DOES INCREASED INFORMATION TECHNOLOGY CAPABILITY INCREASE THE BUSINESS VALUE OF INFORMATION TECHNOLOGY?

by

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ABSTRACT

ALAN E. TUROVLIN. Does increased information technology capability increase the business value of information technology? (Under the direction of DR. REGINALD A. SILVER)

Firms believe their investments (of time and money) in IT increase their IT capabilities that, in turn, improve their competitive position in the marketplace. But to invest, firms need to understand how IT capability impacts business value. This dissertation, based on the resource-based view of the firm, explores the relationship between IT capability and the business value of IT using the DeLone and McLean Information Systems Success (ISS) framework to define IT capability and four dimensions of IT (strategic, transactional, informational, and transformational) to define the business value of IT. A partial least squares regression analysis demonstrated a high correlation between IT Capability and the Business Value of IT; however, analysis showed no indication of a relationship between Service Quality and IT Capability. The later finding is important because it challenges a key aspect of the widely accepted, highly cited DeLone and McLean ISS framework.

DEDICATION

I would like to dedicate this to my loving (and patient!) wife, Linda. When she suggested that I apply for a doctorate program, little did we realize how much effort and time it would take. Of course, everyone expects the doctoral student will spend long hours, commit high levels of effort, and remain focused, but no one ever consider the rest of the family. While I studied, theorized, wrote, revised, wrote, revised again, wrote, and revised some more, Linda kept everything together! This was a journey that we have talked about for years but never actually thought would happen. Now it has.

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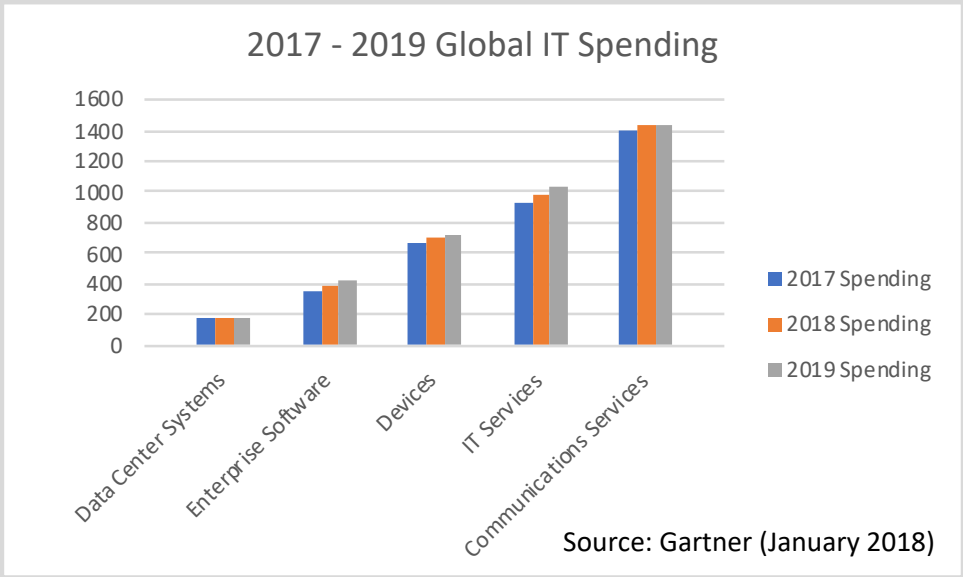
CHAPTER 1: INTRODUCTION

Gartner (Gartner, 2018) projected worldwide information technology (IT) expenditures for 2019 would be $3.8 trillion worldwide, a number the magnitude of the total GDP of Germany in 2017 (International Monetary Fund, 2017). Expenditures this large beg asking, “Why do firms choose to invest such large amounts of money in information technology?”. Firms make investments in IT based on the rationalization of the potential impact of their investments (Koellinger, 2008). However, if investing in IT is the only variable to increase the business value from IT, then all firms investing a similar amount of money in IT would realize similar results. Figure 1 shows the categories of IT that firms spend in and that firms do not spend equally across all categories of IT. Something is missing.



Note: This figure illustrates projected IT spending by category across the years, 2017, 2018, and 2019 (Gartner, 2018).

FIGURE 1: Worldwide IT Spending Forecast (Billions of USD)

The "something" that is missing can be explained by the resource-based view (RBV) which posits that firms create competitive advantage through valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Resources, as they relate to information technology, consist of both IT assets and IT capabilities (Wade & Hulland, 2004). However, understanding resources, capability, and competitive advantage are not enough to explain why firms invest in information technology. Firms also need to see value from information technology investments (Koellinger, 2008).

Value from information technology is explained as the "direct economic benefits (e.g. ROI, market share, and stock price) . . . [and] economic value must be expanded to include indirect and intangible value" (Kohli & Grover, 2008, p. 33), inferring that traditional financial metrics do not portray an appropriate explanation of why firms invest in information technology. The ability "to identify how and where IT [investment] is contributing to value creation" (p. 28) is difficult because "unless we can measure it, we cannot demonstrate value" (p. 28). Measuring the value of IT in and of itself is not easily understood and relating it to resources and capabilities that create competitive advantage has not been attempted.

The relationship between IT capability and the business value of IT is not simple (Kohli & Grover, 2008). IT capability, a component of competitive advantage, "does not create value in isolation [as it] must be part of a business value creating process" (Kohli & Grover, 2008, p. 26). Investment in information technology by itself does not create competitive advantage, the capability created from information technology must be

valuable, rare, inimitable, and non-substitutable to create competitive advantage. This dissertation explores the relationship between IT capability and the business value of IT.

IT Capability

To understand the impact IT capability can have on the business value of IT, a further understanding of IT capability is required (Hitt & Brynjolfsson, 1996). There are many definitions of IT capability (Bharadwaj, 2000; Bharadwaj, Sambamurthy, & Zmud, 1998; Caldeira & Ward, 2003; Ravichandran & Lertwongsatien, 2005; Ross, Beath, & Goodhue, 1996) and while they describe IT capability in alignment with a general understanding of IT resources in the resource-based view (Wade & Hulland, 2004), there are too many differences in the individual definitions to provide a consistent and valid measurement of IT capability. To provide clarity and consistency to explore the relationship between IT capability and the business value of IT, this dissertation employs the DeLone and McLean Information Systems Success (ISS) framework (DeLone & McLean, 1992, 2003), a highly cited and broadly accepted framework. Their framework consists of the following constructs: (a) Information Quality, (b) System Quality, (c) Service Quality, (d) Information Use, and (e) User Satisfaction. Thus, to improve the validity of the dissertation's construct, IT capability, the complete set of DeLone and McLean's constructs are tested across all of the relationships of the constructs.

Business Value of Information Technology

Although DeLone and McLean is a widely accepted framework that is utilized for IT capability, there is, unfortunately, no consistent or widely adopted framework to measure the business value of IT. In fact, there are many different measurements, such as

measurement by firm performance, market share, stock market value, earnings, or other indicators (Aral & Weill, 2007; Bharadwaj, Bharadwaj, & Konsynski, 1999; Brynjolfsson & Hitt, 1993; Chand, Hachey, Hunton, Owhoso, & Vasudevan, 2005; Dehning & Richardson, 2002), but none of these measurements directly quantify the contribution or value of investments in information technology.

In addition to different ways to measure the business value of IT, there are also different definitions of the business value of IT. To ensure consistency, comprehensiveness, and an efficient analysis of the business value of IT, this dissertation creates a clear definition of the business value of IT. The definition of business value of IT draws upon research by (a) Weill (Weill, 1992) that addressed the transactional, informational, and strategic value of IT and (b) Gregor, Martin, Fernandez, Stern, and Vitale (Gregor, Martin, Fernandez, Stern, & Vitale, 2006) that identified a fourth, discrete dimension of IT, the transformational value of IT. Therefore, the business value of IT is defined along four dimensions of IT: (a) the transactional value of IT; (b) the strategic value of IT; (c) the informational value of IT; and (d) the transformational value of IT.

In summary, this dissertation utilizes a set of definitions for IT capability and the business value of IT that is consistent and sets the stage for establishing a relationship between the constructs, IT Capability and the Business Value of IT. DeLone and McLean's (DeLone & McLean, 1992, 2003) ISS framework defines IT capability, and a composite of four dimensions of IT value defines the business value of IT.

The remainder of this dissertation is structured as follows: (a) a review of the literature that provides the foundation for the development of the conceptual model

underlying this study and the associated research hypotheses; (b) a discussion of the development and methodology for testing the model; (c) the results of the study; and (d) a discussion of the findings, limitations, and opportunities for further research.

