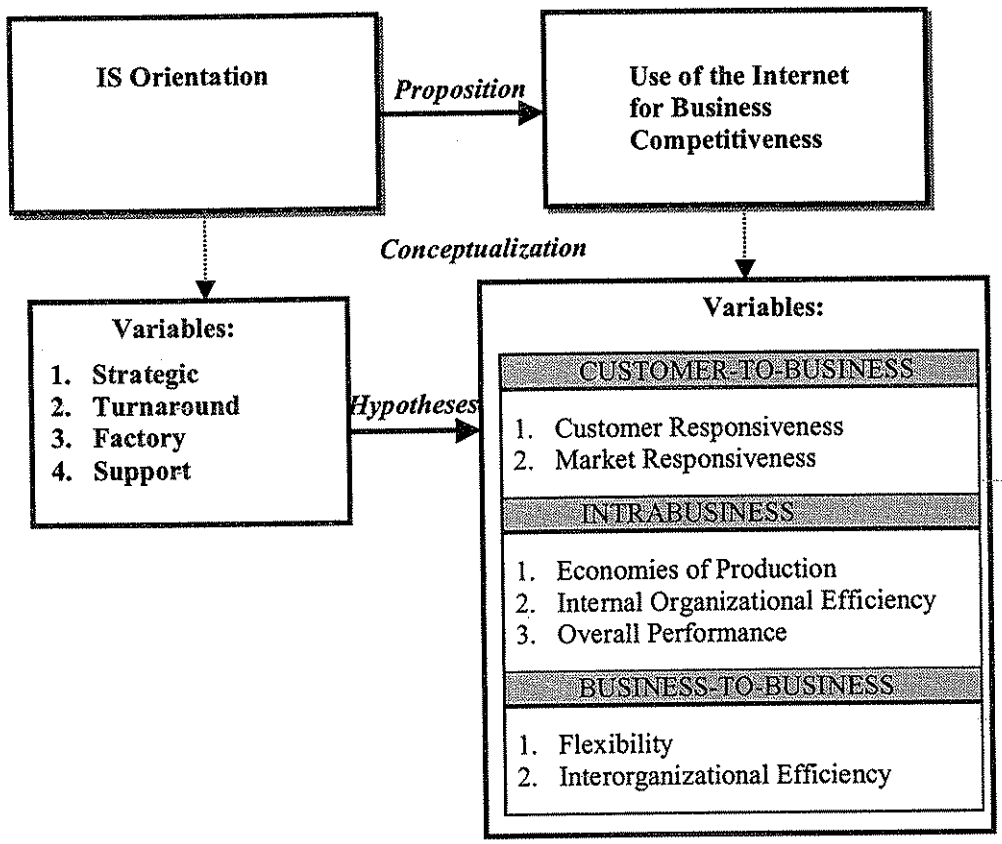

Figure 2. Research Model

globally. In this way, the Internet is a time- and cost-efficient tool that enables companies to provide better customer service [9]. From the literature cited above, it is apparent that achieving customer responsiveness is one of the factors associated with business use of the Internet. This is consistent with the research indicating that customer responsiveness is a strategic variable affected by IT [51]. In line with the research proposition, the following hypothesis is proposed:

> *Hypothesis 1a: Organizations in the strategic/turnaround groups of the strategic grid make greater use of the Internet to be customer-responsive than organizations in the factory/support groups.*

Market Responsiveness

The Internet provides a powerful new platform that corporations with Web sites can use to extend their reach to a larger customer base by marketing and advertising their products and services to a global market. The increased flow of information across organizations is a basis for detecting shifts in market equilibrium, more accurately assessing competitors' capabilities, and improved ability to react to market changes [46]. As such, the Internet is a labor-efficient, cost-efficient way of distributing information to worldwide clients (whether existing or potential) while achieving market responsiveness.

The extensive use of the Internet to achieve market responsiveness makes this variable a strategic business variable in the customer-to-business dimension. In line with the research proposition, the following hypothesis is proposed:

> *H1b: Organizations in the strategic/turnaround groups of the strategic grid make more use of the Internet to be market-responsive than organizations in the factory/support groups.*

Intrabusiness Dimension

As shown by the rapid proliferation of intranets, the Internet is a catalyst for dramatic changes in internal organizational functioning. The organizational model it facilitates, fundamentally different from past models, is characterized by a shift from a hierarchical command-and-control organization to an information-based organization [24]. In the intrabusiness dimension, firms must pay close attention to the factors that affect business operations. This issue will be discussed here with respect to achieving economies of production, internal efficiency, and overall business performance.

