

Managing E-Business Transformation: Opportunities and Value Assessment[§]

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Abstract

While the field of electronic commerce has often focused on the rise and fall of “dot coms,” a major transformation is under way in many traditional organizations that are investing heavily in Internet technologies in order to improve financial performance. While anecdotes in the business press suggest that some firms have achieved unprecedented benefits by leveraging the Internet, there is no systematic basis to guide managers through this transformation process. Based on IT business value research, we present a framework of electronic business value that enumerates linkages between performance drivers (e.g., Internet applications, processes, and electronic business readiness of customers and suppliers), and operational excellence and financial metrics. We argue that firms engaged in electronic business transformation must make synergistic investments and commit resources not only in information technology, but also must align processes and customer and supplier readiness to maximize the benefits. The model and the general approach provide a rich foundation for managers to analyze the types of electronic business initiatives that lead to better operational and financial performance. Further, management can use this model to benchmark their electronic business projects and to identify areas that may require attention and additional resources.

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1 Introduction

Electronic business (e-business) involves the total digitization of value chains and business processes, and holds the promise of helping traditional organizations create new value and reach previously unattained heights of operational and financial excellence. Firms such as Cisco Systems, Dell Computer and GE report impressive payoffs by making the Internet a key element in their strategies and business models, and by transforming their “bricks-and-mortar” operations into e-business organizations. Cisco Systems and Dell Computer report in excess of 250% return on invested capital, and over \$650,000 in revenue per employee. They also have the highest gross profit margin in their respective industries. As a result, traditional firms are under increasing pressure to follow suit, and to achieve the often-cited benefits of e-business. Management in these firms is faced with the task of identifying opportunities, and assessing and justifying e-business investments. This raises a set of important questions: What specific areas of business should managers consider in their initiatives? How and where is e-business value created through the judicious selection of strategies, processes and technologies? What obstacles do firms face in transitioning to e-business? What are some specific performance metrics by which such transformation should be judged?

In this article, we propose an operational model of e-business value creation that provides a reference framework for management, and offers guidance for e-business strategies. This model, rooted in Information Technology (IT) business value research¹, has been validated with data from over 1000 small, medium and large companies in the manufacturing, retail, distribution and wholesale sectors. The basic premise of the model is that e-business will be judged by traditional metrics: *operational excellence* on a daily basis, which, depending on other external factors, should translate into improved *financial performance* measures like revenue per employee, gross income, return on assets and return on investment. Operational excellence is achieved by making a complementary

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set of changes and investments in e-business *drivers* such as business processes in the entire value chain, informational and transactional capabilities of IT, and readiness of customers and suppliers. The e-business drivers are factors that a manager can change through resource commitment. The interdependent nature of the drivers suggests that large IT investments in isolation do not necessarily translate into success, as evident from failed re-engineering projects of the early 1990s². From the data analysis, we have established strong relationships between the e-business drivers, operational excellence and financial performance, and have identified untapped opportunities for building stronger online relationships.

The metamorphosis to e-business is at the heart of the Internet economy. Every organization can be a player in this economy, depending on the extent to which it digitizes its business operations and takes advantage of the essential elements of an online world: information, knowledge, relationships, and increased velocity of operations throughout the value chain. Unfortunately, there is a widespread misconception of the recent failure of a number of highly publicized “dot coms” as the demise of the Internet economy. According to our assessment³, dot coms, defined as electronic retailers and/or electronic intermediaries who earn at least 95% of their revenues over the Internet, account for only 9.6% of the total Internet economy revenues⁴. Thus, there is substantial potential to expand the Internet economy as more and more traditional businesses adopt e-business practices. Ultimately when every business becomes an e-business enterprise, there will be no distinction between the Internet and traditional economies.

