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# CRITO Research: Improving Your Return on IT Investments: Aligning Information Technology with Business Strategy

by Paul Tallon

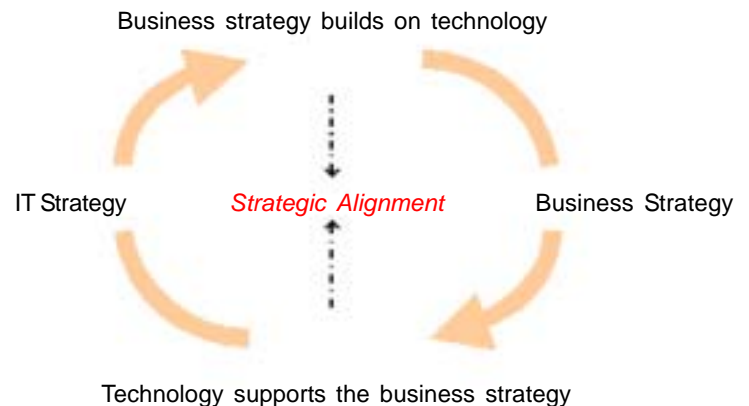
## Introduction

Strategic alignment, the alignment of information technology (IT) with business strategy, has repeatedly been ranked among the most important issues facing executives worldwide. While there is much discussion among IT managers as to how alignment can be achieved across organizations and built into the planning phase of IT projects, there has been some question about the benefits of closer alignment. The issue, therefore, is whether improved alignment between IT and the business strategy will enable a firm to achieve a higher return on its IT investment. This summary reports on the results of an international survey of companies across a variety of industries, the results of which indicate that strategic alignment is an important determinant of payoffs from IT.



## Modeling Strategic Alignment

In a managerial setting, strategic alignment is usually seen as the use of IT investments to support business strategy. While creating IT support for business activities is an increasingly important dimension of alignment, it is only one half of the relationship. As shown below, strategic alignment involves a bi-directional relationship between IT and business strategy. The critical component that corporations often overlook is that alignment can be improved by introducing changes to business strategy that take account of IT capabilities. Developing business opportunities in response to internally created IT capabilities is a way to enhance business strategy without having to make drastic changes to a company's existing portfolio of IT investments. In this way, it is possible to model strategic alignment by measuring not only the extent to which IT supports business activities, but also the extent to which the business strategy capitalizes on IT capabilities.



**Figure: Dimensions of Strategic Alignment**

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# CRITO Research: Returns to IT Investment — What the Numbers Say

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Vijay Gurbaxani, Jason Dedrick, and Kenneth Kraemer

*“You can see the computer age everywhere but in the productivity statistics.”*

Robert Solow, Nobel Prize-winning MIT economist, 1987

*“Despite differences in methodology and data sources, a consensus is building that the remarkable behavior of IT prices provides the key to the surge in economic growth.”*

Dale Jorgenson, Harvard economist, 2001

There is a strong consensus among economists that IT investment pays off in higher productivity, and that it was a significant source of economic growth in the second half of the 1990s. The argument now is whether the high rates of productivity growth associated with the move to the IT-intensive networked economy are due to a fundamental transformation derived from structural changes in business processes and accompanied by a permanent improvement in the prospects for economic growth, or whether it is a temporary phenomenon, enabled by the business cycle.

Investments by U.S. companies in information technology increased steadily from 1950 until about 1995. Then they accelerated significantly, resulting in accelerated labor productivity growth, which in turn led to significant increases in per capita income. Labor productivity, which grew at 1.5 percent per year in the 1973-1995 period, grew at 3.1 percent per year in the period, 1995-2000.

Yet, in the face of the recent economic slowdown, IT investment has fallen sharply. A significant factor in the reduction in IT spending is uncertainty about the returns to these investments, magnified by the reduced competitive pressure from the dot-com companies. The trend is not universal. Companies such as Fidelity Investments and General Electric continue to spend aggressively on IT, perceiving increased opportunities as their competitors scale back their investments. Their confidence is supported by evidence provided in the rich academic literature that has emerged in the last decade. Also, Alan Greenspan believes we are experiencing only a pause in what he calls “investment in a broad set of innovations that has elevated the underlying growth rate in productivity.”

## Two Paths to Productivity

The fundamental economic mechanisms by which IT investments boost productivity can be grouped into two categories. First, providing workers with more IT capital can increase labor productivity, in the same way as

traditional capital investments such as factory equipment do. Economists call this mechanism capital deepening.