Economies of Production

The better resource utilization typically resulting from use of the Internet helps organizations to improve their economies of production. According to Cronin, the Internet facilitates more effective deployment of human resources by enabling managers to select personnel for projects based on their expertise and regardless of geographic location [7]. A firm can also utilize the Internet to locate its operations in a country with low labor costs [44].

The strategic functions of the Internet in this area make economies of production another variable that can have a long-term impact on business competitiveness. With the research proposition in mind, the following hypothesis is formulated:

> *Hypothesis 2a: Organizations in the strategic/turnaround groups of the strategic grid make more use of the Internet to achieve economies of production than organizations in the factory/support groups.*

Internal Organizational Efficiency

While the Internet is revolutionizing the external business climate, its contribution to achieving internal organizational efficiency through internal, corporate-wide networks should not be overlooked. Intranets enable organizations to use the Internet as a convenient, low-cost channel for intraorganizational information sharing and distribution [24]. Corporate intranets are the fastest growing segment of the Internet. According to Forrester Research, sales of intranet hardware, software, and services exceeded $4 billion in 1996. This figure is expected to increase tremendously in the next few years [12].

Modern work processes require employees to have immediate access to in-

formation from many different sources. Employees must be able to share information within their group, across the enterprise, and with outside business partners. As businesses become aware that conveying information by paper, fax, and disk is inefficient and costly, many of them are switching to intranet applications to meet departmental, interdepartmental, and company-wide communication needs, thereby improving internal organizational efficiency. Employees can also seek advice from discussion groups and can often obtain free public-domain software to help them tackle routine tasks [7].

As the preceding discussion demonstrates, the Internet can make an important contribution to the organization's internal operating efficiency. Thus, the following hypothesis is formulated:

> *Hypothesis 2b: Organizations in the strategic/turnaround groups of the strategic grid make more use of the Internet to achieve internal efficiency than organizations in the factory/support groups.*

Overall Performance

King saw the Internet as an example of the modern information technology applications that have significantly affected business profitability and productivity [26]. To maintain business competitiveness, organizations must stand ready to serve as innovators in the use of Internet applications.

A study by Lederer et al. reveals that enhanced competitiveness tops the benefits sought from Web-based information systems [30]. In a similar vein, Turner found that most organizations have great expectations for the Internet. Eighty percent of his respondents indicated that the business value of a Web page more than offsets its costs, while more than 90 percent expected the Web to be strategic to their businesses [64].

The Internet will soon become a necessity in operating a global business, particularly in the area of direct marketing on the net [39]. One company whose business model stresses Internet commerce is Amazon.com, the Internet bookstore. It targets the virtual community as its customer base, using cyberspace technology to generate business, improve service and overall efficiency, and cut costs. Adopting a similar strategy, Dell Computers, the world's third-largest PC maker, has attained enormous growth by selling its computers direct to end-users in 142 countries. This example substantiates the use of the Internet to increase profit margins and market share to improve overall business performance [28]. Hence, the following hypothesis (in line with the research proposition):

> *Hypothesis 2c: Organizations in the strategic/turnaround groups of the strategic grid make more use of the Internet to achieve overall organizational performance than organizations in the factory/support groups.*

Business-to-Business Dimension

The Internet also has a great impact on business-to-business interactions. It facilitates the network form of organization, which emphasizes flexibility in daily business activities among organizations in order to meet changing cus-

tomer demands more effectively. In effect, an integrated supply-chain is the key business objective in managing the chain of networks linking customers, workers, suppliers, distributors, and even competitors. To support this form of organizational environment, the management of "on-line transactions" in the supply chain assumes a critical role [24].

Flexibility

In response to the dynamic demands of today's customers, many companies have replaced their traditional product-development process with a flexible process based on the Internet. Greater information flow in the product-development stage allows designers to continue to define and shape products even after implementation has begun. This means that companies can incorporate rapidly evolving customer requirements and changing technologies into their designs until the last possible moment before a product is introduced to the market. The foundation for flexible product development is especially emphasized in industries where the need for responsiveness is paramount [21]. Hence, the following hypothesis in line with the research proposition is put forth:

> *Hypothesis 3a: Organizations in the strategic/turnaround groups of the strategic grid make more use of the Internet to achieve flexibility than organizations in the factory/support groups.*

Interorganizational Efficiency

According to Cockburn and Wilson, the Internet attracts businesses that collaborate with one another to achieve interorganizational efficiency [6]. This is because companies find it easier to communicate through the Internet when links are formed across systems. An example is the collaborative effort of IBM and Bellcore in using Internet links to share a workstation [63]. This innovative use of the Internet has helped both companies to be more efficient and cost-effective.