CHAPTER 2: LITERATURE REVIEW, CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

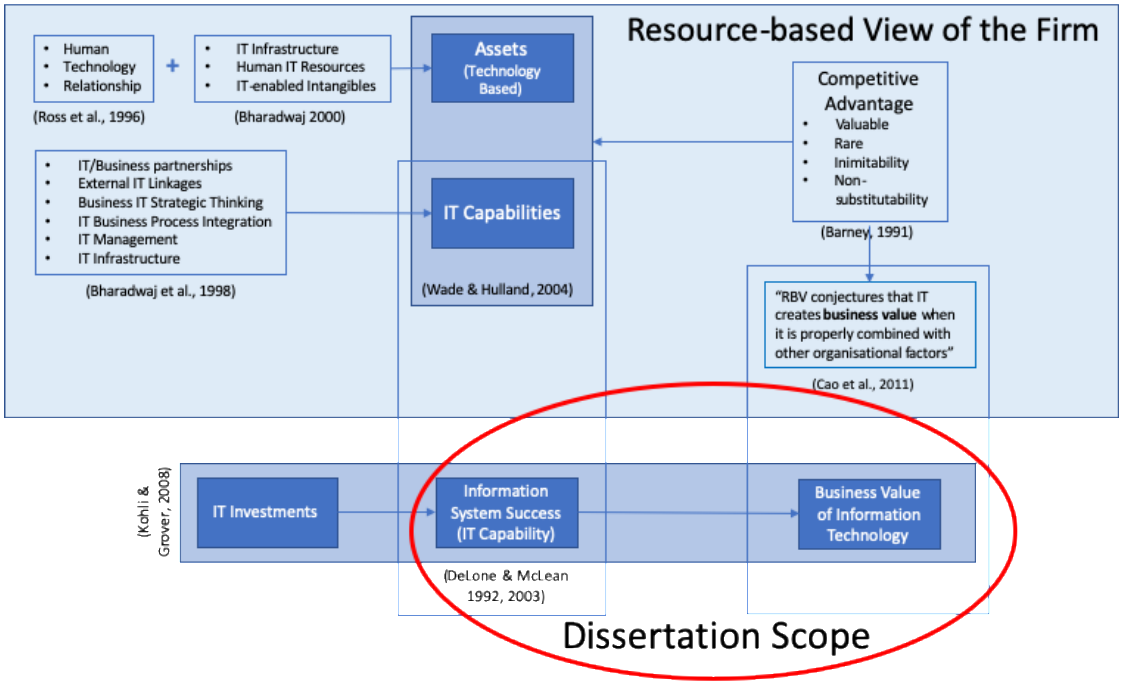
A review of existing literature led to the establishment of a theoretical foundation and assisted with identifying gaps in current research. Accordingly, this chapter is organized in six parts: (1) a discussion of how the resource-based view of the firm establishes a theoretical foundation for the study; (2) a detailed discussion of how the business value of IT is defined; (3) a discussion of the relationship between IT capability and the business value of IT; (4) a discussion of how alternative measurements of IT investments are conducted; (5) a discussion of the factors that led to the selection of DeLone and McLean's Information Systems Success framework as a way to measure IT capability; and (6) a discussion of the development of the hypotheses used in the research model.

Resource-Based View and Competitive Advantage

Gartner (Gartner, 2018) reported a significant amount of corporate spending for categories of information technology (IT) across multiple years. How these investments in IT are made and how they create value for the organization, though, remain little understood. Kohli and Grover (Kohli & Grover, 2008), Wade and Hulland (Wade & Hulland, 2004), Cao, Wiengarten, and Humphreys (Cao, Wiengarten, & Humphreys, 2011), and Melville, Kraemer, and Gurbaxani (Melville, Kraemer, & Gurbaxani, 2004) offered that IT creates business value when combined with "other factors". These other factors are the subject in question and are developed below.

Bharadwaj reasoned "that firms can and do differentiate themselves on the basis of their IT resources" (Bharadwaj, 2000, p. 176) and thus see IT as a way to build competitive advantage. Porter and Millar wrote that for a firm "to gain competitive advantage over its rivals, a company must either perform these activities at a lower cost or perform them in a way that leads to differentiation and a premium price [more value]" (Porter, 1985, p. 150). Therefore, Bharadwaj's research suggests that if IT investments lower cost, increase differentiation, or are a means to support premium pricing strategies, then the pursuit of competitive advantage can be a factor in creating business value, particularly when this pursuit incorporates the use of IT.

Barney (Barney, 1991) purported in the resource-based view of the firm (RBV) that competitive advantage is derived from valuable, rare, inimitable, and non-substitutable (VRIN) resources. As a firm invests in resources to create competitive advantage, competitive advantage leads to differentiation among firms (Porter, 1985). This differentiation can generate increased firm performance and improve business value. Melville et al. suggested that "RBV [of a firm can be used] to analyze the competitive advantage implications of information technology theoretically and to assess the complementariness between IT and other firm resources empirically" (Melville et al., 2004, p. 291). Figure 2 presents a conceptual overview of the theoretical components of RBV and shows their relationship to this study.



Note: In this figure, the dark blue shading shows the major theory and research constructs that create the core of this study. The red circle highlights the scope of the dissertation and its relationship to the resource-based view of the firm.

FIGURE 2: Resource-Based View and Its Relationship to the Scope of the Dissertation

RBV and competitive advantage offer an explanation for why firms invest in different categories of IT. All else being equal, companies that have the same ability to purchase IT should share the same level of competitive advantage, eliminating IT as a differentiator among firms. Therefore, investment in IT alone is not enough to create competitive advantage, suggesting other factors may be involved.

Further, competitive advantage stems from a firm's resources that are (a) valuable, (b) rare, (c) inimitable, and (d) non-substitutable (VRIN) (Barney, 1991). VRIN resources are fundamental to understanding why every investment in IT does not have the same impact on a firm's competitive advantage. Bharadwaj stated that "investments in IT are easily duplicated by competitors, investments per se do not provide any sustained

advantages. Rather, it is how firms leverage their investment to create" (Bharadwaj, 2000, p. 170) competitive advantage and that "firms that achieve competitive advantage through IT have also learned to combine effectively their IT resources to create an overall IT capability" (Bharadwaj, 2000, p. 176). Bharadwaj's work establishes a connection between competitive advantage and IT capability, but, more importantly, it identifies that there are factors beyond the investment in IT that matter.

Cao, Wiengarten, and Humphreys supported a similar viewpoint that IT alone cannot create VRIN conditions; rather, IT creates "business value when it is properly combined with other organizational factors" (Cao et al., 2011, p. 99). For the four VRIN criteria to be met, "IT assets would have to be put to appropriate use for them to be of value to the firm" (Ravichandran & Lertwongsatien, 2005, p. 240), especially since IT resources "are part of a complex chain of assets and capabilities that may lead to competitive advantage" (Masli, Richardson, Sanchez, & Smith, 2011, p. 103). Although competitive advantage and VRIN explain some rationale for a firm to invest in IT at a conceptual level, these concepts do not identify how IT investments increase the business value of IT.

Technology-Based Assets and IT Capabilities

In RBV, resources create competitive advantage (Barney, 1991). Wade and Hulland (Wade & Hulland, 2004) took IT resources and split them into IT assets and IT capabilities. Dividing resources into assets and capabilities thusly can provide clarity as to why an investment by itself does not increase competitive advantage. It is not enough

to purchase a valuable IT asset; a firm must also have the capability to make it valuable, rare, inimitable, and non-substitutable (Barney, 1991).

Bharadwaj said "it is how firms leverage their investments to create unique IT resources and skills that determine a firm's overall effectiveness" (Bharadwaj, 2000, p. 170), expanding investment beyond a resource to include skills and effectiveness. Caldeira and Ward added that "resource-based theory treats enterprises as potential creators of value-added capabilities"(Caldeira & Ward, 2003, p. 128). Bharadwaj stated that "IT capability is not so much a specific set of sophisticated technological functionalities as it is an enterprise-wide capability to leverage technology to differentiate from competition" (Bharadwaj, 2000, p. 186), expanding the definition to include a firm's capabilities. Capabilities, then, can be viewed as the ability to convert an IT asset or investment into a resource that creates competitive advantage for a firm. Therefore, the creation of sustainable competitive advantage cannot be accomplished by assets alone—it must be supplemented by capabilities that have the ability to make a resource valuable, rare, inimitable, and non-substitutable.

While this study's focus was on IT capabilities, it is important not to confuse these IT capabilities with Wade and Hulland's (Wade & Hulland, 2004) definition of IT resources that distinguishes between both IT assets and IT capabilities. The definition of IT assets is supported by (a) Ross, Beath, and Goodhue who defined IT assets as "(1) a highly competent human resource, (2) a reusable technology base, and (3) a strong partnering relationship between IT and business management" (Ross et al., 1996, p. 31) and (b) Bharadwaj (Bharadwaj, 2000) who split IT assets into IT infrastructure, human IT

resources, and IT-enabled intangibles. The distinction between assets and capabilities is useful when teasing out how IT investments create business value.

