72.1 Introduction

Interest in the business value of IT has been a dominant theme in the information systems literature since its early days. The literature on IT value has expanded considerably from its origins in the 1970s (Lucas 1975a,b). IT has become far more pervasive throughout the economy since 1970s, changing the way firms do business, enabling new business models that are creating value, and altering everyday life through social networking and Web 2.0 applications (Lucas 2008; Mithas 2012). Our goal in this chapter is to review what the field has learned in the last 40 years and discuss future opportunities for research (see Table 72.1 for several prior reviews of this literature).

Our conclusion is that there is no question any longer that IT, if properly deployed, creates value for organizations and society. We now have a much better understanding of how IT contributes to value, but the changing nature of IT raises some new questions. How do organizations incorporate rapidly developing technologies into their business models? What new kinds of services and products does the technology make possible? How should incumbent firms respond to new technologies that may destroy their value; for example, how does management avoid the outcomes that have befallen Borders, Blockbuster, and Kodak? These and many other related questions make the business value of IT research an enduring, interesting, and exciting area for researchers and practitioners.
### TABLE 72.1 Selective Meta Review of Review Articles on “Business Value of IT” Literature

<table>
<thead>
<tr>
<th>Study</th>
<th>Time Period and Focus of Review</th>
<th>Key Findings</th>
<th>New Opportunities for Research Identified in the Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucas (1993)</td>
<td>1960–1991, Historical perspective on the business value of IT</td>
<td>• Technology should be suitable to the situation in which it is used</td>
<td>• Studies of the deployment of one type of technology and of its users during system implementation offer the best chance to demonstrate that an investment in IT has business value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To demonstrate business value, the organization and individuals must use technology in an appropriate manner</td>
<td></td>
</tr>
<tr>
<td>Brynjolfsson (1993)</td>
<td>1983–1993, Empirical studies of IT and productivity</td>
<td>• IT productivity paradox might be due to four reasons: mismeasurement, lags, redistribution, and mismanagement</td>
<td>• Researchers must be prepared to look beyond conventional productivity measurement techniques</td>
</tr>
<tr>
<td>Brynjolfsson and Yang (1996)</td>
<td>1982–1995, Empirical studies of IT and productivity</td>
<td>• Several studies document IT’s positive effect on productivity performance</td>
<td>• There is little evidence of a positive contribution from IT to other performance measures such as profit and market value</td>
</tr>
<tr>
<td>Brynjolfsson and Hitt (2000)</td>
<td>1987–2000, Empirical studies of interaction of IT and organizational complements on productivity</td>
<td>• Organizational capital complements IT investments to increase performance</td>
<td>• Measuring the intangible components of complementary organizational assets</td>
</tr>
<tr>
<td>Barua and Mukhopadhyay (2000)</td>
<td>1963–1999, Studies on “process-oriented” and production function approach</td>
<td>• A positive contribution does not tell us whether we over- or underestimate IT impacts • Complementarity between IT and other factors</td>
<td>• Can we empirically distinguish between firms that make identical investments in IT but that may obtain very different returns from such investments? • What are some key factors that might have been ignored in production function and business value studies?</td>
</tr>
<tr>
<td>Dehning and Richardson (2002)</td>
<td>1990–2002, Archival studies that use accounting or market measures of firm performance</td>
<td>• Proposes a framework for IS research by suggesting that IT has a direct or indirect effect on business processes, which together determine the overall performance</td>
<td>• Examining the relation between IT and business processes, and business processes and overall firm performance • Understanding the effect of contextual factors on the IT-performance relation • Examining the IT-performance relation in an international context • Examining the interactive effects of IT spending and IT management on firm performance • Understanding of the mechanisms by which IT pays off in higher productivity • IT spillover effects • Further examine the IT and profitability relationship • Excess returns at the firm level • Timing of payoff from IT investments • Industry differences on IT returns</td>
</tr>
<tr>
<td>Dedrick et al. (2003)</td>
<td>1985–2002, Empirical studies based on economic analysis on IT productivity</td>
<td>• At both the firm and the country level, greater investment in IT is associated with greater productivity growth • IT-performance relationship at the firm level can be further explained by complementary investments in organizational capital</td>
<td></td>
</tr>
</tbody>
</table>

© 2014 by Taylor & Francis Group, LLC
Because the onset of modern computing started in 1950s, information systems is a relatively young discipline, compared to other disciplines found in business schools. The field started to create an identity in the 1960s. Gordon Davis wrote one of the first books to introduce business students to computers in 1965. Subsequently, Gordon Davis, Gary Dickson, and Tom Hoffmann started a program at the University of Minnesota in 1967 to offer a master’s degree and a PhD in Management Information Systems (Davis 2009). The Sloan School at M.I.T. had a large group of IS faculty in the late 1960s and offered a PhD in information systems. The University of Arizona, NYU and Purdue University also started PhD programs in 1970s. The first premier scholarly journal of the discipline MIS Quarterly was launched in 1977 with Gary Dickson as the editor and Hank Lucas as associate editor. The first conference in information systems, ICIS, started in 1980. INFORMS launched the other premier journal of the field, Information Systems Research, in 1990.

With this backdrop of the evolution of the discipline, we trace the development of business value of IT research in three overlapping phases over time.

