

An extensive study finds that investing in e-business drivers improves operational excellence, which in turn improves financial performance.

Anitesh Barua, Prabhudev Konana, Andrew Whinston, and Fang Yin

Measures for E-Business Value Assessment

Companies are investing heavily to leverage the Internet and transform their traditional businesses into e-businesses. Senior managers are increasingly under pressure to justify e-business costs. Do these investments pay off? And if so, how can a company make sure they keep paying off? Managers in successful companies struggle to articulate where such benefits came from, and those without success strive to find a way to turn things around and cash in on e-business initiatives.

In the last issue of *IT Professional* (Nov./Dec. 2000, "Making E-Business Pay: Eight Key Drivers for Operational Success"), we discussed results from an extensive survey about how eight key drivers affect a company's e-business success. Researchers from the Center for Research in Electronic Commerce (CREC) at the McCombs School of Business, the University of Texas at Austin, conducted the survey to assess e-business value in small, medium, and large companies across the US and Europe.

The study identified critical links between e-business drivers, operational excellence measures, and financial success measures. Here, we describe these links in detail, showing that e-business initiatives improve operational excellence, which in turn improves financial performance.

DATA COLLECTION

As our last article explained, our 74-item questionnaire addressed e-business drivers, operational measures, and financial success measures. MarketVision Research collected data from manufacturers, retailers, distributors, and wholesalers

in the US and Europe. However, the data presented here is only from the US. Of more than 4,500 US respondents contacted by phone, about 25 percent responded on the Web site. Of these, approximately 45 percent were wholesalers; 11 percent, distributors; 35 percent, manufacturers; and 9 percent, retailers. About 59 percent of the companies had 100 or less employees, 10 percent had between 101 and 400 employees, and the rest (31 percent) had more than 400 employees.

E-business drivers are key factors to maximize e-business value. The eight main drivers are:

- system integration;
- customer orientation of IT, informational and transactional;
- supplier orientation of IT, informational (quality, supply continuity, and relationship management) and transactional;
- internal orientation of IT applications;
- customer-related processes;
- supplier-related processes;
- customer e-business readiness; and
- supplier e-business readiness.

RELATING E-BUSINESS DRIVERS TO FINANCIAL SUCCESS MEASURES

Financial success measures indicate a company's financial performance. Our survey focused on four:

- revenue/employee,
- gross margin,
- return on assets, and
- return on investment.

Table 1. How e-business drivers affect each financial success measure.

Customers investing in this e-business driver...	...reported increases in these financial measures			
	Revenue/employee	Gross margin	ROA	ROI
System integration	X			
Customer orientation of IT (informational)	X	X	X	X
Supplier orientation of IT quality				
supply continuity		X	X	X
relationship	X	X	X	X
Internal orientation of IT applications				X
Customer-related processes	X	X	X	X
Supplier-related processes		X	X	
Customer e-business readiness	X	X	X	X
Supplier e-business readiness	X	X		

Revenue/employee is the ratio of revenue (sales) to the number of employees. *Gross margin* is the ratio of sales minus cost of goods sold divided by sales. Gross margin, given as a percentage, measures the difference between what a customer pays for a company’s product and the cost of goods. *Return on assets* measures a company’s profitability. ROA, usually expressed as a percentage, equals earnings divided by the present value of assets. *Return on investment* also measures a company’s profitability. It equals that company’s annual income divided by the sum of equity and long-term debt, where equity includes common and preferred stocks. ROI is a simple way to measure the income generated from a fiscal year’s investments.

Table 1 shows whether investing more in each e-business driver correlates positively with each of the financial success measures. For most of the e-business drivers, the answer is yes. (If you’re interested in the actual significance levels for this data, please feel free to contact us.) The only driver that does not appear to significantly affect any of the financial measures is supplier orientation of IT (quality). Perhaps smaller companies influence suppliers less or transact with smaller suppliers, where the use of IT might not be cost beneficial. Or, perhaps most of the companies in our study have had no significant IT investments for interfacing with suppliers. In fact, most companies lag behind in aligning their information systems toward suppliers and vendors.