The use of the Internet to achieve interorganizational efficiency is further explicated as a communications backbone for Electronic Data Interchange (EDI). Traditional e-commerce through EDI has been an exciting and growing aspect of information and communication technology for several years. However, the value-added networks (VANs) and private messaging networks on which EDI is based are characterized by high costs and limited connectivity [49]. Unlike conventional EDI, the Internet has worldwide connectivity and is relatively inexpensive. In the long run, the Internet may eventually dominate e-commerce initiatives that originate from EDI. However, given the benefits of EDI and their investments in the technology, many companies would prefer to use the Internet for hybrid solutions rather than replace EDI altogether [35]. Conducting EDI-based transactions on the Internet and intranets should make it possible for organizations to achieve interorganizational efficiency less expensively.

This leads to the next hypothesis (in line with the research proposition):

> *Hypothesis 3b: Organizations in the strategic/turnaround groups of the*

Item	Description
EXI	Extent of importance of IS
CSF	Fit of applications portfolio to organization's critical success factors
COM	IS contribution to organization's ability to compete
PRF	IS contribution to improving profitability
NEW	IS contribution to developing new products and services
STR	IS support to strategic planning level
TAC	IS support to tactical management level
OPR	IS support to operations
FIN	IS contribution to financial gains through improved operations
CRT	Perceived overall criticality of IS to organization
1HR	Impact of one-hour shutdown of main computer center
3WK	Impact of three-week total shutdown of main computer center
BDG	IS budget as percentage of total corporate revenues
DIS	Distribution of software budget between development and maintenance

Table 1. Items Measuring IS Orientation.

strategic grid make more use of the Internet to achieve interorganizational efficiency than organizations in the factory/support groups.

Method

Operationalization of Research Variables

Multi-item indicators were used in gathering the data to measure the research variables. Information system orientation was assessed using the two dimensions of the strategic grid shown in Figure 1. Fourteen items were used to measure the existing and future roles of IS (*see Table 1*). These items were adapted from an empirical study by Neumann et al. [40] that identified a set of measurable variables based on guidelines provided by McFarlan et al. [36]. Neumann's scale was chosen because it is comprehensive and validated. Respondents were asked to indicate the extent of the impact of existing and future IS on their organizations, ranging from (1) "not at all" to (5) "great extent." Organizations were then classified into one of the four groups on the strategic grid based on whether their responses along the two dimensions were above or below the mean values of the sample.

Table 2 shows the items used to measure the extent of the Internet's impact on businesses. These items were adapted from earlier research that empirically validated a set of measures of the impact of IT on organizational strategic variables [34, 44]. Respondents were asked to indicate how much the Internet had contributed to their organizations, on a scale ranging from (1) "not at all" to (5) "great extent."

Sample and Procedures

A survey questionnaire was used to gather data for this study. The questionnaire was targeted at information technology executives (obtained from Dun & Bradstreet's *Key Business Directory of Singapore* [10]) because they are more likely

Variable	Item	Description
Customer-to-business dimension		
Customer responsiveness	CUSTOM1	make product/services database available to customers
	CUSTOM2	bundle more information with products/ services
	CUSTOM3	enhance after-product sale services and activities
	CUSTOM4	provide administrative support (e.g., billing, collection, inventory management) to customers
	CUSTOM5	Better anticipate customer needs
Market responsiveness	MKT1	locate and develop profitable new markets
	MKT2	identify market trends
	MKT3	serve new market segments
	MKT4	enhance sales forecast accuracy
	MKT5	help reduce marketing costs
	MKT6	reinforce customer loyalty
	MKT7	track market response to promotions (e.g., discounts)
Intrabusiness dimension		
Economies of production	EOP1	reduce cost of designing new products/ services
	EOP2	reduce cost of adding new features to existing products/services
	EOP3	achieve economies of scale in marketing
	EOP4	achieve economies of scale in hardware usage
	EOP6	maintain or reduce unit costs
Internal organizational efficiency	INORGEF1	improve process and content of decision-making
	INORGEF2	improve internal meetings and discussions
	INORGEF3	provide better coordination among functional areas
	INORGEF4	improve strategy planning
	INORGEF5	provide information support to subsidiaries
Overall business performance	OVERALL1	provide competitive advantage to company
	OVERALL2	support firm in becoming global business
	OVERALL3	increase profit margins
	OVERALL4	increase market share
Business-to-business dimension		
Flexibility	FLEXI1	achieve flexibility in locating and relocating business operations
	FLEXI2	source product/services from different locations
	FLEXI3	eliminate duplication of effort in other business subsidiaries
	FLEXI4	utilize excess capacity in any operational location
	FLEXI5	share resources across business operations