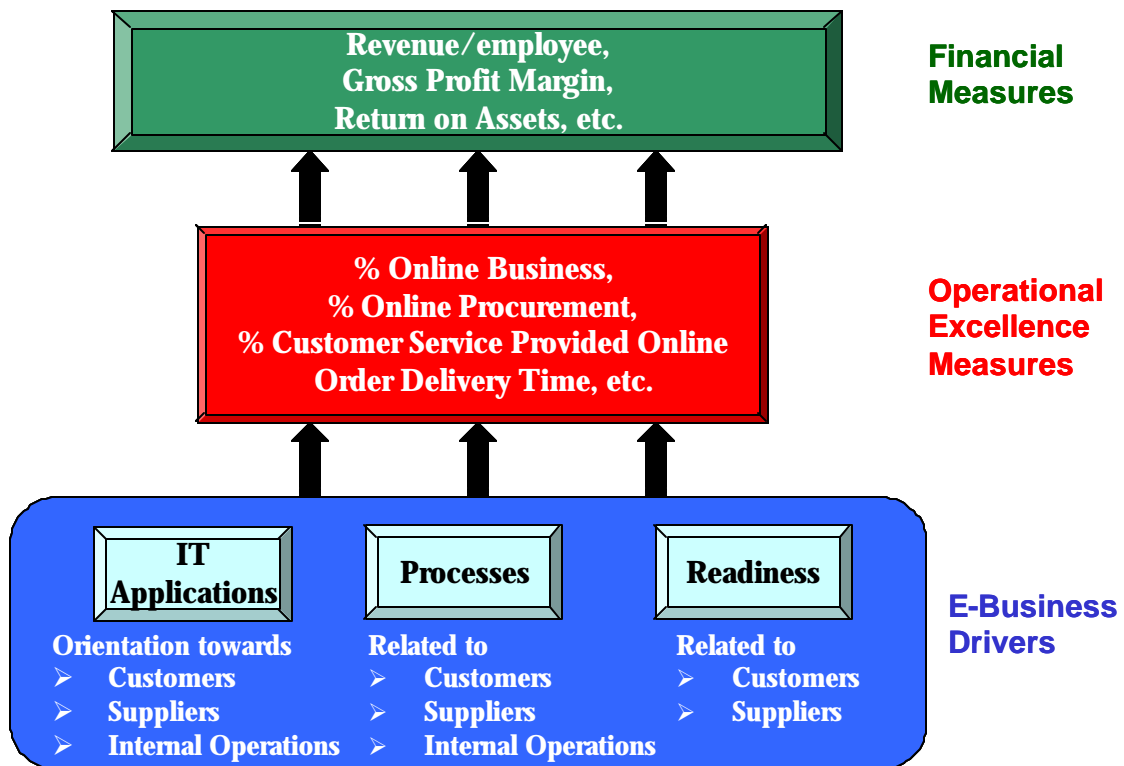
2. A Model of E-Business Value

Anecdotes of e-business success and failure abound the business press. Yet there is no systematic evidence of what types of strategies and initiatives lead to success in this new way of doing business. Mixed opinions from IT productivity experts have added to the confusion regarding payoffs from Internet related investments. For example, Steven Roach of Morgan Stanley has recently remarked

“In the rush to get wired to the Internet, corporate America overdosed on technology..”⁵ The existing literature on IT productivity may offer only limited help in this regard owing to its aggregate level of analysis linking IT investment dollars to some financial performance measure. Hence, a “process-based” business value model that links choices available to managers to various measures of operational and financial performance appears to be more suitable than IT productivity models in offering both diagnostic and prescriptive guidance to leverage the Internet in a firm’s operations. The model we have developed suggests that e-business performance is judged by the same financial measures used in the “old economy”. However, before a firm can contemplate improving financial measures, it must achieve excellence in its daily operations through e-business practice. Further, it has to choose simple but meaningful measures by which such excellence will be judged. These measures are conceptually similar to critical success factors⁶; another way to look at operational excellence is that it is a “beneficial strategic necessity”⁷ in the sense that a firm or business unit must achieve high levels of operational excellence to stay competitive. However, the strength of the relationship between operational excellence and financial performance measures can be moderated by many factors including channel conflict, competitive response, and general economic conditions. For instance, even when there are large productivity gains from IT investments, such benefits may have to be passed on to customers because of competition⁸.

How does a firm achieve operational excellence through e-business? A manager has at his or her disposal a set of complementary e-business drivers, a set of key factors that s/he has to invest in and commit resources to in order to improve operational performance. These drivers are like knobs that have to be turned in unison by management in the right directions by the right amount². The overall model is shown in Figure 1 below. The operational excellence and e-business drivers are discussed in the balance of this section.

Figure 1: E-Business Value Model



3. Operational Excellence Measures

Investments in e-business technologies and processes have first-order impacts on the daily operations of a firm. These impacts are experienced by a firm's customers, suppliers/vendors, and business partners like value added resellers and other channel players. These entities judge the firm by criteria such as the firm's responsiveness to their needs, the time it takes to fulfill orders and service requests, and by the ease of doing business with the firm. The excellence of a firm's operations can be assessed by a combination of e-business specific and traditional operational measures. The e-business specific measures are the percentage of (i) total business transacted online, (ii) existing customers conducting business online, (iii) new customers acquired online, (iv) MRO

items purchased online, (v) production goods purchased online, and (vi) customer service provided online. Traditional operational measures like order delivery cycle time, incorrect order fulfillment incidences, stock out incidences, and inventory turnover are also critical, and are expected to improve through the above e-business specific metrics. For example, through online procurement, Office Depot has increased its inventory turnover from four to six times¹³. The above performance measures are a representative but not an exhaustive list, and a firm may choose to use additional measures that it considers critical for its financial success⁹.