### 72.2 Phases and Foci in Business Value of IT Research over Time

Because the onset of modern computing started in 1950s, information systems is a relatively young discipline, compared to other disciplines found in business schools. The field started to create an identity in the 1960s. Gordon Davis wrote one of the first books to introduce business students to computers in 1965. Subsequently, Gordon Davis, Gary Dickson, and Tom Hoffmann started a program at the University of Minnesota in 1967 to offer a master’s degree and a PhD in Management Information Systems (Davis 2009). The Sloan School at M.I.T. had a large group of IS faculty in the late 1960s and offered a PhD in information systems. The University of Arizona, NYU and Purdue University also started PhD programs in 1970s. The first premier scholarly journal of the discipline MIS Quarterly was launched in 1977 with Gary Dickson as the editor and Hank Lucas as associate editor. The first conference in information systems, ICIS, started in 1980. INFORMS launched the other premier journal of the field, Information Systems Research, in 1990.

With this backdrop of the evolution of the discipline, we trace the development of business value of IT research in three overlapping phases over time.

#### 72.2.1 First Phase from 1970s until the Mid-1990s

The first phase of IT value research from 1970s till late 1990s focused on the so-called productivity paradox (Lucas 1999; Panko 1991). During this period, academic studies and the business press periodically revisited this so-called paradox of computers. The productivity paradox referred to the phenomenon that, on the one hand, computing power in the U.S. economy increased significantly over this period, but on the other hand, economy-wide productivity, especially in the service sector, seemed to have stalled. For example, the average labor productivity growth in the U.S. economy averaged only about 1.4% from 1973 to 1995 (Brynjolfsson and Saunders 2010).
Many economy-level studies found broadly negative correlations of IT with productivity. Econometric estimates also suggested low IT capital productivity in different industries (Brynjolfsson and Yang 1996; Loveman 1994; Roach 1991). Multifactor productivity growth, which takes into account changes in capital, had also declined significantly during the period (Baily 1986). The overall negative correlation between economy-wide productivity and the advent of computers was used by some to argue that information technology did not help U.S. productivity or even that IT investments were counterproductive (Baily 1986). This link was further supported by Stephen Roach’s (1987, 1991) research focusing specifically on information workers across industries. Roach cites statistics indicating that output per production worker grew by 16.9% between the 1970s and 1986, while output per information worker decreased by 6.6%.

Industry-level studies also suggested that most of the productivity slowdown was concentrated in the service sector (Roach 1987, 1991). Because services use a significant part of computer capital, this was taken as indirect evidence of poor IT productivity. Roach’s widely cited research on white collar productivity, discussed earlier, focused principally on IT’s performance in the service sector (Roach 1987, 1991). Studies using data from manufacturing also found evidence of a productivity paradox. Berndt and Morrison used a dataset from the U.S. Bureau of Economic Analysis (BEA) that covers the whole U.S. manufacturing sector. Morrison and Berndt (1991) found evidence that every dollar spent on IT produced, on average, less than one dollar of value on the margin, indicating a general overinvestment in IT. They also examined broad correlations of IT with labor productivity and multifactor productivity (Berndt and Morrison 1995) and did not find a significant difference between the productivity of IT capital and other types of capital for a majority of the 20 industry categories.

Some firm-level studies also examined the relationship between IT investment and productivity. Among studies of IT’s impact on the performance of financial services firms, a study by Parsons et al. (1993) estimated a production function for banking services in Canada and found that the impact of IT on multifactor productivity was quite low between 1974 and 1987. Another study looked at data on the insurance industry and found a positive, but quite weak, relationship between IT expenses and various performance ratios (Harris and Katz 1991). Among firm-level studies of IT productivity in the manufacturing sector, Loveman (1994) estimated that the impact of IT capital on output was approximately zero over the 5 year period studied in almost every subsample he examined. Weill (1992) was able to disaggregate IT by use. He found that significant productivity could be attributed to transactional types of information technology, but he was unable to identify gains associated with strategic systems or informational investments.

Researchers proposed several explanations for the so-called IT productivity paradox: (1) mismeasurement of outputs and inputs, (2) lags, (3) redistribution and dissipation of profits, and (4) mismanagement of information and technology (Brynjolfsson and Yang 1996). Some even argued that given measurement errors and the nonautomatic nature of payoffs, it was time to stop conducting general IT impact studies for the entire economy and, instead, consider studies of the management of IT impacts for departments, individual firms, and individual users (Panko 1991). Subsequent research addressed some of these issues and led to resolution of the original “productivity paradox” while observing some new paradoxes.

### 72.2.2 Second Phase from Mid-1990s until the Early 2000s

The second phase of value research from mid-1990s till mid-2000s (and continuing) used newer datasets and more sophisticated methodologies. Some of these studies documented IT’s positive effect on productivity (see Table 72.2). Lichtenberg (1995) reported positive effects of IT based on output. Brynjolfsson and Hitt (1996) confirmed the results of Lichtenberg (1995) and their own prior study (Brynjolfsson and Hitt 1995) using the same data source and similar methods based on output and consumer surplus measures.

This phase also began to focus on intangibles, and some of this literature observed a “new productivity paradox” (Anderson et al. 2003). The use of the word “productivity” may not have been entirely accurate here because researchers were characterizing high valuation multiples on Y2K spending, which ranged from 31 to 45 for 1999 to 2002 (about 3–4 times that on R&D spending) as the new paradox of too high returns on IT (Anderson et al. 2003). Tables 72.3 and 72.4 provide a summary of these studies.
Several studies have stressed the need for better theoretical models that trace the path from IT investments to business value (Bharadwaj 2000). These researchers adopted a “process-oriented” view that examines the effects of IT on intermediate business processes (Barua et al. 1995; Melville et al. 2004; Tallon et al. 2000).