Focusing on IT capabilities, Bharadwaj, Sambamurthy, and Zmud (Bharadwaj et al., 1998) defined capabilities along six dimensions: (1) IT business partnerships, (2) external IT linkages, (3) business IT strategic thinking, (4) IT business process integration, (5) IT management, and (6) IT infrastructure. Later, Bharadwaj defined IT capability as linked to firm performance via (a) IT infrastructure, (b) human IT resources, and (c) IT-enabled intangibles (Bharadwaj, 2000). Ravichandran and Lertwongsatien identified the "importance of IS capabilities in converting investments into IT assets" (Ravichandran & Lertwongsatien, 2005, p. 240). Ravichandran and Lertwongsatien suggested a relationship similar to what Kohli and Grover described (Kohli & Grover, 2008): IT investment creates IT capabilities that, in turn, create business value. The work of Kohli and Grover (Kohli & Grover, 2008) suggests that IT capabilities are the mediating factor of IT investment for the business value of IT.

Business Value of Information Technology

A commonly accepted definition of the business value of IT does not exist (Cronk & Fitzgerald, 1999). Brynjolfsson and Hitt (Brynjolfsson & Hitt, 2000) proposed that the recognition of business value from IT investments is the most important measurement of the business value of IT because it focuses on expected outcomes. Brynjolfsson and Hitt supported Weill's earlier idea that "IT is not a homogenous entity; different systems exist for quite different management objectives" (Weill, 1992, p. 308), implying that value may be interpreted differently depending on the objective of the IT systems.

Because there are a variety of definitions of business value, a consistently used measure for the business value of IT is hard to come by (Caldeira & Ward, 2003). Early research focused on measuring the performance of IT investments, specifically, (a) Dos Santos, Peffers, and Mauer measured improved market value (Dos Santos, Peffers, & Mauer, 1993); (b) Brynjolfsson and Hitt measured firm productivity (Brynjolfsson & Hitt, 1993); (c) Bharadwaj, Bharadwaj, and Konsynski measured change in market value as measured by Tobin's q (Bharadwaj, Bharadwaj, et al., 1999); and (d) Tallon, Kraemer, and Gurbaxini assessed an executive's perception of business value (Tallon, Kraemer, & Gurbaxani, 2000), creating multiple interpretations for the business value of IT.

Kohli and Grover (Kohli & Grover, 2008) focused on the creation of IT value, affirming that the "when" and "how" of business value is just as important as the creation of value from IT. Kauffman and Weill (Kauffman & Weill, 1989) likewise discussed how and where value is measured and noted that value is not always easy to define. As an example, measures of user satisfaction and firm performance may not provide good indicators of value. Further, Kohli and Grover highlighted "the 'intangible' value created by IT as becoming increasingly important—and in many cases, our measurement instruments are too blunt to capture it" (Kohli & Grover, 2008, p. 33). In essence, Kholi and Grover supported Kauffman and Weill's statement. Also, IT-related benefits for the firm relate to the expected benefits or value (Mirani & Lederer, 1998) and within a firm, can be defined differently depending on the objective (Tallon et al., 2000). Because business value, in general, can be interpreted in different ways, there is the need for a more rigorous approach to measuring the business value of IT.

Gregor et al. alleviate some of the confusion related to defining the business value of IT. Gregor et al. provided a broad definition of business value of IT along four main themes or dimensions: (a) the strategic value that IT can contribute to business value; (b) the transactional value of IT; (c) the informational value of IT; and (d) the transformational value of IT (Gregor et al., 2006). A discussion of each dimension follows.

For the strategic dimension of the business value of IT, Gregor said that operational effectiveness can also have strategic value if the IT investment has multiple objectives. Weill stated that "investments in IT are made for different management objectives and are likely to be related to firm performance in different ways" (Weill, 1992, p. 310). Mirani and Lederer (Mirani & Lederer, 1998) also suggested that when goals are focused on strategic benefits or competitive advantage, such as how an organization's products compete, then there can be strategic business value from IT.

Moreover, the strategic dimension is supported by Masli et al. (Masli et al., 2011) who focused on the role of IT and how it relates to business strategy and leadership. Masli et al. suggested that if these IT investments are used to gain competitive advantage by developing new products or processes, then IT provides strategic benefit. Kohli and Devaraj (Kohli & Devaraj, 2003) and Jee-Hae, Dehning, Richardson, and Smith (Jee-Hae, Dehning, Richardson, & Smith, 2011) held a similar view of business value through the impact of IT investments on a firm's performance. Although the business value of IT can be related to firm performance and thus more transactional in nature, it can be more strategic in nature when the investment is made with the future objectives of the firm in

mind. Cao et al. (Cao et al., 2011) discussed both the strategic and organizational alignment of IT, and Bharadwaj (Bharadwaj, Bharadwaj, et al., 1999) captured the strategic business value of IT by measuring the market response to IT investments using direct measures of stockholder value or Tobin's q (public firms). Lastly, Schryen (Schryen, 2013) defined the business value of IT in terms of the performance of investments in IT assets and how these assets have an impact on performance and capability. Schryen's work supported Wade and Hulland's (Wade & Hulland, 2004) research, which discussed IT assets, IT capabilities, and building competitive advantage. The aforementioned research, therefore, provides a comprehensive definition of the strategic business value of IT.

For the transactional dimension of the business value of IT, its history is longer. Weill (Weill, 1992) focused on the transactions that are required to efficiently operate the firm. Kohli and Grover (Kohli & Grover, 2008) explained that process improvements reduce cycle time, increase profitability, or improve ROI and ROA. Masli et al. described transactional value as "infrastructure investments as… those [investments] used primarily to cut costs or increase output for the same cost" (Masli et al., 2011, p. 89). Finally, Mirani and Lederer (Mirani & Lederer, 1998) explained that if the goal of a firm is to reduce costs or maximize efficiency, then these are transactional objectives and their value should be considered appropriately.

For the informational dimension of the business value of IT, Masli et al. stated "informational investments [are] those used to provide information for specific purposes" (Masli et al., 2011, p. 89). Mirani and Lederer (Mirani & Lederer, 1998) defined the

informational dimension in broader terms: It is not only the information infrastructure of the organization but also the IT systems that retrieve, deliver, provide access, or improve the reliability of information as key components that drive business value.

For the transformational dimension of the business value of IT, Gregor et al. (Gregor et al., 2006) identified transformational value of IT as a distinct dimension, via a qualitative study supported by quantitative analysis. Their results infer that IT value that results in changes in the organizational structure and capacity of a firm (a) "should be treated as an important dimension of IS success" (p.251) and (b) creates a "transformational dimension for assessing IT business value" (p.251) and (c) identifies "a driver of further change" (p.252). Kobelesky, Richardson, Smith, and Zmud (Kobelsky, Richardson, Smith, & Zmud, 2008) expanded Gregor's definition to include new ways that fundamentally redefine business processes and relationships. Lastly, Daulatkaur and Sangle (Daulatkar & Sangle, 2016) identified the dependent variable of the business value of IT as having a transformational dimension in addition to the strategic, transactional, and informational dimensions.

Although prior research identified four dimensions of the business value of IT, the definitions of the dimensions can overlap. Melville et al. defined business value as "the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts" (Melville et al., 2004, p. 287). In doing so, the authors define both the transactional and strategic value of IT. According to Melville et al., the business value of IT was measured by the amount of money spent or invested, the number of

systems, the qualitative objectives set by managers, or on the role and performance of the IT employees, suggesting that different definitions lead to different values. Kobelsky et al. (Kobelsky et al., 2008) and Henderson, Kobelsky, Richardson, and Smith (Henderson, Kobelsky, Richardson, & Smith, 2010) evaluated business value based on the relationship between IT's contribution and its financial performance. Bergeron and Raymond took a broader view that "IT investment by itself, be it transactional, managerial, or strategic in nature, provides no assurance of bottom line improvements" (Bergeron & Raymond, 1995, p. 177). Focusing on financial results, Bergeron further expanded the discussion to multiple dimensions, thereby creating the need for transactional as well as other dimensions to measure the business value of IT. Teo and Wong (Teo & Wong, 2000) proposed that those firms with traditional views of the role of IT see value in transactional management, and those firms where IT is used to support an evolving business see IT value as more strategic. Teo and Wong suggested that value may have not only different definitions, but also different overall objectives and goals of the firm. Teo and Wong split IT business value into four dimensions: strategic, transactional, informational (explained below), and "threshold" where the investment is made only to compete. Because competitive advantage is a component of strategic investments, Teo and Wong's threshold provision could be confused with the strategic value of IT.

To conclude, prior research to define the business value of IT shows no one clear definition. However, it does identify repeatedly four distinct dimensions that can be used to measure the business value of IT.

IT Capability and the Business Value of Information Technology

The goal of achieving competitive advantage can explain the motivation behind purchases or investments in IT, but it is difficult to measure the impact that these investments have on a firm's performance or the creation of business value. As mentioned, the relationships among IT investments, IT capability, and business value are not always clear. Kohli and Grover (Kohli & Grover, 2008) asserted that there are relationships between (a) IT investment and IT capability, (b) IT investment and the business value of IT, and (c) IT capability and the business value of IT. Kohli and Grover called for additional research into the understanding of how these constructs relate to each other.

Muhanna and Stoel continued the investigation into the relationship between IT investment and IT capability and their effect on market value. They found that "investors reward firms with superior IT capabilities through higher market values, consistent with the notion that IT capability contributes to the firm's prospects and that market performance different from IT rests less on IT spending, per se, and more on the firm's IT capability" (Muhanna & Stoel, 2010, p. 43).