Dollars may be dollars, but online dollars are better

The percentage of online revenues may be indicative of how efficiently business is conducted. Online revenues signify a leaner and meaner operation geared toward customer needs. Immediate benefits of online sales include a potentially smaller sales force, less paperwork, fewer data errors, and improved transactional efficiencies that are not feasible to achieve through traditional channels. Online sales also shift tasks like product information search, order entry and tracking to the customer. For example, Northwest Airlines eliminated agent commissions and reduced processing costs by 80%¹⁰ per online transaction. By selling through the Internet, companies can fulfill their customers' informational, transactional and service needs in a speedy and cost-efficient manner. Our study involving 1000 firms found that small organizations (with total revenues less than \$10 million) obtained nearly 40% of their revenues online with a median of 25%. Larger firms generated an average of 7.1% of their revenues online with a median value of only 1%, implying ample room for obtaining additional financial benefits.

Catch them online

New customers constitute an important part of the growth of a firm, and the ubiquitous nature of the Internet provides an opportunity to increase its customer base. For instance, Texas Instruments recognized that it could reach out to small consumer electronics companies over the Web, a potential customer segment that it had not served in the past¹¹. Wells Fargo gave \$600 million in the form of online home equity loans in 2000 in areas of the country where it does not operate branches¹⁰. About 65% of Wall Street Journal's initial online customers were new in that they were not subscribers to the print edition of the Journal¹². Office Depot credits the Internet for large contracts with customers such as General Electric, Proctor and Gamble and MCI World Com¹³. However, online customer acquisition is not limited to large organizations. In fact, small firms can gain a wider exposure to new markets than large firms (who may already be familiar names among potential customers) by going online. Indeed we found that 41% of new customers of small companies were acquired online, relative to only 8.75% for large firms in our sample.

Bring your existing customers online

One of the fastest ways to improve bottom-line impact through e-business involves getting existing customers do business online since there is no acquisition cost for existing customers. A traditional firm already has a relationship with its existing customers, and has earned their trust and business in the physical world. Smart organizations will work to transfer these relationships online and to strengthen it through better customer knowledge and service. Unlike new customers, existing customers do not suffer from the "fear of the unknown", and face less uncertainty in doing business online with a company they have dealt with before. 83% of FTD Inc.'s customers order flowers

online, resulting in large cost savings and marketing costs for the company¹⁰. 90% and 50% of Cisco's and Dell's business, respectively, is conducted online¹⁴. However, such high figures are exceptions rather than the norm. In our study, less than 15% of existing customers of large organizations do business online, while the median stands at only 3%.

Buy it online

Electronic procurement is not new to organizations like GE and Ford Motor. As early as 1996, GE had set up its Trading Process Network (TPN) for this purpose. Indeed for successful e-business organizations, it is not enough to earn revenues online. From the standpoint of gross income or gross profit margin, what matters is the cost of goods sold, which includes inbound and outbound logistics. According to many industry analysts, the big three auto companies procuring over \$240 billion a year may expect to save anywhere from \$2000 to \$3000 per \$19,000 vehicle through online procurement, supply-chain, information sharing, and collaboration¹⁵. Online procurement may involve lower prices through participation in private or public exchanges, tighter coordination with suppliers and vendors, fewer stock-out situations and disruption of production schedule, and the ability to operate in a truly just-in-time mode. This is perhaps the least visible part of e-business and yet the most difficult to implement. However, this may be the secret to the success for large corporations, who cannot necessarily double their customer base by simply going online, and who must achieve excellence in operating extremely complex supply chains. For example, GE expects to deliver 10 cents a share in savings in 2001 through online procurement and related initiatives¹⁰.

Ironically enough, large firms in our study do not make the grade in online procurement. The average percentages of MRO and production goods procured online are 9% and 11% respectively, with median values of 2% and 0% respectively. This finding is in sharp contrast with

industry predictions of B2B procurement reaching up to \$10 trillion by 2004, and can explain why many B2B marketplaces are going out of business or incurring substantial losses.

Address customers' needs and problems online

Customer service has always been a challenging part of business operations, with little scalability due to highly labor-intensive tasks. The Internet holds the potential for building one-to-one relationships with customers in a cost efficient manner. As in other areas of operational excellence, Cisco Systems and Dell Computer lead online customer service by providing comprehensive information repositories, online communities where customers help each other, and interactive features that “help customers help themselves”¹⁶. However, large firms in the business sectors we studied are yet to deploy online customer service on a significant scale. While an average 17% of customer service requests is resolved electronically by these organizations, the median is only 2%, indicating that half of the organizations in the sample hardly provide any online customer service. While the benefits of online customer service such as speed of response, customer knowledge building, cost efficiency and scalability are compelling, it involves major technology and process initiatives that most firms have not undertaken. Thus online customer service remains an area of significant untapped potential.

Relationship between operational and financial metrics

Where is the empirical evidence of relationships between the e-business oriented measures of operational excellence and improved financial performance? To investigate the linkages between electronic business initiatives, we designed and tested a comprehensive survey instrument, and gathered data on electronic business initiatives and performance measures from over 1000 organizations (see sidebar for research methodology).