(continued)

Interorganizational efficiency	INTOREF1	enhance geographical interorganizational communication pattern
	INTOREF2	coordinate regional, national, and global activities
	INTOREF3	coordinate closely with customers and suppliers
	INTOREF4	allow worldwide integration of business with suppliers, distributors, wholesalers, or retailers

Table 2. Operationalization of Strategic Business Variables.

than executives in other functions to understand the organizational role of IS and the use of the Internet. The sample was made up of randomly selected companies with more than 100 employees because large companies, by virtue of their size, diversified functions, and resources, are more likely to have embraced the use of the Internet in business.

The questionnaire draft went through two phases of extensive pretesting before it was administered. The first phase involved five students and one faculty member. In the second phase, feedback was gathered from another five IT executives. In both phases, respondents were asked to complete the questionnaire and comment on its content and format. Based on the feedback, the questionnaire was revised to ensure coherence and clarity. It was then mailed out to the 650 companies. There was a second mailing three weeks later to nonresponding companies.

Three companies declined to answer the survey because the questions on business use of the Internet were inapplicable to them, and 30 of the questionnaires were not delivered because the targeted key executive had resigned or the company had moved. All told, 225 usable responses were received, giving a response rate of 36.5 percent [(225)/(650–30–3)].

Validity and Reliability Assessment

Items in the questionnaire were assessed for content and construct validity prior to hypothesis testing. *Content validity* refers to the degree to which a measure covers the range of meanings included in the concept. This was satisfied through an extensive literature review on IS orientation and use/impact of the Internet. *Construct validity* is based on the way a measure relates to other variables in a system of theoretical relationships. In the present study, construct validity (of the measures for IS orientation and the impact of the Internet on businesses) was evaluated using principal component factor analysis with varimax rotation. The retention of items was based on the following two criteria:

1. Only items with a loading of at least 0.50 were retained.
2. Items with a loading of less than 0.50 on all dimensions or exceeding 0.50 on two or more dimensions were removed.
3. Reliability assessment was also used as a criterion for eliminating items. Any item not strongly related to the other items in the construct was eliminated. The final results of the factor analysis on IS orientation variables are presented in Table 3. Note that separate factor

	IS orientation	
Items	**Present IS**	**Future IS**
EXI	× (1st factor analysis)	× (1st factor analysis)
CSF	× (1st factor analysis)	× (1st factor analysis)
COM	× (1st factor analysis)	√0.695
PRF	√0.767	√0.693
NEW	√ 0.728	√0.694
STR	√ 0.816	√0.704
TAC	√ 0.840	√0.792
OPR	√ 0.751	√0.719
FIN	√ 0.803	√0.681
CRT	× (1st factor analysis)	× (1st factor analysis)
1HR	× (Reliability)	× (1st factor analysis)
3WK	× (Reliability)	× (2d factor analysis)
BDG	× (2d factor analysis)	× (Reliability)
DIS	× (3d factor analysis)	× (Reliability)
Eigenvalue	3.700	3.549
Variance (%)	61.669	50.705
Cronbach alpha	0.875	0.837

Table 3. Key Dimensions of IS Orientation.

analyses were carried out for Present IS and Future IS, as was done by Neumann et al. [40]. The results of the two factor analyses were combined in Table 3 to save space and provide easier comparison of items retained. The bracketed first factor analysis, second factor analysis, etc., show items that were dropped at each stage, whereas the nonbracketed numbers show the final factor loadings.

Constructs that assess the contribution of the Internet to business competitiveness were also subjected to factor analysis. Note that the items in the three dimensions (customer-to-business, intrabusiness, and business-to-business) were subjected to a separate factor analysis on each of the categories. This ensured the stability of the factor loadings with respect to the ratio of variable items to sample size. In the area of IS research, separate factor analyses have been used and validated in several other studies [27, 48].