Second, some researchers have suggested that IT is different from traditional forms of capital in that it not just automates, but also provides better information for decision-making, and enables substantial organizational transformation. Correspondingly, investments in IT have the potential to result in large performance improvement through an impact on production techniques and methods. These improvements in production methods imply that higher levels of output can be achieved without increasing the levels of capital and labor inputs. Economists measure technical progress as multi-factor productivity (MFP), or the increase in output for a constant level and quality of inputs.

A cashier at a retail chain store, for example, can process a transaction in less time using a point-of-sale system, increasing his productivity. Further, information provided by the system allows the firm to make better inventory decisions, which may further enhance productivity. To achieve even higher levels of productivity, the company may redesign its supply chain using a supply chain management system, of which the point-of-sale system is a key element. These improvements in process may increase MFP at the firm level and lead to permanent improvements in productivity.

In recent years, numerous researchers have conducted rigorous empirical studies of the returns to IT investment to firms. The preponderance of evidence provided in these studies suggests that, in all sectors of the economy, IT investment raises productivity via capital deepening. The results for multifactor productivity are witnessed clearly in some industry sectors, such as durable goods and high technology. In these sectors of the economy, it is the case that IT has also enabled structural changes in production techniques and process that permanently improve the prospects for economic growth.

## Complementary Business Investment is Crucial

Interestingly, while average returns to IT investment are significant and positive, the benefits vary widely among companies. The greatest returns accrue to companies that invested in systems that enhance and complement critical business processes. Of critical importance, investments in IT capital must be coupled with investments in organizational assets through practices such as process redesign, employee empowerment, training, and decentralized decision-making.

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## Returns to IT Investment — What the Numbers Say *(continued from page 2)*

Dell Computer and Wal-Mart are two companies that exemplify the importance of aligning technology strategy with the business. Through their relentless focus on using IT consistently to leverage their business models, they have come to dominate their respective industries. Wal-Mart selects and applies information systems judiciously, driven by a singular focus on driving supply-chain efficiency. Its technology-enabled supply-chain-management practices are widely acknowledged as among the best in the world, allowing it to offer the best value proposition to its customers. Indeed, Wal-Mart's gains in efficiency have spurred its competitors to strive for similar gains, resulting in permanent improvements in the overall productivity of the industry. Dell has achieved end-to-end integration from its customers to its suppliers with an efficiency that no other PC manufacturer has been able to copy. This integration has allowed Dell to respond to market conditions rapidly, managing its production processes with the lowest levels of inventory in the industry, and adopting new technologies more rapidly than its competitors.

### **Productivity Increases Will Continue**

There are sound reasons for expecting IT to continue to enhance productivity. As Alan Greenspan reported earlier this year, the exploitation of available networking and other information technologies was only partially completed when the cyclical retrenchment of the past year began. It is both the direct impact of IT on labor productivity and its role as an enabler of more efficient business organizations that matter. Payoffs from IT investment accrue to companies that never lost sight of the basics — those that invested in IT and complementary organizational assets.

Importantly, these findings are derived mainly from examining the returns to IT investment in old-economy firms, suggesting that these firms can be central to productivity gains in the future. Companies must seek not only to derive benefits from new applications of IT, but also focus on exploiting fully their prior investments in the technology. Executives must be driven by a relentless commitment to discovering additional sources of efficiency and effectiveness through the deployment of new information technologies in concert with organizational changes.

Our perspective is based on our own original research at the firm and country level, as well as a critical assessment of the evidence presented in the rich academic literature that has emerged in the last decade.

### **A Financial-Services Company**

The Charles Schwab Company illustrates how senior executives mix a disciplined approach with risk taking in IT investments. Like its competitors, it has invested in IT to improve customer service and enhance productivity. What sets Schwab apart is how IT is integrated with the rest of the business.

The firm's CIO sits on the executive board and has an equal voice with other business managers. IT is centralized, but is aligned with business units. The IT manager for each business unit reports to the CIO and is responsible for ensuring that IT is meeting the needs of that unit. This structure helps the firm gain the economies of scale of centralization while keeping a strong focus on business needs.

Technology budgets are funded by the business unit heads, not by the technology people. Technology investments must compete with other potential uses of funds, such as advertising or opening a new sales office, helping ensure that sound investment decisions are made. Schwab understands that the value of an IT investment is difficult to measure. So investments are based on a combination of best estimates of specific benefits and executives' instincts as to the more indirect benefits.

The payoffs to Schwab have been impressive. From 1991 to 2000, revenues increased nearly ten-fold and net income soared from \$49 million to \$718 million. Like other brokerages, Schwab has suffered from the stock market reverses of 2000-2001 and has downsized its staff. But the company's lower-cost operations and large customer base puts it in a good position to weather the slowdown and come out stronger with its IT-led customer focus.