Research Methodology

The data for the study were collected through phone and web-based survey of firms in the manufacturing, retail, distribution and wholesale sectors. The initial structured questionnaire was generated based on existing academic and practitioner-oriented literature in supply-chain management, Electronic Data Interchange (EDI), and reengineering. A seven-point Likert scale was used to collect most responses. The final questionnaire consisted of thirty nine items for ten drivers, thirteen performance excellence measures related to customers and suppliers, four financial performance measures, eight items related to transactional capabilities, and ten questions related to the firm.

Only those firms that had a corporate website, and also used traditional channels of business (i.e., accept orders through sales force, phone, fax and mail) were included in the study. Pure “dot coms” were excluded since the focus of the study was to assess the value of electronic business transformation. A professional research organization with extensive expertise and corporate contacts to collect data from multiple managers within individual organizations was employed. Over 4500 firms – selected based on SIC code, publicly traded companies, and other databases – were contacted via telephone, and approximately 25% participated in the survey. Approximately 45% of the respondents are wholesalers, 11% distributors, 35% manufacturers and 9% retailers. Of these companies, approximately 59% of the companies had 100 or less number of employees, 10% between 101 and 400 employees, and rest 31% over 400 employees. The respondents reflect the distribution of firms in the U.S. The titles of the individuals who completed the questionnaire differed widely across firms. In small firms, owners and principals were able to answer for an entire organization. In larger firms, the information was dispersed throughout the organization. At the end of the data collection process, 1026 data points were retained

To minimize the risk of obtaining inaccurate responses respondents could choose “don’t know” to each question in order, and were promised that individual responses will remain confidential. An independent and extensive cross-validation of responses were conducted on over 250 websites for assessing the accuracy of stated informational and transactional capabilities. The items and constructs were tested for reliability and validity. The widely used reliability measure, Cronbach alpha, was above 0.70 for all constructs. The constructs show high convergent and discriminant validity based on various tests.

It is evident from the figures that firms that improved financial performance through e-business adoption have higher levels of operational excellence than those who did not. For example, companies that have experienced an increase in revenue per employee due to e-business initiatives earn an average of 40.4% of their revenues online, while firms who have not observed any increase earn an average of 10.5% of their revenues online¹⁷. The results are consistent across all operational measures and financial metrics. The results also suggest that a firm may tend to observe benefits only when certain levels of operational excellence are achieved, indicating a chasm in the beginning of e-business transformation. A likely explanation is that in the early phases of transformation a firm may need to run parallel systems – online and offline – before the firm, customers and suppliers learn and become savvy at doing business online.

Table 1: Operational Excellence and Financial Performance

Operational Measure	Increase in Revenue/Employee due to e-business?			Increase in gross profit margin due to e-business?			Increase in ROA due to e-business?			Increase in ROI due to e-business?		
	No	Yes	Significant difference?	No	Yes	Significant difference?	No	Yes	Significant difference?	No	Yes	Significant difference?
% online revenue	10.5	40.4	Yes	12.0	42.2	Yes	12.9	44.8	Yes	14.2	45.0	Yes
% online MRO procurement	11.3	19.7	Yes	11.6	19.1	Yes	10.9	20.1	Yes	10.9	20.9	Yes
% online production goods procurement	12.3	23.6	Yes	12.9	21.6	Yes	13.8	23.1	Yes	13.6	22.8	Yes
% service request resolved online	16.8	40.2	Yes	19.2	40.7	Yes	18.8	43.5	Yes	19.2	42.1	Yes
% new customer acquired online	10.9	43.4	Yes	15.2	43.3	Yes	14.9	45.7	Yes	15.7	46.0	Yes
% existing customer doing business online	14.8	43.9	Yes	15.3	45.3	Yes	16.6	47.6	Yes	17.3	48.2	Yes

4. The e-business drivers

The drivers are the actionable part of the e-business value model. Managers invest resources to change the levels of these drivers to achieve primary impacts on operational excellence and higher

order impacts on financial performance. The drivers encompass three distinct but related areas: e-business processes, IT applications, and the readiness of customers and suppliers. While Internet related technologies have often been the focus for e-business transformation, we note that systems do not work in vacuum, and need complementary or synergistic business processes across the value chain for the realization of maximum benefits¹⁸. The reengineering era saw many examples of disjoint changes in technologies and processes without an explicit recognition of the natural synergy that exists between the two, resulting in significant failures².

Customer Related Processes

In order to use the Internet for better customer relationship and service, firms must re-evaluate their customer related processes. Customers in need of service should be able to communicate their needs online effectively through a single contact point. Otherwise, it places an unnecessary cognitive overload on the customer to search and identify the right channel and to place service requests. Once a customer service request is received, ideally, there should be no coordination gaps as a result of information flow breakdowns within the customer support process due to either the lack of information, the presence of incorrect information, or information overload¹⁹. From our study, it appears that a majority of the firms have made significant efforts in streamlining customer processes to provide one-stop contact point (75%) and to resolve customer complaints with only a few steps (81%).