RELATING OPERATIONAL EXCELLENCE TO FINANCIAL SUCCESS

The operational excellence measures are metrics of a company’s performance in its daily operations. To financially benefit from e-business investment, companies must

maintain operational excellence. The eight main operational measures are:

- percentage of revenue generated online,
- percentage of online MRO (maintenance, repair, and operations) supply procurement,
- percentage of online production-goods procurement,
- order delivery cycle time,
- number of incorrect order fulfillment incidents per month,
- percentage of service requests resolved online,
- percentage of new customers acquired online, and
- percentage of existing customers doing business online.

The percentage of revenue generated online gives the ratio of revenue generated online to total revenue. Here, we are interested in revenue from online ordering. *Percentage of online MRO procurement* is the ratio of online MRO procurement to total MRO procurement. *Percentage of online production-goods procurement* is similar, but the procurement is for direct procurement goods.

Order delivery cycle time is the time between receiving an order and delivering the product to the customer. A lower cycle time can obviously improve financial performance. *Number of incorrect order fulfillment incidents per month* (the number of times orders have been incorrectly delivered in a month) concerns the various errors that can affect order fulfillment, including recording errors, data errors during information flow, and so on. *Percentage of service requests resolved online* compares the number of customer service requests resolved online to the total number of such requests. *Percentage of new customers acquired online* is the ratio of new customers

Table 2. How operational excellence measures affect revenue/employee.

Operational excellence measure	Amount in companies observing an increase in revenue/employee	Amount in companies observing no increase in revenue/employee
Percentage of revenue generated online	40.4	10.5
Percentage of online MRO procurement	19.7	11.3
Percentage of online production-goods procurement	23.6	12.3
Order delivery cycle time (days)	10.8	15.6
Number of incorrect order fulfillment incidents per month	6.4	11.0
Percentage of service requests resolved online	40.2	16.8
Percentage of new customers acquired online	43.4	10.9
Percentage of existing customers doing business online	43.9	14.8

acquired through online operations to the total number of new customers. *Percentage of existing customers doing business online* reflects the number of existing customers who have moved their business online.

Companies observing improvements in financial measures because of e-business initiatives have far higher levels of these operational measures than those reporting no improvements. Table 2 shows how the operational excellence measures improve revenue/employee in companies reporting some or no financial benefits from investing in e-business drivers. The other three financial indicators showed similar results. Companies reporting gains in financial performance due to e-business initiative showed significantly higher levels for all eight operational excellence measures relative to companies reporting no improvements in financial measures.

Companies observing increases in revenue per employee generate at least 40.4 percent of their revenues online compared with 10.5 percent for companies observing no increase in revenue per employee. The implication is that companies will start observing actual increases in revenue per employee as they cross a threshold in the percentage increase of revenue generated online. Similar relationships hold for all other operational performance measures. In general, companies have significant potential to exploit online procurement of MRO (maintenance, repair, operation) and production goods.

Table 3. Increases in financial measures due to investment in e-business drivers for small and large companies.

Financial measure	Increase (percentage) for companies with revenue less than \$1 million		Increase (percentage) for companies with revenue of at least \$10 million	
	Mean	Median	Mean	Median
Revenue/employee	46.9	40	13.2	5
Gross margin	39.6	25	11.8	8
Return on assets	47.6	40	10.3	5
Return on investment	50.2	50	20.9	10

RELATING COMPANY SIZE TO FINANCIAL PERFORMANCE

Our study shows that as company size increases, the relationships between e-business drivers and financial performance, and operational excellence and financial performance, become stronger. However, the absolute percentage gains in financial performance decrease because larger companies face significantly higher barriers in e-business adoption. Table 3 shows the average financial gains due to investment in e-business drivers for small (less than \$1 million in revenue) and large (greater than or equal to \$10 million) companies.

We repeated this analysis for companies' transactional features with customers and suppliers. Companies with secure capabilities to submit orders online, modify orders online, automatically notify customers of order status, and pay suppliers and vendors online reported increases in all four financial measures. Surprisingly, supplier-oriented IT

Table 4. How transactional features affect each financial indicator.