The results of the factor analyses for the three dimensions (customer-to-business, intrabusiness, and business-to-business) are presented in Table 4. Note that the items in the business-to-business dimension loaded on one single factor in the first round of factor analysis. A second round of factor analysis was conducted by force-loading the items into two factors because flexibility and interorganizational efficiency are conceptually distinct, the former pertaining to business-to-business operations within a firm, the latter to business-to-business operations between different firms. Further, business-to-business operations from the same firms may be more hierarchical than those from different firms that are more market-oriented. The results showed that the items loaded highly on distinct factors, thus satisfying convergent validity. Discriminant validity was also satisfied, as there was no cross-loading of items on separate factors. The high convergent and discriminant validities supported the deci-

	Factor 1	Factor 2	Factor 3
(a) Customer-to-business dimension			
CUSTOM 1	0.320	**0.867**	
CUSTOM 2	0.346	**0.861**	
CUSTOM 3	0.332	**0.868**	
CUSTOM 4	0.307	**0.805**	
CUSTOM 5	0.348	**0.805**	
MKT 1	**0.775**	0.369	
MKT 2	**0.843**	0.225	
MKT 3	**0.785**	0.306	
MKT 4	**0.815**	0.279	
MKT 5	**0.765**	0.349	
MKT 6	**0.619**	0.494	
MKT 7	**0.735**	0.351	
Eigenvalue	7.686	1.351	
Variance (%)	64.052	11.262	
Cronbach alpha	0.945	0.928	
(b) Intrabusiness dimension			
EOP1	**0.805**	0.276	0.239
EOP2	**0.832**	0.251	0.255
EOP3	**0.678**	0.205	0.491
EOP4	**0.763**	0.398	0.301
EOP5	**0.785**	0.368	0.250
EOP6	**0.777**	0.295	0.318
INORGEF1	0.456	**0.779**	0.185
INORGEF2	0.339	**0.801**	0.228
INORGEF3	0.256	**0.828**	0.320
INORGEF4	0.361	**0.748**	0.349
INORGEF5	0.188	**0.761**	0.321
OVERALL1	0.292	0.308	**0.842**
OVERALL2	0.257	0.442	**0.729**
OVERALL3	0.457	0.288	**0.723**
OVERALL4	0.325	0.272	**0.837**
Eigenvalue	9.840	1.274	1.083
Variance (%)	65.600	8.491	7.222
Cronbach alpha	0.946	0.937	0.934
(c) Business-to-business dimension			
FLEXI1	**0.810**	0.384	
FLEXI2	**0.831**	0.234	
FLEXI3	**0.760**	0.430	
FLEXI4	**0.839**	0.350	
FLEXI5	**0.756**	0.456	
INTOREF1	0.294	**0.854**	
INTOREF2	0.331	**0.870**	
INTOREF3	0.351	**0.796**	
INTOREF4	0.446	**0.720**	
Eigenvalue	6.112	**0.935**	
Variance (%)	67.913	10.389	
Cronbach alpha	0.927	0.910	

Table 4. Results of Factor Analyses.

sion to force-load the items into two distinct factors that could be conceptually justified (as discussed above).

To ensure the internal consistency of the constructs, reliability was assessed using Cronbach alpha. All the constructs have alpha values greater than 0.7, thereby indicating adequate reliability [43].

Results

Demographic Profile

Table 5 summarizes the profiles of the 225 respondents by their job titles. About 70 percent of the respondents held management positions, and executives comprised 25.3 percent of the sample. The respondents had, on average, 5.60 and 9.60 years of experience in the company and industry respectively. The responding companies were well distributed across industry groups and average annual revenue levels. Average annual revenue ranged from less than S$10 million to more than S$1 billion, with most of the companies in the range of $10 million to $100 million. Most of the companies (34.7 percent) were in the manufacturing sector.

There was a fairly even distribution of small and medium enterprises (fewer than 200 employees) and large organizations (more than 200 employees) in the sample. The distribution of the number of IT staff employed was generally consistent with the size of the total workforce.