In addition to servicing customer requests promptly, it is critical that customer feedback be quickly disseminated into organizational processes (e.g., design, manufacturing, quality assurance) for immediate action. In fact, many large firms take several months to incorporate customer feedback to products/services, or have no formal processes to address customer feedback. Our study shows that firms who have observed financial gains are more likely to have processes in place to communicate

customer feedback/complaints quickly to other departments relative to firms who have not observed financial gains.

Supplier Related Processes

The Internet provides new opportunities for businesses to substitute inventory with information and to develop mutually beneficial relationships with suppliers. However, such strategies require a careful analysis of the entire span of procurement activities, as well as changes in processes to minimize related uncertainties and inefficiencies. Uncertainties can arise from different sources including demand volatility, product innovation, quality, cost, lead-time, supply continuity, resource availability, and relationship-oriented factors. While sharing of information in real time within the value chain helps reduce undesirable consequences such as the bullwhip effect²⁰, it requires trust and strong relationship between buyers and suppliers. Therefore, a set of strategic process changes is required to provide appropriate incentives to suppliers to participate in e-business.

Fundamental to the above information sharing initiative is the supplier selection strategy. Successful e-businesses have reduced the number of suppliers for each item²¹ based on strategic goals, value proposition, product characteristics, suppliers' willingness to participate in e-business, and conflict of interest (e.g., agency-related issues). In the presence of multiple sources of supply for a given item, these firms allocate demand for each supplier to minimize the risk and to enhance relationships. They have processes to determine the type, precision, frequency, format, and security of data shared, and channel(s) for such exchange. Without such processes, merely having the technology for information sharing does not serve any purpose. Our study suggests that a majority of the firms are lagging in developing appropriate processes to share information through the

Internet. For instance, only 27% of the firms in our sample share demand and product roadmap information with suppliers, while 33% have information exchange policies with suppliers.

Many firms lack processes to let them monitor quality at the supply source. By contrast, Cisco Systems is able to use the Internet to monitor defect rates and yields at the source of the supply, and prevent potential problems. Similarly, buyers need to provide feedback on the quality of work-in-progress, field incidence reports, and customer feedback in a timely manner that will let suppliers refine their manufacturing processes. These activities call for formal supplier evaluation metrics, which are unfortunately lacking in 69% of the firms in our study.

Firms also need processes that reduce approval steps, paper work, and exception handling for all purchasing decisions. For instance, if a firm decides to adopt a B2B MRO procurement hub, then rules must be defined as to who can order, how much one is authorized to purchase, how exceptions will be dealt with, and how the authorization process will work. Furthermore, firms have to redefine processes that will consolidate fragmented ordering within the organization to allow negotiation of better overall prices.

Customer orientation of IT applications

The reengineering and the Enterprise Resource Planning (ERP) revolutions of the nineties brought together silos of isolated technologies within the organization. However, both had an internal focus, and lacked the market orientation that enables a firm to interact and build strong relationships with its customers and suppliers. In addition to enabling seamless information sharing within the organization, e-business systems must be geared toward its external operations. Customer facing systems should have both informational and transactional capabilities. They should provide personalized product-related information (e.g., catalog, product description, detailed specifications, etc.) and a comprehensive FAQ, allow customers to customize products online, and make it easy for

them to contact service representatives or seek service online. These systems should also enable customers to submit, modify and track orders online, pay online, and receive automatic electronic notification of order status.

Our study shows that there is substantial scope for firms to fully exploit IT capabilities in interacting with customers. For example, 66% of the firms do not have any capabilities to personalize content (e.g., order history, order status). 72% do not exploit the benefits of online forums and virtual communities to enhance stickiness and information exchange, while 48% of the firms do not even provide an FAQ related to products/services and contact information. By contrast, Danzas AEI Inc., a \$7.5 billion freight forwarding and logistics company and an InternetWeek 100 honoree, exemplifies how providing online information that customers need can be a strategic differentiating factor²². Charles Schwab, the leader in the online stock brokerage business with 41% of all online assets, has succeeded in providing customized online content for its customers by categorizing them into different groups of investors, and by recognizing that different types of investors need dramatically different types of resources.

Firms in our sample fare poorly when it comes to customization capabilities. While it is not difficult to create Web sites that let customers customize their orders online, the challenge lies in cost efficient and speedy fulfillment of customized orders. For example, in late 1999, Nike started offering online order customization capabilities, but indicated that there were major challenges in integrating their supply chain systems with online product customization applications²³.