Cao et al. suggested that IT value as a function of IT investment, as explained by RBV, creates business value when IT is combined with organizational factors or business processes (Cao et al., 2011). Cao et al. also asserted (a) that researchers must “further understand when, how, and why IT creates business value” (Cao et al., 2011, p. 85) and (b) that “the nature of how IT and other firm resources interact to create business value is largely unknown”(Cao et al., 2011, p. 92). Similarly, Cao argued that in IT business value

research, “few studies agree what organizational factors should be considered and how they affect IT business value” (Cao, 2010, p. 268).

Masli et al. connected competitive advantage with improved performance when they stated “we expect a close relationship between increased shareholder value and competitive advantage; however, we also note that successful IT initiatives can improve performance and deliver shareholder value without necessarily creating competitive advantage” (Masli et al., 2011, p. 86).

Understanding the relationship between IT capability, which is a component of RBV that explains competitive advantage, and the creation of business value from IT is key to understanding why investments are made in IT.

Measurement of the Impact of IT Investments

Porter and Millar (Porter & Millar, 1985) demonstrated the need for the measurement of the value of IT by describing the impact that IT has on the value chain among companies. Later, Davis advanced the discussion by defining the “perceived usefulness [of information technology] as the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320). Weill (Weill, 1992) went a step further when he conducted empirical tests that correlated IT investment with IT performance, although IT performance was broadly defined. Cronk and Fitzgerald (Cronk & Fitzgerald, 1999) confirmed Weill's research and further suggested that while some financial measures, such as return on investments (ROI) and return on assets (ROA), are commonly used, these measures do not fully

explain the relationships among IT expenditures, firm performance, or the business value of IT.

There are many ways in which to measure or interpret the impact of IT on firm performance. In fact, Quan, Quing, and Hart suggested that the lack of consistency in measuring the impact of IT results from "a need for more rigorous theoretical studies that analyze the impact of IT investments on . . . performance measures" (Quan, Qing, & Hart, 2003, p. 122). Research regarding investment in IT provides a myriad of ideas regarding the impact of investment in IT on a firm's performance. As examples, (a) Dos Santos et al. (Dos Santos et al., 1993) found that not all IT investments improve the market value of the firm; (b) Byrnjolfsson and Hitt (Brynjolfsson & Hitt, 1996) found that IT investment contributes to a firm's output; (c) Henderson et al. (Henderson et al., 2010) identified that firms that invest heavily in IT have increasing returns that start a year or two after the initial investment and that firms with poor performance will sacrifice current earnings for increased investment in IT for potentially improved returns in the future; (d) Masli et al. said that combining "IT investment with IT skills and knowledge, creates IT capability" (Masli et al., 2011, p. 89) but exactly how firms do this is not usually available. Thus, the research provides many different proxies for IT investment that may not lead to the identification of the appropriate independent variables, and IT investment by itself does not indicate efficiency and effectiveness of a firm's IT capability (Aral & Weill, 2007; Stoel & Muhanna, 2009). It is the value derived from IT that is important. Based on the research, firms (a) believe that there is a relationship between IT investment and firm performance and (b) hold a perception that value is

derived from IT investments. At this point, it is important to discuss alternative methods of measuring the results of an investment, because most assessments or approaches focus on measuring the results of an investment instead of the business value of the investment.

Accounting Measures

Finance and accounting are typically credited with having a standard, widely applied approach for measuring the results of investments in IT. The approach of these disciplines utilizes commonly known accounting measures, such as return on investment (ROI) or return on assets (ROA). Although ROI, ROA, or other calculations may be numerically correct, these numbers merely measure how much cash, savings, or improved revenue is realized compared to the amount of money expended. ROI and ROA, then, do not measure nor do they indicate the complexities and nuances associated with IT capability or the business value of IT.

First, accounting measures are based on past performance. Accounting measures record the amount of cost at the time of the investment and continue with the same amount throughout the life of the asset. This focus on the past is at odds with the objectives of investing in IT, because IT resources are expected to affect future performance. Further, trying to connect the past with the future becomes complicated as historical costs "can be subject to manipulation or distortions for various reasons, such as the different nature of depreciation policies elected, inventory valuation, consolidation of accounts, and standardization of the handling of international accounting conventions" (Jee-Hae et al., 2011, p. 150). As an example, consider how depreciation of an asset in accounting is based on the asset's purchase price and a standard length of time as

determined by its “useful” life. Although these standard accounting measurements help provide comparability and understanding, the measures do not show the impact of an IT investment on the value to a firm (Henderson et al., 2010). How IT investments influence a firm's performance rather than how IT assets (investments, applications, organizations) affect a firm's performance, such “as productivity, profitability, risk, shareholder value, and intangibles” (Mithas, Ramasubbu, & Sambamurthy, 2011, p. 251), are not interchangeable constructs.

Acknowledging that the backward focus of accounting measures is a concern, even though the measures provide consistency, the bigger issue is that accounting-based measures are inadequate in providing insight into the usefulness or the business value of IT. “Accounting rates of return are distorted by failure to consider differences in systematic risk, temporary disequilibrium effects, tax laws, and accounting conventions regarding Research and Development (R&D) and advertising” (Wernerfelt & Montgomery, 1988, p. 247), and they do not take into account risk.

Second, accounting measurements for IT investments involve how accounting treats investments for research and development (R&D). In accounting, R&D investments consume financial resources in a current term for an intangible benefit expected sometime in the future, and the quantification of these benefits is hard to estimate. Similarly, investments in IT consume current financial resources for an intangible future benefit that is difficult to quantify. However, investments in R&D, unlike investments in IT, are disclosed on public company financial statements, which offer investors some insight into a firm's capabilities or its business value in a future

period. IT investments are neither disclosed nor treated differently than any other tangible capital asset; they are simply treated as a historical cost divided by its useful life as an asset. Thus, there are similarities between investments in R&D and IT, but their treatment according to Generally Accepted Accounting Principles (GAAP) differs—there is no recognition of IT's future capabilities or its business value for the company.

Third, accounting measurements do not show how IT investments can affect revenue and profit. Lubbe, Parker, and Hoard examined the impact of IT on gross profit and revenue and described IT's impact "as a result of a more efficient operations function" (Lubbe, Parker, & Hoard, 1995, p. 48), inferring IT's relationship to quantifiable cost, expense reduction, or even increased capability. Investments in IT can improve performance in both perceptual (growth and profitability) and objective (ROA) terms (Bergeron, Buteau, & Raymond, 1991). Muhanna and Stoel "conclude[d] that the distinctive value from IT rests on [how] IT is deployed and used within an organization, and that IT capability, rather than IT investment, is the primary source of IT-enabled intangible value" (Muhanna & Stoel, 2010, p. 63).

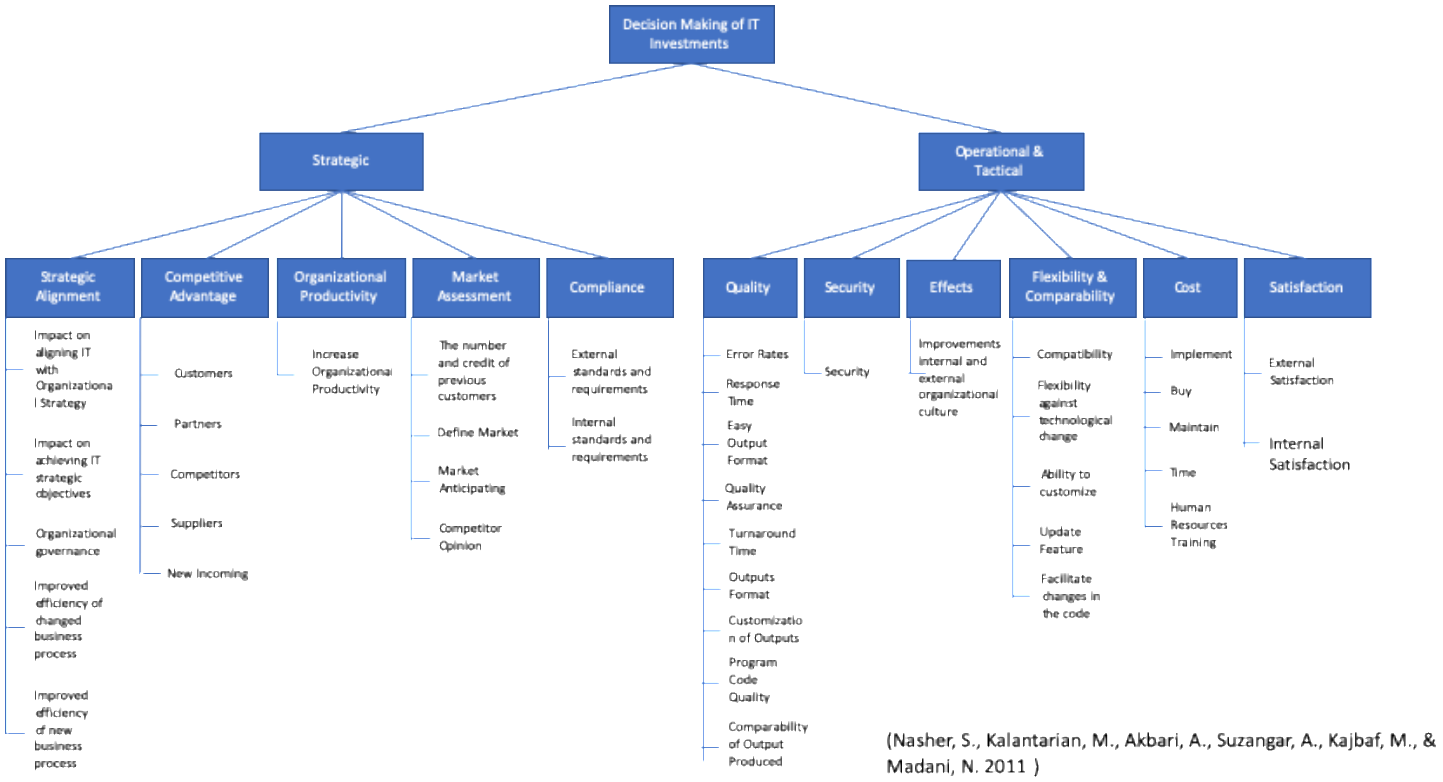
Fourth, accounting measurements do not focus on the value of investments, let alone the value of IT investments. Table 1 (Silvius, 2006) lists key investment valuation methods, their associated qualities, and their limitations. Silvius suggested that the firm's senior IT management should recognize the importance of these commonly used methods while acknowledging these methods are limited as measurements of business value to the firm. These methods align with measurements used in research from Henderson, Liang and Li, and Tallon and Kraemer (Henderson et al., 2010; Liang & Li, 2008; Tallon &