Other researchers proposed that the positive effect of IT on intermediate variables can be examined through internal firm processes, inter-organizational relationships, and customer relationships. First, some studies suggested that IT enables greater automation, streamlining, and rationalization of processes (Santhanam and Hartono 2003). Better governance of systems and streamlined processes also enable firms to make better and more accurate use of their data—leading to improved analytical models and inferences (Davenport 2006) and more effective strategic decision making. IT investments can also facilitate innovation in products and services to help firms leverage organizational learning and knowledge (Kleis et al. 2012; Ravichandran et al. 2011; Tippins and Sohi 2003).

Second, IT investments can also enhance business processes critical in inter-organizational partnerships such as supply-chain relationships and corporate alliances. IT infrastructure provides firms with the ability to implement shared transaction processing and supply chain management across organizational boundaries (Mukhopadhyay and Kekre 2002; Whitaker et al. 2007). IT also makes it possible to reduce transaction hazards that could arise within inter-organizational relationships (Kim

### TABLE 72.2  Selected Empirical Studies Linking IT and IT-Enabled Capabilities with Productivity

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tambe et al. (2012)</td>
<td>Survey of 253 firms in 2001 matched with IT employment data</td>
<td>IT employment</td>
<td>Product development and productivity</td>
<td>Test a three-way complementarities model that indicates that the combination of external focus, decentralization, and IT is associated with significantly higher productivity. In contrast, firms that have only one or two of these organizational practices in place, instead of all three, are not more productive than firms with none of them.</td>
</tr>
<tr>
<td>Tambe and Hitt (2012)</td>
<td>1800 firms across 20 years (36,000 firm-years from 1987 to 2006)</td>
<td>IT personnel counts</td>
<td>Value added (sales minus nonlabor variable costs)</td>
<td>IT returns are substantially lower in small- and mid-sized firms than in Fortune 500 firms and materialize more slowly in large firms. The measured marginal product of IT spending is higher from 2000 to 2006 than in any previous period, suggesting that firms, and especially large firms, have been continuing to develop new, valuable IT-enabled business process innovations. Furthermore, the productivity of IT investments is higher in manufacturing sectors.</td>
</tr>
<tr>
<td>Brynjolfsson and Hitt (1996)</td>
<td>1987–1991</td>
<td>IS spending</td>
<td>Sales</td>
<td>Average marginal product of computer capital was 81% compared to 6.26% for noncomputer capital. Attribute to hidden IT capital and organizational capital.</td>
</tr>
</tbody>
</table>
### TABLE 72.3 Selected Empirical Studies Linking IT and IT-Enabled Capabilities with Firm Risk and Returns

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li et al. (2012)</td>
<td>2004–2008 data with 5230 firm-year observations</td>
<td>IT control quality, types of IT material weaknesses</td>
<td>Management forecast accuracy</td>
<td>Firms with IT material weaknesses in their financial reporting system are associated with less accurate management forecasts; systems with IT material weaknesses related to data processing integrity have the least accurate management earnings forecasts</td>
</tr>
<tr>
<td>Dewan and Ren (2011)</td>
<td>1987–1994 data over 500 Fortune 1000 firms</td>
<td>IT capital</td>
<td>Firm return and firm risk</td>
<td>Suitable boundary strategies can moderate the impact of IT on firm performance in a way that increases return and decreases risk; this interaction effect is strongest in service firms, in firms with high levels of IT investment, and in more recent time periods</td>
</tr>
<tr>
<td>Kim et al. (2012)</td>
<td>1995–2002 data</td>
<td>IT investments</td>
<td>Bond rating and yield spread</td>
<td>Bondholders have different perspective toward risk than equity investors; lower bond ratings and higher yield spread in transform industries than in automate or informate industries</td>
</tr>
<tr>
<td>Henderson et al. (2010)</td>
<td>1991–2005 data from InformationWeek</td>
<td>IT investments</td>
<td>Market value, accounting performance, firm risk, abnormal stock returns</td>
<td>Information about a firm’s IT expenditures help explain its future performance in terms of accounting measures and market measures; mispricing is attributable, at least in part, to the lack of adequate and verified information about firms’ investments in IT</td>
</tr>
<tr>
<td>Kobelsky et al. (2008)</td>
<td>1992–1997 data from InformationWeek</td>
<td>IT investments</td>
<td>Earnings volatility</td>
<td>IT investments increase the volatility of future earnings; this impact is highly contingent upon sales growth, unrelated diversification, and size</td>
</tr>
<tr>
<td>Dewan et al. (2007)</td>
<td>1987–1994 data on over 500 Fortune 1000 firms</td>
<td>IT capital</td>
<td>SD (daily stock returns) and SD (realized annual earnings for 5 years after investment), market value of firm</td>
<td>Attribute high returns on IT to higher IT risk. About 30% of gross return on IT investment is due to risk premium associated with IT</td>
</tr>
<tr>
<td>Dewan and Ren (2007)</td>
<td>1996–2002 event data</td>
<td>Electronic commerce announcements</td>
<td>Risk-adjusted abnormal return</td>
<td>Wealth effects are not significant after controlling for contemporaneous risk changes</td>
</tr>
</tbody>
</table>

© 2014 by Taylor & Francis Group, LLC
Information Technology and Firm Value

Third, IT improves existing customer relationships and helps reach new customers, sometimes involving new channels or new offerings (Mithas et al. 2005). IT systems such as customer relationship management (CRM) facilitate personalization of offerings and services through improved knowledge of customers’ wants and needs, leading to better customer response, improved one-to-one marketing effectiveness (Mithas et al. 2006), and higher customer satisfaction (Ansari and Mela 2003; Babakus et al. 2004). In turn, customer satisfaction is associated with higher stock prices and shareholder values and reduced risk (Aksoy et al. 2008, 2012; Fornell et al. 2006, 2009a,b; Tuli and Bharadwaj 2009).