Supplier orientation of IT applications

While customer-facing systems are the most visible elements of a firm's online applications, the proliferation and success of e-business critically hinges on the successful implementation of electronic linkages with supply chain partners. Supplier oriented systems must be capable of sharing

information regarding quality (e.g., customer feedback, product failures and defects, process quality, and changes in orders and product design), resource planning (inventory, production schedules, capacity, and demand), and relationship management (e.g., online communities for suppliers/vendors, online FAQ, and supplier evaluation reports). Such capabilities must be complemented with an array of supplier related process changes, as outlined earlier. Further, these applications should support automatic ordering from a firm's existing material requirement planning or ERP system, online invoicing, procurement order status tracking and electronic payments. A Web based alliance between Home Depot and GE highlights the importance and benefits of supplier facing systems. In its attempt to offer higher product variety, but lower inventory, Home Depot set up a strategic partnership with GE, whereby an Internet application enables GE appliances purchased at Home Depot to be delivered directly to consumers' homes from the nearest GE warehouse²⁴. This alliance helps both partners avoid any conflict that is typical in multi-channel environments. While firms in our sample have made some progress in developing online customer relationships, there is an untapped potential to gain efficiencies with supplier relationships and the entire value chain. Approximately 70% to 89% of the firms do not have any form of online transactional and informational sharing capabilities with their suppliers.

Internal orientation of IT applications and processes

Intranet based applications are a critical element of an organization's e-business initiatives. They can be pivotal in improving the efficiency of internal operations. At GE Capital, a pioneering intranet application, created in 1996, supports key functions including human resources, intra-organizational collaboration, project management, best practice sharing, and information dissemination. The impacts of the intranet on internal communication, project management and internal process improvements have been impressive, including a 50% reduction in time spent on obtaining access to

project information from other business units. The intranet has been described as being an important step towards the boundary-less organization envisioned²⁵. At Intel Corporation, all employee communications and employee transactions related to human resources and other functions are completely supported by intranet applications²⁶. Firms that have not exploited the Internet for internal processes are unlikely to succeed with customer and supplier orientation of IT applications. Employees cannot be responsive to customer needs if they cannot readily access internal information through easy-to-use interfaces.

As with any technology, intranet applications call for process changes within the organization. For example, to encourage usage of the intranet, GE Capital provided explicit incentives and guidelines. The intranet “quality library” was declared as the new medium of communication regarding quality information. Management also made participation in the intranet a part of employee evaluation²⁵.

Systems Integration

Systems integration initiatives act as the glue that holds internal, customer and supplier facing systems together. Successful e-business practice for a traditional organization necessitates seamless flow and sharing of order and customer information throughout the value chain across all channels of operation. Home Depot has approached this problem methodically by ensuring a complete integration between its online and back office capabilities²⁷. By contrast, Toys ‘R Us experienced major difficulties in fulfilling online orders for lack of integration between online and back-end systems during the holiday season of 1999²⁸.

A high level of systems integration across different channels of operation enables an organization to transmit, combine and process data from customers and suppliers. Its external and internal systems are able to monitor order status at various stages in the process (e.g., manufacturing,

shipment) and automatically reflect order changes in downstream processes or systems (e.g., inventory and manufacturing systems). Further, integration makes it easy to share data among various internal systems (e.g., forecasting, production, shipment, accounting, etc.) and to retrieve information from various databases for decision support (e.g., cost information, reporting tools). However, integration across internal and external systems is a significant challenge for most organizations. A Jupiter Research study found that 76% of retailers cannot track their customers across multiple channels. Firms such as J. Crew, Hallmark Cards and Borders Group are pursuing major technology initiatives to address the integration problem²⁷. Our analysis found that larger organizations score lower on the level of systems integration than smaller ones. Smaller firms do not face the same integration challenges owing to the relative simplicity of their IT applications. However, because of the complexity of their operations, larger firms can also benefit more from combining systems to interact with customers and business partners across all channels.

E-business readiness of customers and suppliers

The proverbial saying “the whole is worth more than the sum of its parts” comes alive in the context of e-business. The success of e-business initiatives of a firm depends not only on its own efforts to digitize its value chain, but also on the readiness of its customers and suppliers to engage in electronic interactions and transactions. While it is tempting to think of this readiness as something external to an organization, it is best considered as a value driver that requires a proactive commitment of resources. External links can easily become the weakest link in the value chain. Consider Amazon.com, which uses Internet based technologies heavily in all its operations from customer interaction to warehouse management. Unfortunately the cost for most publishers to create an infrastructure to manufacture any number of books the same day Amazon receives the orders, and to drop ship them that very night is too high. This lack of e-business readiness, coupled

with the need to deliver books to customers as soon as possible, have forced Amazon to build costly warehouse facilities and distribution capability. General Electric projects savings of \$1.6 billion in 2001 due to e-business, but the lack of readiness of many “old-school” customers and suppliers may hinder further savings²⁹.

Dell Computer implemented an online supply-chain management application to help its component suppliers increase the accuracy of their forecasts by providing them access to direct customer order information³⁰. Further it has actively helped customers (e.g., LSI Logic) increase their e-business readiness by enabling them to integrate their procurement applications with Dell’s customer facing systems.

Relationship Between Drivers and Operational Excellence

Table 2 shows the relationships between e-business drivers and operational excellence measures. For each driver (e.g., systems integration), we divide the firms into two categories – the top half and the bottom half, based on the level of the driver (e.g., level of systems integration). Then we test whether the levels of the operational excellence measures (e.g., % online revenue, % online customer service) are significantly different across the two categories of firms. The statistical significance of the differences in operational excellence measures is indicated by one to three asterisks, where three asterisks indicate a very high level of significance. Blank cells in Table 2 indicate the absence of a statistical difference in the sample. Nine out of ten drivers show strong impacts on operational excellence measures in our sample.