Kraemer, 2007). In addition, Nasher et al. (Nasher et al., 2011) organized a comprehensive set of criteria that firms can use to evaluate IT investments (Figure 3).

TABLE 1: Overview of Investment Valuation Methods

Valuation method	Qualities	Limitations
Return on investment	Easy to calculate Easy to interpret (a simple percentage) In line with the financial administration	Outcome sensitive to amortisation method Ignores the time-value of money Ignores risk
Pay-back period	Quite easy Intuitively coping with risk	Ignores part of the revenues Simplistic, does not determine value
Internal Rate of Return	Includes the time-value of money Easy to interpret (a simple percentage) Based on cash-flows	Complex Not in line with the financial administration Ignores risk Multiple outcomes, or none, possible
Discounted Cash Flow / Net Present Value	Includes the time-value of money Based on cash-flows Copes with risk	Complex Complex to interpret Not in line with the financial administration Not conclusive in case of projects with different durations
Economic Value Added	Includes the opportunity value of money In line with 'shareholder value'	Value calculation based upon one of the other methods Not in line with the financial administration

Note: (Silvius, 2006)



(Nasher, S., Kalantarian, M., Akbari, A., Suzangar, A., Kajbaf, M., & Madani, N. 2011)

FIGURE 3: IT Decision Making

Although the criteria of Nasher et al. defined a firm's decision making for IT investment, these criteria are limited in that they define only performance improvements in the firm and ignore IT capability and the business value of IT.

Fifth, the timing of accounting measurements is another factor to consider when evaluating investments in IT. Determining exactly "when" to measure the results of the investment is critical. Galy and Sauceda (Galy & Sauceda, 2014) called for increased understanding of how the timing of measurement impacts results. Firms that invest in information technology must be concerned not only with success at the point of adoption but also with understanding the results may change over time. Brynjolfsson and Hitt (Brynjolfsson & Hitt, 2000) also addressed the timing of the benefits derived from investments in IT. Their work focused on the effect of productivity growth of a firm over time. Knowing and understanding the "when" of an investment, then, can help quantify and standardize the measurement of the impact of such IT investments. And lastly, the valuation methods of Silvius (Silvius, 2006) and the decision making criteria of Nasher et al. (Nasher et al., 2011), unfortunately, do not address the timing of IT investments, reducing the potential of accounting measures as a way to measure the impact of IT investment and subsequent business value.

Market Value

Measuring market value of a firm is another approach to understanding the impact of IT investments on a firm. Mithas et al. (Mithas et al., 2011) and Dehning, Richardson, and Zmud (Dehning, Richardson, & Zmud, 2007) identified the relationship between an investment in IT and a measurement of value (via the capital market value). "The capital

markets are sufficient to evaluate the impact of new information (events) on expected future profits of the firm. Thus, one can gauge technology investments' negative or positive financial impact on a company by doing an analysis of the abnormal stock returns that occur when a technology investment has been announced" (Dardan, Stylianou, & Kumar, 2006, p. 102). Such an occurrence subsequently reflects a change in value due to an IT investment.

Kohli, Devaraj, and Ow confirmed that "IT investment is more pronounced on firm value [alone] than when comparing public and private firms" (Kohli, Devaraj, & Ow, 2012, p. 1145). Quan et al. stated that "in a market environment, where products and services are commodities, the contribution of IT investments is usually enhanced" (Quan et al., 2003, p. 139). Muhanna and Stoel (Muhanna & Stoel, 2010) found that accounting measures can influence market value, but the influence is related to the disclosure of intangible benefits. For example, an announcement of an investment in new software or hardware increases market value as long as there is an expectation that earnings will improve.

While an accounting view is backward-looking, a market view is forward-looking and provides a vision of future potential. Bharadwaj attributed this difference to the viewpoint of accountants versus the viewpoint of economists and their respective use of accounting-based measures versus market-based measures. According to Bharadwaj, market-based measures are advantageous because (a) they are the only direct measure of stockholder value; (b) they are widely available for public firms; (c) they reflect all aspects of performance; (d) they can see through manipulations in accounting measures;

and (e) they reveal investors' assessment of firms' decisions (Bharadwaj, Bharadwaj, et al., 1999). However, market-based measures do not discriminate among other factors that may influence the market, applies only to publicly listed firms, and confounds the impact of the IT investment on business value.

Balanced Scorecard

Accounting-based measures focus on quantitative results that are based on historical expenditures and leave a significant gap for measuring the business value of IT. The Balanced Scorecard, a highly cited body of research as defined by Kaplan and Norton (Kaplan & Norton, 1992; Norton & Kaplan, 1996), introduced a broad, multi-function vehicle to measure a firm's performance. Kaplan and Norton employed a holistic approach to measuring firm performance but did not specifically address information technology. Later, Martinsons and Davidson (Martinsons & Davidson, 1999) and Chand, Hachey, Hunton, Owhoso, and Vasudevan (Chand et al., 2005) expanded the Balanced Scorecard and included a measurement for IT. Their modified Balanced Scorecard provides more opportunity to understand the business value of IT.

Masli et al. also used the Balanced Scorecard to examine "the relationships between IT investments and business value [placing] IT in a business strategy context and describing the cause-and-effect relationships that create business value [associating] firm value and IT" (Masli et al., 2011, p. 82). Masli et al. used the Balanced Scorecard to determine how "IT affects business process performance and, ultimately, how IT affects overall firm performance" (Masli et al., 2011, p. 83). Masli et al. expanded the Balanced Scorecard to include a deeper understanding of the impact of IT investments.

Mithas et al. (Mithas et al., 2011) developed another multi-dimensional accounting-based framework to define a firm's performance. Although this framework differs from Kaplan and Norton's Balanced Scorecard (Kaplan & Norton, 1992), it, like the Balanced Scorecard, goes beyond traditional accounting measures to include measures for IT investments. The framework encompasses four areas: (a) customers, (b) financial and market performance, (c) human resources, and (d) organizational effectiveness, effectively broadening measurements for IT investments beyond ROI and ROA.

Firm Performance

Although there remain inconsistent measures or methodologies to ascertain the impact of IT investment on a firm's performance, firms continue to invest in IT. IT investments are believed to be necessary to operate a business (Dos Santos, Zhiqiang, Mookerjee, & Hongyu, 2012) and to grow (Galy & Sauceda, 2014). The relationship between IT investment and the business value delivered is consistent with Mithas et al. (Mithas et al., 2011) who found that IT investments increase firm performance. Dos Santos et al. further supported this relationship by showing that the growth in IT services is higher than the growth of the economy and, therefore, is a reliable indicator of demand for IT; their work implies that greater business value can be derived from information technology.

Dehning and Richardson investigated the "interactive effects of IT spending and IT management on firm performance" (Dehning & Richardson, 2002, p. 7) and found that there is a "direct link between IT and overall firm performance" (Dehning & Richardson,

2002, p. 9). Moreover, they defined business process performance to include gross margin, inventory turnover, customer service, quality, efficiency, other costs, profit margin, and turnover ratios. Thus, Dehning and Richardson establish a relationship among IT investment, business processes, and firm performance.