Bivariate Relationships : t-tests

To validate the hypotheses, independent sample t-tests were used to assess the differences in strategic impact of the Internet between the two main groups on the strategic grid (i.e., support/factory and turnaround/strategic). The key underlying assumptions in using the t-test for differences of means are:

1. The samples are drawn from normal distributions.
2. The variances of the two populations or groups are equal (homoscedasticity).

The first assumption was more or less fulfilled, as the sample sizes of the two main groups in the hypotheses were greater than 30. Using the Central Limit Theorem, the distribution of this sample should approximately follow a normal distribution. For the second criteria, Levene's test for equality of variances (of the two groups) was conducted to check for homoscedasticity. According to the general rule, if the Levene's significance value is greater than the stated level of significance, equal variances (i.e., homoscedasticity) would be assumed.

Customer-to-Business Dimension

Levene's test for equality of variances confirmed that the assumption of homoscedasticity was valid, as the test values of 0.374 and 0.914 for customer

Characteristics	Percentage (%)
Job title	
Managing director/director	8.4
CIO/IT; MIS; EDP manager/head	44.4
General manager	6.7
Finance manager	4.9
HR manager	1.8
Manager (other)	4.4
Executive	25.3
Other	4.0
Industry	
Architecture/engineering	12.0
Business service	7.6
Finance/banking	8.0
Insurance	3.1
Logistics/transportation	7.6
Manufacturing	34.7
Retailing	8.9
Travel/tourism/hotel	6.2
Other	12.0
Average annual revenue	
$10 million or more	12.0
$10-$100 million	44.9
$101-$300 million	16.4
$301-$600 million	8.9
$601 million-$1billion	1.8
$1billion or less	9.8
Missing	6.2
Number of employees	
2000+	14.2
1001-2000	4.9
751-1000	4.9
501-750	6.2
250-500	18.2
1-250	51.6
Number of IT employees	
200+	7.6
101-200	2.7
76-100	1.3
51-75	0.9
25-50	3.6
1-25	84.0

Table 5. Sample Characteristics.

and market responsiveness respectively were both greater than $p = 0.05$. As shown in Table 6, the t-test results indicated that hypotheses 1a and 1b are supported.

Intrabusiness Dimension

There are three variables in the intrabusiness dimension: economies of production, internal organizational efficiency, and overall performance. Variances for

Hypothesis	Variable	Group	Mean	S.D.	t-value	Sig. (2-tailed)
Customer-to-business dimension						
H1(a)	Customer responsiveness	Strategic/ turnaround	3.441	1.118	5.559	0.001
		Support/ factory	2.660	0.988		
H1(b)	Market responsiveness	Strategic/ turnaround	3.172	0.880	6.656	0.001
		Support/ factory	2.418	0.820		
Intrabusiness dimension						
H2a	Economies of production	Strategic/ turnaround	2.897	1.012	5.643	0.001
		Support/ factory	2.184	0.873		
H2b	Internal organizational efficiency	Strategic/ turnaround	3.242	0.907	4.129	0.001
		Support/ factory	2.716	1.000		
H2c	Overall performance	Strategic/ turnaround	3.569	0.996	5.983	0.001
		Support/ factory	2.780	0.980		
Business-to-business dimension						
H3a	Flexibility	Strategic/ turnaround	3.137	1.016	4.167	0.001
		Support/ factory	2.581	0.986		
H3b	Inter-organizational efficiency	Strategy/ turnaround	3.547	0.949	4.103	0.001
		Support/ factory	3.002	1.036		

Table 6. Bivariate Analysis: t-Tests.

each of the variables are assumed to be equal under Levene's test, as the test values of 0.200, 0.156, and 0.601, respectively, are greater than $p = 0.05$. The results of the t-test, as shown in Table 6, indicate support for hypotheses 2a, 2b, and 2c.

Business-to-Business Dimension

As with the other dimensions, the Levene's test results were 0.579 for flexibility and 0.192 for interorganizational efficiency, both of which were higher than the stated level of significance at 0.05. From Table 6, the t-statistics for both variables in this dimension are significant, thereby supporting hypotheses 3a and 3b.

The results of the t-tests indicate that organizations with a more strategic and long-term view of the IS function (i.e., firms in the strategic/turnaround groups) will make more use of it than firms in the support/factory groups to achieve strategic business objectives in the three dimensions (customer-to-business, intrabusiness, and business-to-business). These findings are consistent with past studies that project an increased deployment of IT applications as the role of IS becomes more integral to corporate strategy [14, 19].