Overall, studies focusing on business processes are examining the activities residing in the black box of microeconomic production theory that transforms a set of inputs into outputs (Melville et al. 2004). These studies suggest that IT can be employed not only to improve individual processes but also to enable process integration across physical and organizational boundaries, thereby improving organizational performance.

72.2.3 Third Phase from Early 2000s Onward

The third phase of value research starting early 2000s began to focus on profitability and shareholder value metrics that also take into account “appropriation of value” aspect of firm performance (see Table 72.5). Previous research, using firm-level IT investment data in early 1990s (Hitt and Brynjolfsson 1996; Rai et al. 1997), failed to find a statistically significant effect of IT investments on firm profitability,

---

**TABLE 72.3 (continued) Selected Empirical Studies Linking IT and IT-Enabled Capabilities with Firm Risk and Returns**

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oh et al. (2006)</td>
<td>1985–1999 event data</td>
<td>IT investment announcements</td>
<td>Cumulative abnormal return</td>
<td>A firm’s growth prospects, uncertainty, the strategic role of IT, and disclosure information are significantly related to CARs; asset specificity and uncertainty interacts negatively</td>
</tr>
<tr>
<td>Anderson et al. (2006)</td>
<td>Y2K investments of Fortune 1000 firms</td>
<td>Y2K spending</td>
<td>Shareholder value</td>
<td>Y2K spending increases firm value; the positive effect of Y2K spending is stronger for firms in transform industries</td>
</tr>
<tr>
<td>Anderson et al. (2003)</td>
<td>Y2K investments of Fortune 1000 firms</td>
<td>Y2K spending</td>
<td>Shareholder value</td>
<td>Valuation multiples on Y2K spending range from 31 to 45 for 1999 to 2002, about 3–4 times that on R&amp;D spending; they attribute high multiples to intangible value</td>
</tr>
<tr>
<td>Brynjolfsson et al. (2002)</td>
<td>1987–1997 panel data</td>
<td>IT capital</td>
<td>Shareholder value</td>
<td>Valuation multiples on IT spending range 10–15, attribute to organizational capital</td>
</tr>
<tr>
<td>Bharadwaj et al. (1999)</td>
<td>1988–1993 data</td>
<td>IT spending</td>
<td>Tobin’s q</td>
<td>IT investments have a significantly positive association with Tobin’s q value</td>
</tr>
</tbody>
</table>

Mahoney 2006) as well as reduce coordination and procurements costs (Gurbaxani and Whang 1991; Mithas and Jones 2007; Mithas et al. 2008).
### TABLE 72.4  Selected Empirical Studies Linking IT and IT-Enabled Capabilities with Intangibles

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tafti et al. (2013)</td>
<td>2000–2006 IT investments</td>
<td>Alliance formation and alliance value</td>
<td>Adoption of open communication standards is associated with the formation of arms-length alliances, and modularity of IT architecture is associated with the formation of joint ventures. IT architecture flexibility enhances the value of arms-length, collaborative, and joint venture alliances. The contribution of IT flexibility to value is greater in the case of collaborative alliances than in arms-length alliances</td>
<td></td>
</tr>
<tr>
<td>Ravichandran et al. (2011)</td>
<td>1990–2005 panel data on manufacturing and service firms</td>
<td>IT investments Patent counts and patent citations</td>
<td>IT investments have a positive and statistically significant association with patents and patent citations and the effect is stronger for the 1998–2005 period. Also, stronger effect in services than in manufacturing and higher impact on patent citations than on patent counts. Study also finds evidence that IT helps to mitigate diminishing returns to R&amp;D</td>
<td></td>
</tr>
<tr>
<td>Gao and Hitt (2012)</td>
<td>1987–1997; 116 manufacturing firms</td>
<td>IT capital stock Trademarks</td>
<td>More IT capital is associated with more new trademarks and retirement of existing trademarks (these signify differences among similar products) leading to shorter trademark life cycle and greater product variety</td>
<td></td>
</tr>
<tr>
<td>Mithas et al. (2011)</td>
<td>An archival data from a conglomerate</td>
<td>Information management capability Customer, financial, human resources, and organizational effectiveness measures of performance</td>
<td>Information management capability contributes to developing other firm capabilities for customer management, process management, and performance management, which, in turn, favorably influence firm performance measures</td>
<td></td>
</tr>
<tr>
<td>Kleis et al. (2012)</td>
<td>1987–1997 data for manufacturing firms</td>
<td>IT investment Innovation output (patents and citations)</td>
<td>A 10% increase in IT input is associated with a 1.7% increase in innovation output after accounting for R&amp;D</td>
<td></td>
</tr>
<tr>
<td>Pavlou and El Sawy (2010)</td>
<td>Surveys of new product development managers in 2002 and 2003</td>
<td>IT-enabled improvisational and dynamic capabilities Competitive advantage in new product development</td>
<td>While dynamic capabilities are associated with competitive advantage in moderately turbulent environments, improvisational capabilities dominate in highly turbulent environments</td>
<td></td>
</tr>
</tbody>
</table>
which Dedrick et al. (2003) called the “profitability paradox” of IT. Hitt and Brynjolfsson (1996) looked for associations between IT spending and various business performance measures. Although they document IT’s positive impact on output and consumer surplus, they do not find a significant positive correlation between IT spending and profitability. They proposed that the productivity benefits associated with IT use may be passed on to consumers through lower prices and not lead to greater profitability because of intense competition. However, Dedrick et al. (2003) argued that it was more likely that IT investments do actually affect profitability, but the modeling techniques and datasets used in previous studies were unable to measure the impacts. Mithas et al. (2012b,c), using archival data for the 1998–2003 period, show that IT has a positive impact on profitability and its effect is higher than that of other discretionary investments such as advertising and R&D.