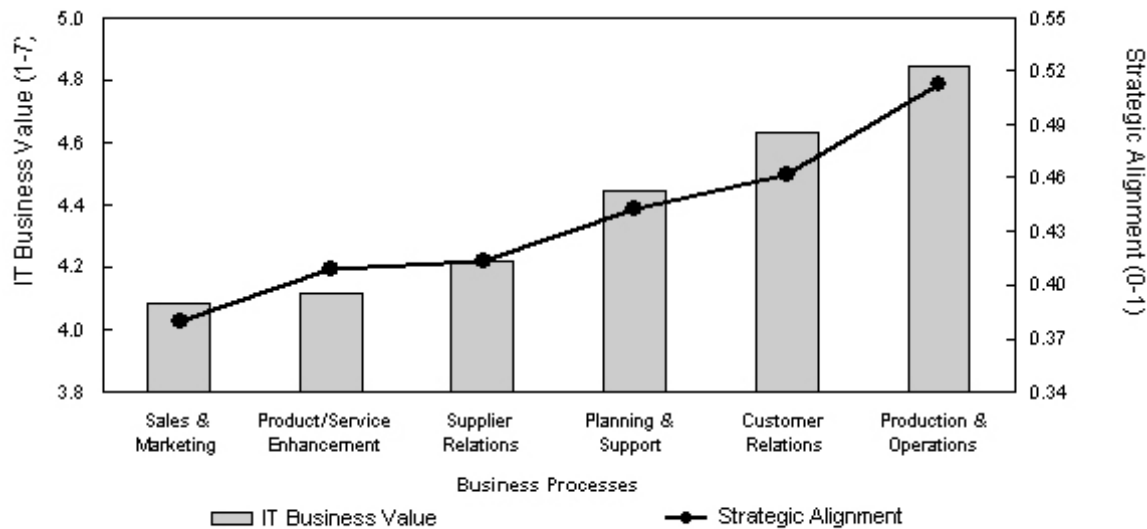
Originally Published in *CSC World*

## Improving your Return on IT Investments *(continued from page 1)*

### Benefits of Improved Strategic Alignment

The many complexities associated with measuring the benefits of IT investment are widely known. Despite this, previous research at the Center for Research on IT and Organizations (CRITO) at the University of California, Irvine, and subsequently at Boston College, has been able to identify payoffs from IT by assessing executives' perceptions of the business value of IT across a variety of business processes. One of the advantages of identifying the business impacts of IT through the eyes of business and IT executives is being able to examine the soft or intangible impacts of IT, without necessarily having to express all costs and benefits in quantifiable or financial terms. In terms of measuring the impacts of strategic alignment, executives' perceptions also allow us to assess how strategic alignment impacts IT payoffs in the different processes of the corporation. Rather than think about strategic alignment as a firm-wide concept, we can begin to think about aligning IT and business strategy inside specific processes.

In late 1999 and early 2000, we applied this notion to a study of process-level alignment and IT business value across 100 companies (average revenues: \$7.3 billion). The question we sought to answer was whether strategic alignment has a positive impact on payoffs from IT investment. As revealed in the diagram below, our findings support this positive relationship, confirming that in processes where corporations have been able to achieve a high degree of fit or congruence between IT and business strategy, payoffs from IT (or the contribution of IT to firm performance) are higher than in processes where alignment is absent. It is also worth noting that strategic alignment and IT business value are highest inside production and operations, confirming that IT investment has been able to deliver lower production costs, improved labor productivity, greater flexibility and higher throughput.



**Figure: Strategic Alignment and IT Business Value**

### Conclusion

The research clearly shows that closer alignment between IT and business strategy is beneficial for corporations. Coming at a time when IT budgets are under increasing pressure and budget cuts are the norm, this suggests that corporations may still realize a greater return on their IT investment if they succeed in aligning IT with their business strategy. For those leading-edge corporations (e.g., Dell, Motorola and Intel) who see IT as a strategic resource, alignment is especially important in developing new business opportunities that use IT capabilities in new and innovative ways. The challenge now, it seems, is for firms to identify what management and IT-planning practices can help them move IT and business strategy closer together.