Multivariate Relationships: Discriminant Analysis

While univariate analyses are useful in identifying the important factors, they do not provide meaningful interpretations of the relative importance of the various constructs. For this, a multivariate analysis using discriminant analysis is used. A two-group stepwise discriminant analysis technique differentiates between the two extreme groups of the strategic grid, that is, the strategic group and the support group. Previously, researchers conducted the analysis using these two groups as the extremes for differentiating among the most discriminating variables. For example, McFarlan et al. used the two groups in discussing the planning and support characteristics of organizations [36]. Similarly, Raghunathan and Raghunathan found that differences in planning variables were markedly different for groups of the two extremes [53]. Hence, it is more relevant and interesting to consider only these two groups in the analysis as the results may serve to reinforce previous findings.

The results of the stepwise discriminant analysis for the strategic business variables are summarized in Table 7(a). To select the variables and generate the discriminant function, Wilks' lambda with a tolerance level of 0.001 was used. The value of the function, as shown in the table, is significant at a 0.001 level of significance. The discriminant loadings, as well as the coefficient (for the only variable) in the function, are also presented. Note that discriminant loadings (or structure correlations) are generally considered more valid than discriminant function coefficients in determining the relative discriminating power of each significant variable [11].

The results of the stepwise discriminant analysis show that there is only one discriminating variable in the final discriminant function (i.e., market responsiveness, from the customer-to-business dimension). This result indicates that market responsiveness is the most significant variable differentiating the strategic and support groups. The high factor loading of this variable (1.000) further validates its significance, as the typical cutoff value for selection of variables is 0.3 [47]. This finding is consistent with past exploratory studies of the benefits of the Internet, where achieving market responsiveness was the most commonly cited competitive advantage of organizations using the Internet (e.g., [29]).

Key variables	Loading	Coefficient*
Customer responsiveness	0.671	
Market responsiveness	1.000	1.226
Economies of production	0.747	
Internal organizational efficiency	0.585	
Overall performance	0.769	
Flexibility	0.649	
Interorganizational efficiency	0.620	
Eigenvalue	0.438	
Canonical correlation	0.552	
Wilks' lambda	0.696	
Chi-square	36.842	
Significance	0.001	

* Discriminant coefficient shown only for the variable in the discriminant function.

Table 7(a). Results of Stepwise Discriminant Analysis.

Actual group (holdout sample)	N	Predicted group Support	Strategic
Support	21	15 71.4%	6 28.6%
Strategic	23	7 30.4%	16 69.6%
Overall	44	Correctly classified = 70.5%	

Table 7(b). Classifactory Ability of Discriminant Function.

While discriminating variables might be identified in the discriminant function, it is also important to determine the ability of the function to classify the groups accurately. Therefore the two group samples were divided into two subsamples before the variables were analyzed. The larger of these samples (known as the analysis sample) was used in estimating the discriminant function. The other subsample (i.e., the holdout sample) was then used for validation purposes. This method is referred to as the split-sample or cross-validation approach [20]. Since no hard-and-fast rules had been established for dividing the sample into the two subsamples, a 70–30 split between the analysis and holdout samples was used.

The results of the classifying ability of the discriminant function (*see Table 7(b)*) indicated that the classification accuracy was very good at 70.5 percent, compared with a chance accuracy of 52.3 percent (calculated as $p^2 + (1-p)^2$, where p is the proportion of sample that is larger among the two holdout groups).

Limitations

This study has three main limitations. First, the use of perceptual measures from a single respondent in an organization may result in some informant bias. This was mitigated by addressing the questionnaire to the senior IS executive,

who was likely to have the necessary knowledge about the firm's use of the Internet. Future research can extend the study to include more than one respondent at each firm.

Second, the results of the study may not be generalizable to areas of information systems other than those it specifically addressed. This is because the exploratory and cross-sectional nature of the study limits the ability to extend results to other aspects of IS or to imply causality in the relationships.

Third, the study only examined selected performance variables. Other performance variables may be examined in future research. It would be interesting, for instance, to examine whether market responsiveness remains a key factor in discriminant analysis when other research variables (not covered in this study) are included.

Conclusion

The operationalization of the strategic grid and the results of the hypotheses based on it serve to validate the grid as a way of assessing the role of information systems in an organization. All the hypotheses supported the proposition that firms with a significant role for IS in the future (i.e., the strategic/turnaround groups) will make more use of the Internet to achieve business competitiveness than firms with a less significant role (the support/factory groups). Specifically, business competitiveness was assessed on three dimensions: customer-to-business, intrabusiness and business-to-business.