Another stream of research using capital market-based measures examines whether and how firms appropriate value from their IT investments. This research generally shows that IT investments are positively associated with shareholder value and stock returns (Mithas et al. 2012a; Saunders 2010). Some of these studies indicate the need to consider risks involved with IT investments, which might explain excess returns (Dedrick et al. 2003; Dewan et al. 2007; Kim and Mithas 2011; Tanriverdi and Ruefli 2004).

### TABLE 72.4 (continued) Selected Empirical Studies Linking IT and IT-Enabled Capabilities with Intangibles

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saraf et al. (2007)</td>
<td>Survey of business units in the high-tech and financial services industries</td>
<td>IS integration and IS flexibility capabilities</td>
<td>Knowledge sharing, process coupling, and BU performance</td>
<td>IS integration with channel partners and customers contributes to both knowledge sharing and process coupling with both types of enterprise partners, whereas IS flexibility is a foundational capability that indirectly contributes to value creation in interfirm relationships by enabling greater IS integration with partner firms</td>
</tr>
<tr>
<td>Ray et al. (2005)</td>
<td>Survey of managers in the life and health insurance industry during 2000</td>
<td>Shared knowledge between IT and customer service units</td>
<td>Customer service process performance</td>
<td>Shared knowledge between IT and customer service units affects customer service process performance and moderates the impacts of explicit IT resources such as the generic IT used in the process and IT spending</td>
</tr>
<tr>
<td>Mithas et al. (2005)</td>
<td>2001–2002 data from InformationWeek</td>
<td>Use of CRM applications</td>
<td>Customer satisfaction</td>
<td>The use of customer relationship management applications is positively associated with improved customer knowledge and improved customer satisfaction. Gains in customer knowledge are enhanced when firms share their customer-related information with their supply chain partners</td>
</tr>
<tr>
<td>Brynjolfsson et al. (2003)</td>
<td>Increased product variety made available through electronic markets</td>
<td>Consumer surplus</td>
<td></td>
<td>Increased product variety of online bookstores enhanced customer welfare by around $1 billion in the year 2000</td>
</tr>
</tbody>
</table>
While there are a number of theories from which to explain the business value of IT (see Table 72.6 for a summary of some review articles), we focus here on the create–capture value approach. Much of the productivity research focuses on the issue of value creation, while the studies relating to profitability and market value focus on appropriability of value.

Researchers use several theoretical paradigms in explaining the value creation of IT, including production economics and process-oriented models. The theory of production has been particularly useful in providing empirical specifications helping to estimate the economic impact of IT (Brynjolfsson and Hitt 1996; Lichtenberg 1995). Researchers have also employed consumer theory (Hitt and Brynjolfsson 1996), data envelopment theory (Lee and Barua 1999), and Tobin’s q (Bharadwaj et al. 1999). Other researchers have developed process-oriented models linking IT to organizational performance in which the impact of IT on firm performance is mediated by intermediate processes (Barua et al. 1995). This approach argues that the enterprise-level impacts of IT can be measured only through a web of intermediate-level contributions.

This body of research suggests several general findings. First, IT creates value. Also, following a complementarity argument, IT infrastructure does not create value in isolation but must be a part of a business value creating process with other organizational factors including IT human capital. The effects of IT occur at many levels (Kohli and Grover 2008), and IT can be treated as an “option” that is valuable because it provides an opportunity to reap benefits if or when the need arises (Benaroch 2002). This argument endows management with flexibility to embrace and manage uncertainty using IT.