## Publications and Talks

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**Paul Dourish** and **Andre van der Hoek**. “Émigré: Metalevel Architecture and Migratory Work.” *Proceedings of the European Conference Mobile Human-Computer Interaction* (Pisa, Italy), September 2002. This paper discusses different models and approaches to the problems of user interfaces for mobile systems (e.g. wireless-connected laptops, cell phones, or PDAs). Rather than trying to eliminate the distinctions between different locations, the paper suggests embracing these differences, and adapting to different technical, organizational, and social settings. It outlines an approach, based on software architecture specification, to making this adaptation. <ftp://ftp.ics.uci.edu/pub/jpd/papers/2002/mobhci-émigré.pdf>.

**Paul Dourish** and **David Remiles** published “An Approach to Usable Security Based on Event Monitoring and Visualization” in *Proceedings of the New Security Paradigms Workshop 2002* (Virginia Beach, Virginia), September 2002. Technologists think of security as a technical problem, to be solved using mathematical and technical approaches. In practice, though, security in real information systems is a practical problem for system users, who need to figure out whether the system in front of them is usable for the tasks they need to perform. This paper discusses the difference between technical and practical views of security, and outlines a new approach, currently under development, to enabling effective decision-making by end-users of networked information systems.

**Rebecca Grant** delivered a paper titled “The State of E-Business Implementation: A Survey of North American Clicks and Mortar Companies” at the Fifth International Conference on E-Commerce Research in Montreal, Quebec on October 24. The paper presented the findings of a survey of how North American firms choose to carry out a variety of e-business development activities. Details of the conference can be found at <http://tecom.cox.smu.edu/icecr5/>.

**Alfred Kobsa** gave a keynote presentation titled “Universal Access and Privacy” (see <http://www.ics.uci.edu/~kobsa/talks/talks.htm>) at the 7th ERCIM Workshop “User Interfaces for All” in Paris, France.

**Gloria Mark, Alfred Kobsa** and **Victor Gonzales** reported on their CRITO research in their paper “Do Four Eyes See Better than Two? Collaborative versus Individual Discovery in Data Visualization Systems” at the Fifth International Conference on Information Visualisation, London, U.K. (see <http://www.ics.uci.edu/~kobsa/papers/2002-IV02-kobsa.pdf>).

**John Mooney** participated in a panel session on “Dynamic Technology Innovations” at ComTech 2002. He argued that web services represent a very compelling technological innovation for business, offering a range of capabilities that extend from providing a new platform for the development of Internet-based software modules, to leveraging and integrating legacy IT systems, to providing an infrastructure for supplying and acquiring outsourced business services. However, he cautioned that all technological innovations must be complemented with innovations in business and management practices, and that it is the latter that ultimately determines the success or failure of new technology adoption.

**Madhu Reddy** and **Paul Dourish** published “A Finger on the Pulse: Temporal Rhythms and Information Seeking in Medical Work” in *Proceedings of the ACM Conference on Computer-Supported Cooperative Work CSCW 2002* (New Orleans, LA), November 2002. While information repositories and information-retrieval technologies are major aspects of modern organizational IS infrastructures, information delivered by these systems is largely presented outside of the context in which it was generated and added to the system. These ethnographic investigations illustrate how, in the course of seeking and providing information, individuals orient themselves towards the rhythms of work. Rhythms are patterns in the repetition of activities over time, and they furnish individuals with ways to understand the context of their own work and that of others. Some implications for the design of online information systems are explored. <ftp://ftp.ics.uci.edu/pub/jpd/papers/2002/cscw02-rhythms.pdf>.

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## **IAB Meeting Slated for January 23-24, 2003**

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The next meeting of the Industry Advisory Board (IAB), the governing body of the CRITO Consortium, will take place January 23-24, 2003 at the Beckman Center in Irvine. The meeting will be an opportunity for partners to hear about and provide input on current and upcoming research projects. In addition, participants will enjoy interesting speakers and engaging panel discussions. Watch the CRITO web site for updated schedule information.

The meetings are open to IAB representatives, guests from their organizations, and CRITO-associated faculty, graduate students and staff. Following the format tried successfully last June, the meeting will begin at noon on Thursday and end by 1 p.m. on Friday to facilitate travel to and from the event.



For more information on the meeting, visit <http://www.crito.uci.edu/iab2003-01.asp>. To learn more about the IAB and CRITO Consortium, contact Karen Walsh at (949) 824-1323, [kmwalsh@uci.edu](mailto:kmwalsh@uci.edu).

## **The CRITO Consortium**

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### **CRITO Welcomes Technology Solutions Company (TSC) to the Consortium**

CRITO is pleased to announce that Technology Solutions Company (NASDAQ: TSCC) has joined the CRITO Consortium. Dr. Nicholas Vitalari, a former UCI faculty member, will represent TSC. Dr. Vitalari is a Senior Vice President of TSC and Managing Director of the Performance Economics Institute (a division of TSC). The Performance Economics Institute is a membership of senior business and government executives dedicated to advancing the art and science of superior economic performance. Technology Solutions Company is a publicly traded consulting firm that provides business execution and technology services to global and midsize clients in the commercial and governmental marketplace. The company has headquarters in Chicago. TSC is interested in the management of IT and the impact of IT on business and government productivity.