The discriminant analysis showed that market responsiveness (in the customer-to-business dimension) is the key variable to discriminate between the support and strategic groups. This means that firms with a more strategic view of IS use the Internet more proactively to tap new business opportunities. Further, the discriminant function had significant classificatory ability, thus indicating that there were indeed separate groups with clear differences in their use of the Internet.

One reason why only a single factor was significant in the discriminant analysis compared to all the factors being significant in the t-test is that the former is a multivariate test (taking all factors into account simultaneously) while the latter is a univariate test (taking each factor into account individually). Despite this, the results were surprising, for they indicated that the use of the Internet to enhance market responsiveness, in itself, differentiates strategic and support firms. This may be because the global nature of the Internet makes this performance measure more prominent. Or perhaps it is because the usefulness in reaching new markets and identifying market trends is a key benefit of the Internet. Earlier studies showed that firms adopt the Internet mainly because of its convenient access to worldwide information and its global reach [59].

The study was useful in three main ways. First, by validating the notion inherent in the strategic grid that firms differ in the role they assign information systems, it demonstrated that the strategic grid is a reliable tool for classifying organizations that use information technology in different ways. Practitioners can use the measures (in terms of present and future IS) to determine the loca-

tion of their firms on the grid. This will help them to plan appropriate strategies congruent with the role they assign IS. In addition, understanding the role of an organization's IS function is important because of:

- its interfaces with other functions (e.g., marketing or finance);
- its influence on the organization's IS planning systems and structures (e.g., the amount of time and financial resources to be devoted); and
- the importance of aligning IT activities with corporate strategy.

The criticality of gaining this understanding was emphasized by one of the survey respondents:

> As long as executives and middle managers become computer literate and understand the power of IT, management of IT can then take off and hence become a strategic force in business.

Second, the study examined key strategic business variables in organizational use of the Internet. The results highlighted three dimensions in the use of the Internet for business competitiveness: customer-to-business, intrabusiness, and business-to-business. Since all the constructs in each dimension were significant on the t-tests, practitioners should consider all three dimensions in designing an Internet strategy rather than focus on only one. Since discriminant analysis showed that market responsiveness is a key performance factor, practitioners should pay particular attention to this in their use of the Internet.

Third, a positive relationship was established between IS orientation and business use of the Internet. This may help practitioners understand the extent of the Internet's impact with respect to the role of IS in their organization. The testing of the hypotheses indicated that firms with a more strategic view of IS would deploy the Internet to a greater extent than firms with a supportive IS role. The former group of firms may eventually attain a higher degree of business competitiveness. Finally, it must be remembered that the strategic grid is a dynamic framework, and firms will shift periodically from one quadrant to another, either on their own initiative or as compelled by external conditions.

Future Directions

This study validates and operationalizes the strategic grid concept as a useful framework and instrument for future studies. The main focus of the research was on the relationship between organizational IS orientation and business use of the Internet. Researchers could build on this study by extending it to other Internet-enabled applications. In particular, there has been increased organizational recognition and adoption of the intranet and the extranet in recent years [15, 55]. Research pertaining to these two applications would be both relevant and useful.

The strategic business variables outlined above are another area for further examination. As this study was exploratory in nature, only a few of the vari-

ables were discussed. To provide a more complete picture, a comprehensive list of the variables affected by the Internet could be developed. Researchers could also examine the impact over a specific timeframe, so as to assess the perceived and actual effect of the Internet on a longitudinal basis. Other frameworks for the role of IS, rather than the strategic grid, could be employed to validate the findings.

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THOMPSON S.H. TEO (fbateosh@nus.edu.sg) is information systems area coordinator in the Department of Decision Sciences, National University of Singapore. He received his Ph.D. in management information systems from the University of Pittsburgh. His current research interests include IS planning and management, IT adoption and diffusion, and electronic commerce. He has published more than 40 papers in international refereed journals, such as *Accounting Management and Information Technologies, Communications of the ACM, Communications of the AIS, Decision Sciences, Database, European Journal of Information Systems, Information and Management, Information Technology and People, International Journal of Electronic Commerce, Journal of Management Information Systems*, and *Omega*.

BEE LIAN TOO graduated with a B.B.A. Honors degree from the Faculty of Business Administration, National University of Singapore.