Jee-Hae et al. (Jee-Hae et al., 2011) expanded on Dehning and Richardson's ideas and suggested that a firm's performance should relate to how the benefits from IT investment are measured. When "IT investment is categorized as enhancing IT strategy, IT investment is more strongly related to market measures . . . [and] researchers must consider five primary issues: (1) the relationship between IT investment and firm performance; (2) IT investment measurement issues; (3) firm performance measurement issues; (4) experimental design and other variable measurement issues; and (5) covariate and control variable selection issues" (Jee-Hae et al., 2011, p. 146).

Hitt and Brynjolfsson found that IT created significant value for consumers but not necessarily extraordinary profitability for the firm, suggesting that there is a "contradiction between increased productivity [and] increased consumer value and unchanged business profitability" (Hitt & Brynjolfsson, 1996, p. 121). Others, such as Ho-Chang, Chang, and Prybutok, had similar findings and stated, "the results of our current analysis showed no significant link between IT capability and firm performance" (Ho-Chang, Chang, & Prybutok, 2014, p. 305). Jee-Hae et al. (Jee-Hae et al., 2011) attributed these conflicting results to the measurement process and not to the constructs, raising concern whether methods or data define the relationships between investments, performance, and business value.

Also, Bharadwaj, Sambamurthy, and Zmud (Bharadwaj, Sambamurthy, & Zmud, 1999) expressed concern for methods, specifically, for methods or measures related to competitive advantage (and subsequent business value). This research highlighted that while IT investments increase firm productivity, they may also lower the barriers to market entry, and in so doing reduce the competitive value of the IT investment. Their point was that IT investments produce both positive and negative effects and, in the long-term, may reduce a firm's competitive advantage and its business value.

Framework for IT Capability

Weill identified that a missing ingredient in valuing IT is a "framework for making informed decisions about IT" (Weill, Subramani, & Broadbent, 2002, p. 58). Similarly, Kohli and Grover (Kohli & Grover, 2008) proposed that the relationships between IT capability and the business value of IT would lead to increased understanding of IT valuations; however, Kohli and Grover did not specify how the constructs were to be measured. Gregor et al. called for extending the models of IT value realization to more dynamic models, including a category for IT transformational benefits (Gregor et al., 2006). Moreover, DeLone and McLean stated that "a well-defined outcome measure [or measures] is essential" (Weill, 1992, p. 61). Both groups of researchers called for a model that would define a comprehensive and consistent set of IT relationships to assist in making informed decisions regarding IT valuation, capability, or business value. However, neither were able to deliver consistent definitions of the exact constructs the model should address.

Weill's call for a consistent way to "define IT and the performance effect" (Weill, 1992, p. 308) resulted in a myriad of approaches instead of a singular approach. First, Mata, Fuerst, and Barney (Mata, Fuerst, & Barney, 1995) utilized the resource-based view to define "IT capability as capital requirements, proprietary technology, technical skills, and managerial skills" (Masli et al., 2011, p. 95). Second, Ravichandran and Lertwongsatien (Ravichandran & Lertwongsatien, 2005) invoked human capital, infrastructure flexibility, and IT partnerships as the contributors to IT capability" (Masli et al., 2011, p. 95) as possible measurements of IT capability. Third, Tallon et al. (Tallon et al., 2000) employed a systematic approach to identify the IT functions focusing on: (a) process planning and support; (b) supplier relations; (c) production and operations; (d) product and services enhancements; (e) sales and marketing support; and (f) customer relations evaluated across the dimensions of operational effectiveness and strategic positioning to determine IT capability. Fourth, Shang and Seddon (Shang & Seddon, 2002) identified five functions of IT that should be evaluated to assess IT capability: (a) operational; (b) managerial; (c) strategic; (d) IT infrastructure; and (e) organizational to provide a comprehensive viewpoint. Fifth, Bharadwaj et al. (Bharadwaj et al., 1998) offered a measure of capability along six dimensions: (a) IT/business partnerships; (b) external IT linkages; (c) business IT strategic thinking; (d) IT business process integration; (e) IT management; and (f) IT infrastructure. Sixth, DeLone and McLean's framework (DeLone & McLean, 1992, 2003) measured information system success.

Additionally, Kohli and Grover (Kohli & Grover, 2008) called for research to be conducted that used practical findings to improve upon the creation of business value

from IT. Kohli and Grover (Kohli & Grover, 2008) further said that IT valuation can be better understood by exploring the relationships between IT capability and the business value of IT. Whereas the business value of IT is defined along four dimensions (see section on Business Value of Information Technology), IT capability is inconsistently defined.

Also, IT has changed dramatically over time in terms of speed of computations, alignment with corporate goals, meeting management needs, and the ability to contribute to process changes (Petter, DeLone, & McLean, 2012). These changes cause concern that individual measures of IT may change over time too, making it imperative that a comprehensive approach to measuring IT capability be found so that any one variable will not significantly influence an outcome. Further, DeLone and McLean stated that for a model to be useful, "it must be complete and parsimonious" (DeLone & McLean, 1992, p. 87).

Fortunately, such a comprehensive approach exists, and the framework provides consistent and comprehensive definitions for information system success. DeLone and McLean's Information Systems Success framework is a "fairly accessible measure of I/S success" (DeLone & McLean, 1992, p. 68) and can lead to a determination of how IT benefits organizations. Gable, Sedera, and Chan (Gable, Sedera, & Chan, 2008) identified DeLone and McLean's framework (DeLone & McLean, 1992, 2003) as a stream of benefits from information systems and in so doing established a connection between IT capability and the business value of IT. But, before adopting DeLone and McLean's independent variables to measure IT capability, one concern must be recognized. Seddon

suggested that while “IS Use is a proxy for the benefits from use” (Seddon, 1997, p. 242), subtle differences in “use” or “usefulness” for the independent variable can create a significant change to the dependent variables; therefore, care needs to be exercised in developing definitions that are comprehensive and consistent for both the independent and dependent variables.

Although DeLone and McLean's framework is not typically used for measuring business value, this dissertation argues for its use. DeLone and McLean's framework is highly cited and consistently defines five independent variables and one dependent variable to measure IT capability. The independent variables include quality (of systems, of information, and of service), use of information, and user satisfaction with a dependent variable, information systems success.

Ross et al. (Ross et al., 1996), Bharadwaj et al. (Bharadwaj et al., 1998), Wade and Hulland (Wade & Hulland, 2004) and Cao (Cao, 2010) defined IT assets that conform closely with aspects of DeLone and McLean’s independent variables of quality, use of information, and user satisfaction. Components of DeLone and McLean’s framework further link to resources required in accordance with the resource-based view. Mirani and Lederer also offered that value from IT can be identified through measuring information quality (Mirani & Lederer, 1998), and Information Quality is one of the independent variables of DeLone and McLean’s framework of information systems success.

This dissertation acknowledges DeLone and McLean’s framework has been criticized for (a) lacking a theoretical basis and demonstrating causality between the

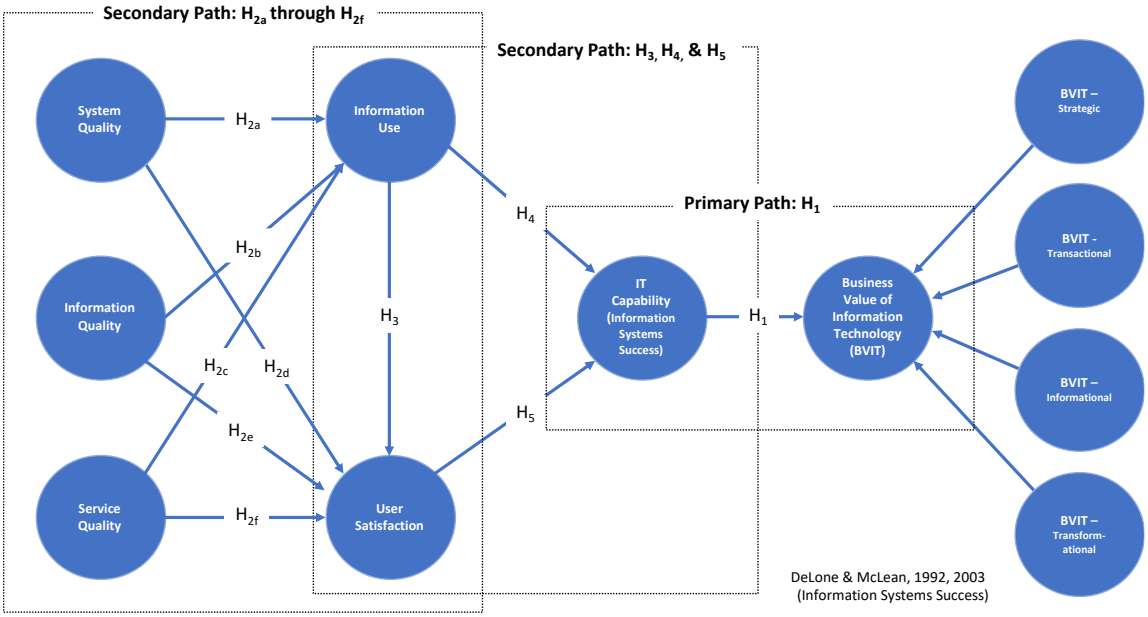
variables (Gable et al., 2008) and (b) that the "results on the relationships among [their] constructs related to information systems success, as well as the determinants of IT Success, are often inconsistent" (Sabherwal, Jeyaraj, & Chowa, 2006, p. 1849). It is, nonetheless, the most frequently cited and most used framework to measure IT information success and thus applicable to measure IT capability.