**TABLE 72.5** Selected Empirical Studies Linking IT and IT-Enabled Capabilities with Financial Measures and Profitability

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mithas et al. (2012c)</td>
<td>1998–2003 data</td>
<td>IT spending</td>
<td>Profitability</td>
<td>IT has a positive impact on firm profitability; a significant portion of IT impact is accounted by IT-enabled revenue growth</td>
</tr>
<tr>
<td>Aral and Weill (2007)</td>
<td>1999–2002</td>
<td>IT investment allocations and IT capabilities</td>
<td>Market valuation, profitability, cost and innovation</td>
<td>Investments in specific IT assets explain performance differences along dimensions consistent with their strategic purpose; a system of organizational IT capabilities drive differences in firm performance</td>
</tr>
<tr>
<td>Bharadwaj (2000)</td>
<td>1991–1994 data</td>
<td>IT capability</td>
<td>Profitability and cost</td>
<td>Firms with high IT capability tend to outperform a control sample of firms on a variety of profit and cost-based performance measures</td>
</tr>
<tr>
<td>Rai et al. (1997)</td>
<td>1994 data</td>
<td>IT investments</td>
<td>Sales, return on assets (ROA), return on equity (ROE), and labor and administrative productivity</td>
<td>Measures of IT investments have differential effects on the various measures of business performance</td>
</tr>
<tr>
<td>Hitt and Brynjolfsson (1996)</td>
<td>1988–1992 data</td>
<td>IT spending</td>
<td>Productivity, profitability, and consumer surplus</td>
<td>IT increases productivity and consumer surplus, but does not increase profitability</td>
</tr>
</tbody>
</table>
Although the previous literature focusing on IT value creation perspective provides valuable insights of IT impacts, the external environment of trading partners, industry characteristics, and sociopolitical conditions is also important, but rarely incorporated in analyses. Moreover, prior work has paid less attention to how the IT benefits are appropriated. Some researchers use game theory to examine the role of strategic interaction among competitors in IT business value capture (Belleflamme 2001). Other researchers draw from agency theory and the incomplete contracts literature (Bakos and Nault 1997).

### TABLE 72.6  Selected Conceptual Reviews or Theories Linking IT and IT-Enabled Capabilities with Firm Performance

<table>
<thead>
<tr>
<th>Study</th>
<th>Theoretical Lens</th>
<th>IT Variable</th>
<th>Dependent or Intermediate Variables</th>
<th>Proposed Moderating Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melville et al. (2004)</td>
<td>Integrative model</td>
<td>IT resources (technology and human)</td>
<td>Business processes, business process performance, organizational performance</td>
<td>Complementary organizational resources, industry characteristics, and trading partner resources</td>
<td>The high degree of complexity leads to a context-contingent set of synergistic combinations of IT and other organizational resources</td>
</tr>
<tr>
<td>Wade and Hulland  (2004)</td>
<td>Resource-based view</td>
<td>IS resources (manage external relationships, market responsiveness, etc.)</td>
<td>Competitive advantage</td>
<td>Organizational factors (e.g., top management commitment to IS) and environmental factors (e.g., environmental munificence)</td>
<td>Only IS resources that are inimitable, nonsubstitutable, and imperfectly mobile will have a positive effect on competitive position in the longer term</td>
</tr>
<tr>
<td>Piccoli and Ives (2005)</td>
<td>Integrative framework</td>
<td>IT-dependent strategic initiatives</td>
<td>Sustainable competitive advantage</td>
<td></td>
<td>Identify four barriers to erosion for sustained competitive advantage: IT resources barrier, complementary resources barrier, IT project barrier, and preemption barrier. They identify the response lag drivers underpinning these barriers, as well as the process of organizational learning and asset stock accumulation by which they may be strengthened over time</td>
</tr>
<tr>
<td>Nevo and Wade (2010)</td>
<td>Systems theory and resource-based view</td>
<td>IT asset</td>
<td>Sustained competitive advantage, synergy, strategic potential</td>
<td></td>
<td>Greater compatibility between an IT asset and an organizational resource positively affects the extent of realized synergy</td>
</tr>
</tbody>
</table>
The resource-based view (RBV) of the firm has been a popular framework in the business value of IT literature. This approach is useful in providing a robust framework for analyzing whether and how IT may be associated with competitive advantage (Bharadwaj 2000; Mithas et al. 2012c; Piccoli and Ives 2005; Powell and Dent-Micallef 1997). This body of research suggests that the IT benefits generated can be dissipated from competition. Differential firm value from IT is elusive since it can be copied and competed away, even though value can be created at the industry and economy level. RBV suggests that firms can create differential value by leveraging IT and complementarities to create resources and capabilities that are heterogeneous and imperfectly mobile.

Mithas et al. (2012c) draw on the RBV of the firm as an overarching framework and propose three reasons to explain why overall IT investments are likely to have a positive association with accounting profits. First, an explanation based on virtuous cycle argument suggests that firms that invest in IT in period 1 reap benefits and then invest more in IT in period 2. Over time, these effects become magnified, leading some firms to continue investing more in IT compared with their historical investment and that of their competitors; these firms maintain a more proactive digital strategic posture. Because of their higher investments in IT and greater opportunities to learn from occasional failures in their overall IT portfolio, the firms undergoing the virtuous cycle are also likely to become better at managing IT.

A second, learning-based explanation suggests that years of continued investments in IT and experience in managing these systems may have improved the capability of firms to leverage information and strengthen other organizational capabilities (Grover and Ramanlal 1999, 2004; Mithas et al. 2011). In support of this explanation, several empirical studies show that firms have learned how to make use of IT to improve customer satisfaction, at the same time boosting profitability through the positive effects of customer loyalty, cross-selling, and reduced marketing and selling costs (Fornell et al. 2006, 2009a; Grover and Ramanlal 1999; Mithas and Jones 2007; Mithas et al. 2005).