### **CRITO Welcomes International Data Corporation (IDC) to the Consortium**

CRITO is pleased to announce that International Data Corporation (IDC) has joined the CRITO Consortium. IDC will be represented by John Gantz, IDC's Chief Research Officer and Carol Glasheen, Vice President Global Market Models and Demand-Side Research. IDC is the world's leading provider of technology intelligence, industry analysis, market data, and strategic and tactical guidance to builders, providers, and users of information technology. They provide global research with local content through more than 720 analysts in 43 countries worldwide. IDC is interested in CRITO's work on globalization and the management of IT.

**CRITO Consortium**  

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**University of California, Irvine**  

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## Publications and Talks (continued from page 5)

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**Walt Scacchi** received a National Science Foundation Information Technology Research (NSF ITR) grant to conduct a three-year study of the organizational dynamics of problems, bugs, failures, and repairs arising in open-source software systems. This is a collaborative research project with Les Gasser at the University of Illinois, Urbana-Champaign, and the UCI Institute for Software Research. Total funding on this grant is \$750,000. This is Scacchi's second NSF ITR grant that involves the study of socio-technical processes and practices associated with open-source software systems.

**Walt Scacchi** was also selected to serve as Research Coordinator on a NSF ITR research project investigating

an integrated social and technical approach to the development of distributed, inter-organizational software applications, directed by Professor Richard N. Taylor at the UCI Institute for Software Research. This four-year research grant is funded at \$1,800,000.

Finally, **Walt Scacchi** completed a three-year research project funded by the Defense Acquisition University investigating how open-source software-development processes can be integrated within the acquisition of software-intensive systems for defense and management information-system applications. The final report is available at <http://www.ics.uci.edu/~wscacchi/ProjectReports/>

## Faculty and Staff Announcements

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CRITO Faculty Associate **Rebecca Grant** has been selected to participate in "Women in the Lead," a juried database of Canadian women recommended for corporate board memberships. In addition, she began serving as executive vice president of the Greater Victoria Chamber of Commerce November 1, 2002.

**Madhu Reddy, Wanda Pratt, Paul Dourish, and Michael Shabot** won the Diane Forsythe award for best paper published by the American Medical Informatics Association at the intersection of Medical Informatics and Social Science. The paper title is "Asking Questions: Information Needs in a Surgical Intensive Care Unit." Drawing on ethnographic fieldwork in a medical organization, this paper demonstrates the importance of organizational information as well as medical information in supporting decision-making in medical care. The paper can be viewed at <ftp://ftp.ics.uci.edu/pub/jpd/papers/2002/amia-infoneeds.pdf>. This work was supported by a grant from the CRITO Consortium.

**Jeannie Nguyen-Doan** will be joining CRITO as the financial assistant. Her responsibilities include processing payroll, travel arrangements, purchasing, and requests for payment and reimbursements, as well as other miscellaneous duties. Jeannie comes to CRITO from private industry, but has 10 years experience working at UCLA's Patient Business Services Department.



Grant



Nguyen-Doan



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## CRITO in the Media

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CRITO Director **Ken Kraemer** took some time earlier this fall to talk to the media following a press release about CRITO's Global E-Commerce Report. The press release elicited the following media coverage:

- KSUN Radio Northridge, September 4.
- *The Daily Deal*, a New York-based business publication targeted at investment bankers, venture capitalists and private bankers, in their September 12 issue focusing on privacy and e-commerce.
- KPLS Radio, September 27.
- *UCI News*, a campus-based publication sent to UCI supporters, alumni and the local community, in their September 2002.
- Front-page placement and link on UC Irvine's web site, [www.uci.edu](http://www.uci.edu).

Research on the Global E-Commerce Report was conducted by Ken Kraemer, Debora Dunkle, Jason Dedrick and Jennifer Gibbs.

**Alladi Venkatesh**, CRITO associate director, was quoted in an October 26 story on video-on-demand in the *Orange County Register*.

## Calendar of Events

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January 23-24, 2003. Industry Advisory Board Meeting, Beckman Center, UC Irvine (949) 824-1323.

April 6-8, 2003: HOIT 2003: The Networked Home and the Home of the Future, CRITO. (949) 824-1134.



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