Conceptual Model and Hypotheses Development

This dissertation sought to investigate if a correlation between IT capability and the business value of IT exists. Currently, no empirical testing of a correlation between IT capability and the business value of IT exists, although there are studies that utilized similar variables and hypotheses, which were leveraged in this dissertation. The dissertation, therefore, provided empirical testing of IT capability and the business value of IT via a comprehensive research model. The research model of the dissertation consists of one primary path and two secondary paths; each path consists of one or more hypotheses (Figure 4). The primary path tests the relationship between the variables IT Capability and the Business Value of IT; two secondary paths test (1) the relationships of the exogenous variables, System Quality, Information Quality, and Service Quality, to the endogenous variables, Information Use and User Satisfaction, and (2) the relationships between (a) Information Use and User Satisfaction, (b) Information Use and IT Capability, and (c) User Satisfaction and IT Capability.

This dissertation focused on Kohli and Grover's (Kohli & Grover, 2008) call for more research into the relationship between IT capability and the business value of IT. To answer the call of Kohli and Grover, one must also take into account firms that operate in

dynamic market environments and decide to act on factors in real time to secure their competitive position in the marketplace. A firm's investments of time and money is critical to achieving its objectives. In particular, firms believe their investments in IT capabilities improve their ability to (a) process data to be more accurate and reliable for better decision making, (b) strategically position their firm relative to competitors, (c) operate more efficiently and effectively, (d) shorten product lifecycles, (e) conduct speedier transactions, and (f) pursue new business opportunities, such as new products and services and additional market segments.



Note: The above structural model identifies the variables, paths and hypotheses used to test the relationship between IT capability and the business value of IT.

FIGURE 4: IT Capability -> Business Value of IT Research Model

In summary, this dissertation answered Kohli and Grover's (Kohli & Grover, 2008) proposition via empirical testing and additionally provided insight to practitioners

in how IT capability improves the business value of IT. The dissertation's hypotheses were developed accordingly.

Primary Path: The Development of Hypothesis H_1

The primary path of the dissertation's research model, IT Capability to the Business Value of IT, reflected a firm's desire to build competitive advantage. The model's use of the variable IT Capability was not without precedent and found in prior research, and so the research model used the same IT Capability variable. However, while Kohli and Grover proposed this relationship, they did not empirically test for the correlation between the two variables (Kohli & Grover, 2008). The relationship between IT capability and the business value of IT has its roots in the resource-based view (Barney, 1991), and IT capability as a component of competitive advantage was reinforced by Wade and Hulland (Wade & Hulland, 2004). Kohli and Grover suggested that to better understand the business value creation from IT, a better understanding of the impact of IT capability is required (Kohli & Grover, 2008); Melville et al. showed that IT can add value to the firm (Melville et al., 2004); and Cao et al. stated that value can be created by IT when it combines with other factors (Cao et al., 2011).

Research conducted by Ho-Chang et al. (Ho-Chang et al., 2014) and Bharadwaj (Bharadwaj, 2000) tested IT capability for its relationship with firm performance; Ravichandran and Lertwongsatien (Ravichandran & Lertwongsatien, 2005) tested the effects of IT capability on core competencies of the firm; and Muhanna and Stoel (Muhanna & Stoel, 2010) tested the correlations between (a) IT capability and market value and (b) IT capability and future earnings.

While IT Capability has been used as an independent variable many times, the dependent variable, the Business Value of IT, has followed a more fragmented path. The primary issue with the variable Business Value of IT is that its definitions are wide-ranging and inconsistent. As discussed earlier in this chapter, the business value of IT has four distinct dimensions that form the concept of the business value of IT. The four dimensions are: (a) the strategic value of IT, (b) the transactional value of IT, (c) the informational value of IT, and (d) the transformational value of IT.

Although the business value of IT lacks a common, consistent, or comprehensive definition, it is nonetheless, described throughout the literature as the dependent variable, and therefore employed the in the same manner in this dissertation. Cao et al. developed the dependent variable so that "IT can be defined as a mediator that creates business value directly" (Cao et al., 2011, p. 99). Cronk and Fitzgerald proposed a definition for the business value of IT that is dependent on systems use, user attitudes, and alignment with the business (Cronk & Fitzgerald, 1999). Melville et al. used the business value of IT as a dependent variable resulting from the organizational impact of IT (Melville et al., 2004). Schreyn used business value of IT as a dependent variable resulting from information technology investments (Schryen, 2013). Teo and Wong also focused on information quality as an antecedent to satisfaction and the ultimate impact to the firm specifically stating "whether the firm has become more competitive" (Teo & Wong, 1998, p. 614) fitting into the definitions of business value. Lastly, Sabherwal and Jeyaraj focused on business value from IT investments but did not take into account IT potential,

technology, organization, and environmental factors as moderators (Sabherwal & Jeyaraj, 2015).

Per Kohli and Grover (Kohli & Grover, 2008), the relationship between IT Capability and the Business Value of IT had not been previously empirically tested. Based on the prior research of IT Capability as an independent variable and the various definitions of the Business Value of IT as a dependent variable described above, the following hypothesis was proposed:

> *Hypothesis H_1: IT capability (ITC) is positively associated with the business value of IT (BVIT).*

Secondary Paths: Introduction

In order to ensure the relationship between IT Capability to the Business Value of IT is adequately tested, it is important that the independent variables were carefully constructed. First, a comprehensive definition of IT Capability is developed; otherwise, the independent variable would not have demonstrated any meaningful relationship to the Business Value of IT. Second, the dependent variable, the Business Value of IT, required a composite and comprehensive definition; otherwise, the test results would not have been complete. Reinforcing the need for a defined, comprehensive set of variables, Petter, DeLone, and McLean (Petter, Delone, & McLean, 2008) attributed differences in their study not to methods and data but to the context of the tests. Likewise, Hitt and Brynjolfsson stated that results are impacted not only by data and methods, but also through the choice of variables (Hitt & Brynjolfsson, 1996).

DeLone and McLean's (DeLone & McLean, 1992, 2003) Information Systems Success framework offers a widely cited measurement for IT that was utilized in this dissertation for its comprehensive set of six variables that create a measure of IT capability. Although DeLone and McLean's framework is widely cited, Sedera and Gable (Sedera & Gable, 2004) identified that the use of all six variables of the framework was applied only in a small number of research studies, creating possibilities for reaching incomplete or incorrect results. Also, Sabherwal et al. (Sabherwal et al., 2006) identified that relationships involving the DeLone and McLean variables are often inconsistent. Therefore, Gable et al. (Gable et al., 2008) called for testing the relationships between the exogenous and endogenous variables of the DeLone and McLean framework to reduce issues related to differing definitions. In this dissertation, all six of the DeLone and McLean variables were utilized to validate the relationship between IT Capability and the Business Value of IT.

So, the two secondary paths tested the antecedent variables of IT Capability. The first path focused on the testing of the exogenous variables of System Quality, Information Quality, and Service Quality, and the second path focused on the endogenous variables of Information Use, User Satisfaction, and IT Capability. The following sections further explain why these variables were chosen and how the associated hypotheses were formed.

Path 1: The Development of Hypotheses H_{2a} through H_{2f}

The secondary path of the dissertation's research model focused on the exogenous variables of System Quality, Information Quality, and Service Quality. According to

DeLone and McLean, “systems quality measures technical success; information quality measures semantic success; and use, user satisfaction . . . measure effectiveness success” (DeLone & McLean, 2003, p. 10). Further, Ives, Olson, and Baroudi utilized user information and satisfaction as a “critical but unmeasurable result of an information system” (Ives, Olson, & Baroudi, 1983, p. 785). Baroudi, Olson, Ives, and Davis (Baroudi, Olson, Ives, & Davis, 1986) found that user involvement had an impact on user information satisfaction and system usage. Doll and Torkzadeh evaluated the impact of ease of use on end-user satisfaction and included accuracy (information quality) as an independent variable focusing on the ultimate objective of system success (Doll & Torkzadeh, 1988, p. 260). Seddon and Yip (Seddon & Yip, 1992) utilized accuracy or information quality as independent variables for user satisfaction when evaluating the effectiveness of general ledger systems. Heo and Han (Heo & Han, 2003) developed the relationships between information quality and system quality with the dependent variables of information use and user satisfaction. Sedera and Gable (Sedera & Gable, 2004) utilized system accuracy, system quality and information quality to determine enterprise systems success. Lastly, Gable et al. (Gable et al., 2008) focused on the variables of accuracy and ease of use to create the variable, System Quality, thereby, defining information systems capabilities. Therefore, in order to evaluate the impact of System Quality and Information Quality on IT Capability the endogenous variables of Information Use and User Satisfaction were utilized.