A third explanation, based on Kohli’s (2007) work, suggests that because of a long history of firms viewing IT mainly as an automation-related investment, with a focus on cost reduction rather than revenue generation, firms may have “just about exhausted efficiency gains from IT” (p. 210). To the extent, RBV focuses on differential firm performance; if revenue growth has become a primary driver for differentiation because of exhaustion of cost-based differentiation, tracing the effect of IT on profitability through revenue growth may be more promising than through cost reduction. These three explanations (virtuous cycle, learning, and strategic posture of differentiating through revenue growth rather than through cost reduction) relate to the key tenets of RBV, which uses the notions of social complexity, erosion barriers, path dependence, and organizational learning to explain why resources create and sustain a competitive advantage (see Piccoli and Ives 2005).

Among methodologies, researchers have used quantitative and qualitative approaches to study the business value of IT. The use of longitudinal archival data and panel models has helped to strengthen claims regarding causality. At the same time, use of newer methodologies such as propensity scores has been particularly useful to view causality from a counterfactual perspective (Chang and Gurbaxani 2012; Mithas and Krishnan 2009), complementing other approaches based on explained variance (as in regression), explained covariance (as in structural equation models, such as LISREL), prediction (as in partial least squares), or a comparison of performance at time \( t \) with some prior time \( (t−1) \) (as in “before-and-after” study designs). While large sample studies will continue to be important and availability of even more granular data will provide new opportunities to explore causal mechanisms more closely, we also call for detailed longitudinal case studies of firms (e.g., Mandviwalla and Palmer 2008; Marchand 2002). Sometimes these detailed case studies can provide very useful insights to guide further quantitative research, beyond their value in teaching.

### 72.4 Impact on Practice

Questions about IT value have forced CIOs to look for more opportunities to enhance revenue as opposed to applications that cut costs. The impact of $1 million additional profits, whether through revenue or through savings, is exactly the same. But contributing to revenue may lead to more
sustainable competitive advantage (Mithas et al. 2012b) and may allow CIOs and other executives to leverage newer opportunities enabled by IT, which may not be obvious if they were to narrowly focus on reductions in IT costs alone. Indeed, if marginal increase in IT investments is outweighed by reductions in non-IT costs, then firms are better off increasing their IT investments as some firms have realized (Glazer 2012; Han and Mithas 2013; Worthen 2012). It may also be that cost savings are often not tracked, and when they are, they frequently prove to be less than promised when a system was approved.

Managers with a focus on revenue generation will look for way to support customers and a firm’s sales efforts. For example, a firm might implement Salesforce.com or some other CRM system to leverage the efforts of its sales force. Getting a new drug through trials and the approval process is critical for revenue in the pharmaceuticals industry so IT can contribute to earlier revenue recognition with a system to manage and expedite clinical trials. The Internet and the ability to reach customers easily provides a platform for efforts to improve revenues in a variety of ways, from CRM systems to order entry applications that make it easier to do business with the firm.

Since the Internet became available for profit making use in 1995, IT has become an integral part of many business models. Firms like Google, eBay, Amazon, Facebook, Twitter, and others rely on technology to function. Without IT, they could not exist. What is the value of information technology to these firms? Consider the case of Amazon in which the technology enabled it to create and execute a business model for retail sales over the Internet. As a result of its expertise in building and operating infrastructure, Amazon has a booming business of selling cloud computing services to companies like Netflix that do not want to develop their own technology infrastructure. Is there any way to value technology in these cases? Is technology equal to the value of the firm or its annual sales?

Table 72.7 lists the sales and market capitalization of a number of firms with business models intertwined with the Internet. All of these firms have created value through technology. Google, Amazon, and eBay are publicly traded companies and are profitable. Can we attribute their profitability to technology? The answer

<table>
<thead>
<tr>
<th>Firm</th>
<th>2011 Sales (All Values Are in Millions US$)</th>
<th>2011 Market Cap (All Values Are in Millions US$)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Amazon</td>
<td>48,077</td>
<td>82,467</td>
<td>Sales—Period ended December 31, 2011</td>
</tr>
<tr>
<td>3. Facebooka</td>
<td>3,700b</td>
<td>65,000–100,000b</td>
<td>Source: USA Today (Swartz, Martin, and Krantz 2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Date: Sales—Period ended December 31, 2011</td>
</tr>
<tr>
<td>4. Twittera</td>
<td>139c</td>
<td>7,700d</td>
<td>Source: eMarketer (Fredricksen 2011) and Reuters (Reuters 2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Date: Sales—2011</td>
</tr>
<tr>
<td>5. Google</td>
<td>37,905</td>
<td>199,077</td>
<td>Sales—Period ended December 31, 2011</td>
</tr>
<tr>
<td>6. eBay</td>
<td>11,651</td>
<td>48,246</td>
<td>Sales—Period ended December 31, 2011</td>
</tr>
<tr>
<td>7. Groupon</td>
<td>1,624</td>
<td>10,835</td>
<td>Sales—Period ended December 31, 2011</td>
</tr>
</tbody>
</table>

Notes: Annual sales information was collected from Bloomberg. Market capitalization information is as of March 14, 2012, and this data was collected from Bloomberg.

a Facebook and Twitter Sales and Market Cap are based on news stories because these firms are yet to trade at the time of writing of this article.


© 2014 by Taylor & Francis Group, LLC
is no because it is the application of technology merged with other business processes that account for their success. Amazon is extremely good at logistics and fulfilling orders. Google has captured the market for search advertising. For these firms, technology is such an important part of their existence that managers simply assume that it will be there like their office or phone. Under these conditions, does it make any sense to try and put a value on IT, or should the focus be on how to manage the technology effectively?