Companies supporting this transactional e-business feature reported increases in these financial measures			
	Revenue/employee	Gross margin	ROA	ROI
Customers can submit orders online	X	X	X	X
Customers can modify orders online	X	X	X	X
Customers can pay online	X	X	X	X
Customers automatically notified of order status	X	X	X	X
Web site is secure	X	X	X	X
Automatic invoice transmission and processing				
Online status of procurement order available		X	X	X
Pay suppliers and vendors electronically				

functionalities such as automatic invoice processing, online status verification of procurement orders, and electronic payments to suppliers affected the financial measures less. (Perhaps companies have not made much progress with

transactional features with suppliers.) All these functionalities had some effect on ROA. Perhaps smaller firms do not have the scale to affect profitability. When we repeated the analyses for companies with revenue greater than \$10 million, the results were much stronger. Table 4 summarizes the effects of transactional features on financial performance for the entire data set.

DO COMPANIES EXPLOIT THE INTERNET FOR PROCUREMENT?

Companies lag behind in adopting the Internet for procurement of both MRO supplies and production goods. The study showed no significant differences between the percentages of online MRO and production-goods procurement. Despite a large number of business-to-business intermediaries for MRO procurement, about 34 percent of companies do not procure any items online. About 41 percent procure less than 20 percent of their MRO items online. The average online MRO procurement for all companies is about 19 percent, with a median of 5 percent. Less than 9 percent of the companies procure more than 50 percent of their MRO requirements online.

These numbers suggest significant potential for companies to gain operational efficiency by switching to online MRO procurement. Likewise, more than 42 percent of companies do not procure any production goods online, whereas about 31 percent procure less than 20 percent of their production goods online. Surprisingly, about 14 percent of companies procure more than 50 percent of their requirements online. Table 5 summarizes these results.

A majority of the companies have acquired some new customers with their e-business initiatives. Only 15 percent find no new customers acquired with their online operations, and about 43 percent have acquired less than

Table 5. Operational excellence measures for online performance.

Operational excellence measure	Percent of companies with these online percentages			
	0 percent online	1 to 20 percent online	21 to 50 percent online	More than 50 percent online
Percentage of online MRO procurement	34	41	16	9
Percentage of online production-goods procurement	42	31	20	14
Percentage of new customers acquired online	15	43	17	25
Percentage of existing customers doing business online	18	40	14	28

20 percent of their new customers online. About 25 percent of companies have acquired more than 50 percent of their new customers online. In terms of existing customers doing business online, 18 percent of companies reported none, 40 percent reported that about 20 percent of their existing customers transact online, and 28 percent said 50 percent of all their customers do business online with them. Table 5 also includes these results.

Results show that there are systematic differences in e-business drivers and operational excellence measures between companies that have observed financial gains and those that have not. Those relationships become increasingly strong as company size increases. Analysis suggests that smaller companies reap immediate benefits by extending their customer base. They do not confront system integration or complex channel conflicts, which they can readily adapt to e-business. Larger companies, on the other hand, face significantly higher levels of complexity in technology, processes, and retail-channel relationships, relative to smaller companies. Unless these large companies invest in the right set of drivers, the benefits from e-business transformation may not be significant. In fact, as our study shows, for all companies, investing in the eight main e-business drivers improves both operational excellence and financial performance. ■

Anitesh Barua is an associate professor of information systems and associate director of the Center for Research in Electronic Commerce at the McCombs School of Business, University of Texas at Austin. Contact him at barua@mail.utexas.edu.

Prabhudev Konana is an assistant professor of management information systems and the assistant director of the Center for Research in Electronic Commerce at the McCombs School of Business, University of Texas at Austin. Contact him at pkonana@mail.utexas.edu.

Andrew Whinston is a professor of information systems, economics, and computer science; the Hugh Roy Cullen Centennial Chair in business administration; and the director of the Center for Research in Electronic Commerce at the McCombs School of Business, University of Texas at Austin. Contact him at abw@uts.cc.utexas.edu.

Fang Yin is a doctoral student in management information systems at the McCombs School of Business, University of Texas at Austin. Contact him at fyin@mail.utexas.edu.