Table 2: Driver Effect on Operational Excellence

Electronic Business Driver	Online Revenue	Online MRO Procurement	Online Production Goods Procurement	Online Customer Service	New Customers Acquired Online	Existing Customers Online
Customer related processes	***	**	**	***	***	***
Supplier related processes						
Customer orientation of IT applications	***	***	***	***	***	***
Supplier orientation of IT applications (quality related)		***	***	*		
Supplier orientation of IT applications (resource related)	***	***		***		***
Supplier orientation of IT applications (relationship related)	***	***	***	***	***	***
Internal orientation of IT applications		***	***	***		***
Systems integration			**			
Readiness of customers	***	**	*	***	***	***
Readiness of suppliers	*	***	***	***		***

*** p < .01, ** p < .05, * p < .1

With the exception of supplier related processes, all other drivers show a significant impact on one or more operational excellence measures. However, being deeply embedded in the supply chain, supplier related processes are perhaps the most difficult driver to change. Across our sample, firms score low when it comes to cutting-edge processes for online interactions with suppliers. This implies that much of the benefits of electronic business to date may have come from the customer side of operations, and that there is room for large gains from online operations on the supplier side of business.

Tables 1 and 2 above provide overall empirical support for the conceptual business value model presented earlier. Table 2 establishes the linkages between electronic business drivers and operational excellence measures, while Table 1 supports the relationships between operational excellence and financial performance.

5. How the model helps management make e-business decisions

The e-business value model conveys to management where to focus organizational resources by highlighting specific areas of opportunities. In particular, our model emphasizes that to achieve operational excellence and subsequent financial gains, managers must evaluate how processes align with e-business transformation, while educating and encouraging the participation of suppliers, customers and internal constituents. In the absence of such complementary investments in process, technology and readiness-related factors, managers risk the failure of this digital transformation, leading to organizational chaos, productivity decline, and dissatisfied customers and suppliers.

Consider the online procurement of MRO and production inputs, two measures of operational excellence, which we found to have a strong positive impact on financial performance. Despite the significant benefits of online procurement as noted earlier, adoption has been slow, contrary to often-cited projections. The distribution of online procurement of MRO and production goods in our data is shown in Table 3.

Table 3: Online Procurement of MRO and Production Goods

	% Online Procurement			
	0%	1% to 20%	21% to 50%	> 50%
% of firms procuring MRO items online	34%	41%	16%	9%
% of firms procuring production goods online	42%	31%	20%	7%

It is evident that a majority of firms do not procure a sizable portion of their MRO or production goods online. Over 73% of the firms procure less than 20% of their MRO or production goods online. What are the issues that a manager planning to increase online procurement should focus on? Our conceptualization model suggests that a manager must focus on several drivers – supplier related processes, supplier orientation of IT applications, systems integration, and supplier readiness – that have direct impact on the firm’s ability to conduct online business with its suppliers.

Our model requires managers to re-visit procurement processes and supplier readiness, rather than investing simply in technology or interfacing with plethora of business-to-business exchanges. Table 4 provides a point of reference to address the various issues within each driver. To further guide managers, we briefly describe some of the analyses for increasing online procurement.

Typical procurement needs of a firm fall along a continuum of procurement types – in the extreme left are highly standardized, low cost, materials (e.g., Maintenance, Repairs, and Operation (MRO) supplies) and to the extreme right are high-cost, highly customized, direct materials. Usually the level of analysis and the purchase importance increase as we move from left to right, while the extensiveness of the choice set (i.e., the number of available vendors and the breadth of alternatives³¹) decreases. It is then imperative that the procurement processes within this continuum will have different characteristics that require increasing levels of collaboration, relationship and trust between the supplier and the buyer as we move from left to right. Therefore, a manager must evaluate whether traditional relationships can be transferred to the online environment with suppliers. This requires an understanding of the supplier-related processes to identify and evaluate the right set of suppliers, and the needs to share the right set of information to enhance relationship and collaboration. However, information sharing requires a manager to evaluate whether the firm is equipped to exchange such information electronically with suppliers in real-time, or to interface with exchanges to communicate with suppliers. Likewise, the manager has to investigate whether suppliers are ready to interact electronically and communicate sensitive information. Suppliers may not have systems in place to provide easy connectivity with the buyers. The manager has to also consider the types of incentives that will encourage suppliers to adopt online environment without the fear of the “unknown,” commoditization, or buyer exploitation (agency issues). For each opportunity that exists for e-business transformation, managers must thoroughly evaluate the various technology, process, and readiness issues.