### 72.5 Research Issues and New Frontiers

We identify several directions for further research. First, the rising use of social networks by businesses raises questions to assess how these networks create value for firms by enabling knowledge exchanges within the firm and with external customers, suppliers, and business partners. Social network data can be very rich and complex with several layers of nesting. For example, one can view individual messages nested in threads, which, in turn, are often nested in forums. Making sense of such nesting can be very complex because messages can also be analyzed at the level of individual contributors, firms, and countries. We expect new methodological innovations and significant extensions of hierarchical linear models to analyze such datasets to generate useful insights.

Second, although we have made significant progress by learning from large sample archival datasets, there is a need for detailed studies of information and technology use inside large and evolving born-digital global firms to understand how firms scale up their information management capabilities to cope with more turbulent and uncertain industry environment.

Third, researchers have paid significant attention to understanding the impact of IT investments, and there have been studies and conceptual frameworks that study IT strategies and IT governance. However, there remains a need to study the joint effects of IT strategies and IT investments on firm performance. In particular, we need to study the interaction between IT investments and ambidextrous strategies (such as the ones that focus on multiple objectives such as revenue growth and cost reduction at the same time) and implications for firm performance (Mithas and Rust 2009). To the extent IT strategies of firms are also shaped by their competitive environment, understanding how competitive environment affects the influence of strategic posture of a firm on its digital business strategy is an important area of research (Mithas et al. 2013).

Fourth, as society digitizes and economies become more globally interconnected, firms are increasingly making use of globally dispersed resources to manage their IT assets. In this context, the role of IT professionals and firm’s choice of how to provide IT services using internal IT labor and outsourced IT labor can be investigated by looking at how such choices influence firms’ ability to innovate and stay entrepreneurial. We also need a better understanding of how outsourcing service providers create value for firms by helping to reduce non-IT costs and providing a service differentiation advantage (Han and Mithas 2013; Ramasubbu et al. 2008). The role of foreign-born immigrant workers and that of IT professionals located abroad in complementing native workers in firms’ profit functions is a fruitful area of research because of significant policy debates and implications that surround movement of people across country borders (Lucas and Mithas 2011; Mithas and Han 2012; Mithas and Lucas 2010).

Fifth, while IT-enabled transformations are spreading across industries, we still do not have adequate theories and methods to investigate such innovations systematically. Although case examples and anecdotal accounts have enriched our understanding of sustaining versus disruptive innovations, more rigorous conceptualizations of core concepts and empirical testing of assertions based on case examples are necessary to draw valid conclusions.

Sixth, because of rising concerns related to climate change there is a need to study how IT can contribute to reducing carbon emissions through more sustainable business operations. This will require broadening the dependent variables for business value of IT research beyond customer satisfaction, profitability, shareholder value, and bondholder value.

Finally, increasing digitization of the economy is accompanied by a rise in services. However, as noted by the prominent economist William Baumol, the unit cost of services increases over time because
productivity growth in services generally lags well behind productivity growth in manufacturing, but real wages grow at about the same rate in the two sectors. This phenomenon of growth in costs of services relative to the rate of inflation, which has come to be known as “Baumol’s cost disease” (see Baumol 1993, 1996; Baumol and Blackman 1983), afflicts many services such as healthcare, education, auto repair, auto insurance, legal services, restaurant services, and public services. For example, the cost of higher education at private colleges in the United States in 2010 was ~2.5 times than in 1982 in inflation-adjusted dollars (Hacker and Dreifus 2010). Similar trends have also been noted in healthcare, which has witnessed significant increase in costs in excess of inflation (Bohmer and Knoop 2006; Reid 2009). A key question in this context is whether and what types of IT resources can help firms, universities, and governments to bend the cost curve in services. At the same time, the role of IT and e-government services to improve access, transparency, quality of services, and citizen satisfaction needs further investigation. This is particularly the case in emerging economies where governments are often viewed with suspicion and corruption in government services is taken for granted (Gupta et al. 2012; Morgeson and Mithas 2009). There is much that organizations can learn from experience of others in different country settings. Therefore, comparative studies across countries can be particularly helpful.

### 72.6 Conclusion

Our goal in this chapter was to review the business value of information technology literature in last 50 years since the origin of the academic discipline of information systems in business schools in the 1960s. We identified key milestones, reviewed what we know, and suggested some promising directions for future research. The last 40 years have brought many new insights, theories, and methods to answer the question of how IT creates value and how some of that value can be appropriated by those who invest in IT. However, the changing nature of IT and concomitant changes in the economy due to globalization, the rise of emerging economies such as China and India, concerns about sustainability of our planet, and rising costs of essential services such as healthcare and education suggest that organizations continue to be challenged to define and create new metrics and ways of measuring IT value in the next 40 years. The possibilities for new research opportunities and finding creative solutions to societal and organizational problems using IT are immense and that should be exciting for researchers and practitioners alike.

### Acknowledgment

We thank Keongtae Kim for assisting with this research.

### References


Han, K. and Mithas, S. Information technology outsourcing and non-IT operating costs: An empirical investigation, *MIS Quarterly* 37(1), 2013, 315–331.


Li, C., Peters, G., Richardson, V.J., and Watson, M.W. The consequences of information technology control weaknesses on management information systems: The case of Sarbanes-Oxley internal control reports, *MIS Quarterly* 36(1), 2012, 179–204.