Table 4: E-Business Drivers Checklist

E-business Driver	Checklist
Customer Orientation of IT	
Informational	<ol style="list-style-type: none"> 1. Are all product -related information available online (e.g., price, product description, catalog, etc.)? 2. Can customers customize orders online? 3. Does your firm provide comprehensive FAQ section online? 4. Can customers conveniently contact service representatives or seek service online? 5. Can customers interact with others using online forums and/or communities? 6. Can customers see personalized content when they log onto the website?
Transactional	<ol style="list-style-type: none"> 1. Can customers submit orders online? 2. Can customers modify orders online? 3. Can customers pay online? 4. Are customers notified of their order status automatically? 5. Do customers access secure website for ordering and other interactions?
Supplier Orientation of IT	
Quality	<ol style="list-style-type: none"> 1. Does your firm share customer feedback and field incidence reports with suppliers/vendors in real-time? 2. Does your firm share process quality information electronically with relevant trading partners in real-time? 3. Are changes in orders communicated to trading partners electronically in real-time?
Supply-continuity	<ol style="list-style-type: none"> 1. Does your firm share continuously updated inventory information with trading partners online? 2. Does your firm share continuously updated production schedules and capacity (e.g., machine, manpower) information with trading partners online? 3. Do you share continuously updated product demand information (actual and forecasted) online?
Relationship Management	<ol style="list-style-type: none"> 1. Does your firm provide online communities (e.g., discussion forums, online chat) to suppliers? 2. Does your firm provide comprehensive online FAQ section (e.g., contact information, glossary, events) available to trading partners? 3. Does your firm provide frequently updated supplier evaluation reports online?
Transactional	<ol style="list-style-type: none"> 1. Do your systems allow automated invoice transmission and processing? 2. Do your systems track status of orders online? 3. Do your systems send payments electronically to suppliers?

Processes	
Supplier-related	<ol style="list-style-type: none"> 1. Does your firm have well defined method of sharing product roadmap and demand forecast with suppliers? 2. Does your firm have well defined information exchange policies with suppliers (e.g., frequency, precision, real-time or delayed, format, and channel)? 3. Does your firm have standard operating procedures that cover all procurement scenarios (e.g., well-defined rules for large versus small procurement)? 4. Are the supplier selection criteria well documented? 5. Are the supplier evaluation metrics well defined? 6. Are the supplier quality monitoring processes well defined?
Customer-related	<ol style="list-style-type: none"> 1. Do customers generally have one contact point for all service needs? 2. Are there only a few steps in resolving customer complaints? 3. Does customer feedback get quickly disseminated into organizational processes?
Readiness	
Supplier-related	<ol style="list-style-type: none"> 1. Do suppliers have Internet-based systems to engage in electronic commerce? 2. Do suppliers feel comfortable (regarding security, privacy etc.) engaging in e-business? 3. Do suppliers willingly share information electronically with your firm? 4. Do suppliers consider it important to engage in e-business? 5. Do suppliers consider it important to improve coordination and collaboration online?
Customer-related	<ol style="list-style-type: none"> 1. Do customers feel comfortable regarding security and privacy in electronic commerce? 2. Do customers consider it important to engage in electronic commerce?
System Integration	
	<ol style="list-style-type: none"> 1. Can data be shared easily among various internal systems (e.g., forecasting, production, manufacturing, shipment, finance, accounting, etc)? 2. Do order changes automatically get reflected in downstream processes or systems (e.g., inventory, manufacturing resource planning and manufacturing systems)? 3. Do your systems easily transmit, integrate and process data from suppliers/vendors and customers through the Internet? 4. Do your systems allow continuous monitoring of order status at various stages in the process (e.g., manufacturing, shipping)? 5. Can employees easily retrieve information from various databases for decision support (e.g., cost information, reporting tools)?
Internal Orientation of IT	
	<ol style="list-style-type: none"> 1. Can employees retrieve required information through the corporate intranet (e.g., press releases, financial information, inventory/production information, etc.)? 2. Do employees manage administrative processes (e.g., scheduling meetings, travel, benefits, healthcare, etc.) online? 3. Are best practice/project management information available through the corporate intranet?

6. Conclusion

The Internet economy involves much more than just dot coms, and necessitates a fundamental transformation of traditional organizations. The true benefits of this new economy are achieved through the digitization of the extended value chain, whereby all processes and activities of all firms involved in a value chain embrace the online world through the deployment of Internet based applications. Firms need guidance in this process of digitization, and we have presented a simple yet powerful operational model of business value creation that provides both diagnostic and prescriptive insights to managers as they strive to maximize the benefits of their e-business investments. We have shown that there are significant financial payoffs from e-business initiatives; however, firms must focus their efforts on specific areas to realize such gains. The nature of benefits and challenges are different across small and large firms, with small firms facing an unprecedented opportunity to expand their customer base with relatively few impediments. Large firms can expect significant gains in supply chain efficiency and productivity, but must overcome major process, systems and readiness barriers. There are untapped opportunities for all firms, especially in the areas of online procurement, supplier relationships, customer service and customization of products and content.

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