In DeLone and McLean’s 1992 framework (DeLone & McLean, 1992), the relationship between system quality and information quality was a key determinant of

information use and user satisfaction. DeLone and Mclean's research identified that quality in IT drives (a) increased information use because of more efficient, effective, and productive processes and (b) higher user satisfaction. Thus, the following hypotheses were proposed:

Hypothesis H_{2a}: System Quality is positively associated with Information Use.

Hypothesis H_{2b}: Information Quality is positively associated with Information Use.

Hypothesis H_{2d}: System Quality is positively associated with User Satisfaction.

Hypothesis H_{2e}: Information Quality is positively associated with User Satisfaction.

DeLone and McLean (DeLone & McLean, 2003) revised their framework in 2003 to include the variable, Service Quality, as a response to (a) growth in end-user computing during the late 1990s and (b) the potential impact of service quality to information use and user satisfaction. Service quality, as such, became a measure of information systems success and was included in the empirical testing for both information use and user satisfaction. Thus, the following hypotheses were proposed:

Hypothesis H_{2c}: Service Quality is positively associated with Information Use.

Hypothesis H_{2f}: Service Quality is positively associated with User Satisfaction.

Path 2: The Development of Hypothesis H_3, H_4, and H_5

The secondary path of the dissertation's research model tested the relationships between (a) Information Use to User Satisfaction, (b) Information Use to IT Capability, and (c) User Satisfaction to IT Capability. These relationships align with Seddon (Seddon, 1997) and DeLone and McLean's (DeLone & McLean, 1992, 2003) research and took into account the interdependencies of numerous variables rolled into one comprehensive model of information systems success.

Considerable research supports the interrelationships between the endogenous variables. Baroudi et al. evaluated the impact of user involvement and the relationship between user information satisfaction and system usage (Baroudi et al., 1986). Seddon and Yip studied a general ledger system with user satisfaction and the ease of use as the primary independent variables (Seddon & Yip, 1992). Heo and Han advised when measuring the value of IT, if variables are not consistently defined and comprehensively measured, then the results will be unclear (Heo & Han, 2003). Lastly, Burton-Jones and Straub focused on system usage and IT capability (Burton-Jones & Straub, 2006).

Information Use and User Satisfaction focus primarily on IT's efficiency, effectiveness, and productivity as the result of IT quality with Information Use as a possible mediator to User Satisfaction. The use of Information Use and User Satisfaction as dependent variables was inconsistent in prior research, so a separate test of the relationship of Information Use to User Satisfaction was necessary (DeLone & McLean, 2003; Doll & Torkzadeh, 1988; Seddon & Yip, 1992). Thus, the following hypothesis was proposed:

Hypothesis H_3: Information Use is positively associated with User Satisfaction.

IT Capability reflects the impact of information technology on the ability of a firm to manage its financial performance, manage its staff and organization, increase firm capacity, and facilitate business change. The measure of IT Capability is made more robust with the incorporation of the variables, Information Use and User Satisfaction, instead of relying solely on the direct testing from the exogenous variables, System Quality, Information Quality, and Service Quality, directly to the endogenous variable, IT Capability. Thus, the following hypotheses were proposed:

Hypothesis H_4: Information Use is positively associated with ITC.

Hypothesis H_5: User Satisfaction is positively associated with ITC.

Control Variables

In order to test the primary hypothesis, Hypothesis H_1: IT capability (ITC) is positively associated with the business value of IT (BVIT), several control variables must be considered. Porter (Porter, 1985) identified that industry type, vertical segment, and geography could affect the results. Kohli and Devaraj (Kohli & Devaraj, 2003) identified that industries, in general, and also specific industries impact results. For example, Muhanna and Stoel (Muhanna & Stoel, 2010) found that high-tech industries where IT is valued more influences the results. However, the objective of this study was to establish the relationship between IT capability and the business value of IT and thus industry, vertical segment, and geography were established as control variables so as not to distract from the primary intent of the research.

Similarly, Cao (Cao, 2010), Gable et al. (Gable et al., 2008), Sedera and Dey (Sedera & Dey, 2006), Heo and Han (Heo & Han, 2003), and Gregor et al. (Gregor et al., 2006) expressed concern that organizational size and respondent position level (within an organization) and associated experiences with IT systems could impact research results. Weill (Weill, 1992) identified respondent tenure within the organization and time working with IT as additional variables that could impact results. Tallon et al. (Tallon et al., 2000) identified that the respondent's role and level of seniority in the organization may also impact results. Accordingly, the variables of organizational size, the respondent's level within an organization, tenure, and role, and level of seniority along with industry vertical segment, and geography were held constant to maintain focus on the primary intent of this study.

Literature Review, Conceptual Model and Hypotheses Development Summary

A survey of the literature revealed that: (a) the resource-based view of the firm established a foundation that firms invest in information technology to improve their competitive advantage through valuable, rare, inimitable, and non-substitutable resources and capabilities; (b) a comprehensive set of definitions was required for the measurement of the business value of IT; (c) there was a lack of empirical testing of the relationship between IT capability and the business value of IT; (d) alternative measurements of IT investments did not provide measures of business value—they were either not directly identifiable as a result of IT investments or were based on historical costs; and (e) DeLone and McLean's Information Systems Success (DeLone & McLean, 1992, 2003)

framework provided a consistent and comprehensive set of constructs to measure IT capability.

Further, the development of the conceptual model and hypotheses were created to respond to Kohli and Grover's (Kohli & Grover, 2008) proposed relationship between IT capability and the business value of IT and probe the prior use of these variables in prior studies. The conceptual model and hypotheses encompassed the complete set of the DeLone and McLean's (DeLone & McLean, 1992, 2003) constructs as the antecedents of IT Capability, requiring the testing of all of the interrelationships of these constructs to improve the validity of the IT Capability construct.

CHAPTER 3: METHODS

For this study, the chapter on Methods is divided into three sections. The first section addresses considerations for testing the research model. The second section describes the creation of the survey, the pilot tests, the final survey, and characteristics of the respondents. The third section presents the methods used to test the hypotheses.

Considerations for Testing the Research Model

Consistency of Results

Gable et al. (Gable et al., 2008) stated that results across studies that measure the impact of information technology have been inconsistent. Studies by Sedera and Gable (Sedera & Gable, 2004) and Hitt and Brynjolfsson (Hitt & Brynjolfsson, 1996), for example, reported positive impacts of information technology, whereas a study by Jee-Hae et al. (Jee-Hae et al., 2011) showed little impact.

Several researchers identified that differences in results relate to issues in the construction of the research model (Gable et al., 2008; Masli et al., 2011; Melville et al., 2004; Sabherwal & Jeyaraj, 2015; Wade & Hulland, 2004). For example, Masli et al. examined the relationship between IT capability and competitive advantage and found the choice of "particular elements of IT capability … limit[s] the generalizability of the findings" (Masli et al., 2011, p. 99). Sabherwal and Jeyaraj (Sabherwal & Jeyaraj, 2015) found that the business value of IT increases when there are fewer IT-related antecedents. And lastly, Melville et al. found that the business value of IT is dependent on a "variety of factors, including the type of IT, management practices, and organizational structure,

as well as the competitive and macro environment" (Melville et al., 2004, p. 284), another researcher identifying an issue with antecedent variables. These examples show that differences in results are a consequence of an inconsistent model (Gable et al., 2008). Melville et al. (Melville et al., 2004) also observed that although the constructs may appear similar, the intermediate business processes are not, and to improve reliability, the construct should be split into well-defined, meaningful subcomponents.

Even with the widely cited DeLone and McLean Information Systems Success (ISS) framework, results differed across studies (Wade & Hulland, 2004). Gable et al. identified this difference when they observed (a) only two out of 45 prior studies employing DeLone and McLean's framework utilized all six variables of the framework and (b) there were "41 mutually exclusive measures of its five success dimensions: satisfaction, system quality, information quality, individual impact, and organizational impact" (Gable et al., 2008, p. 380). Again, an incomplete, inconsistently used model leads to discrepancies in results.

Formative versus Reflective Constructs

Constructs need to be defined as reflective or formative in order to properly test the proposed research model. Whether a construct is reflective or is formative is determined by how observed indicators either influence or are themselves influenced by an associated construct. In this dissertation, (a) the observed indicators of the DeLone and McLean constructs and the IT Capability construct were highly correlated with their associated constructs; (b) the indicators did not cause changes in the construct; and (c) the

indicators were interchangeable within the construct and share a common theme; therefore, the constructs were determined to be reflective in nature (Hair et al., 2016).

On the other hand, the construct for the Business Value of IT that consists of four dimensions of business value of IT: (a) strategic, (b) transactional, (c) informational, and (d) transformational, was not highly correlated across the construct and was not expected to covary with other items. The Business Value of IT construct, therefore, represented a formative construct (Jarvis, MacKenzie, & Podsakoff, 2003; Lee, Petter, Fayard, & Robinson, 2011).

A Higher-Order Construct

Because the formative construct of the Business Value of IT represented four distinct dimensions, care must be taken to ensure that the construct is identified as distinct from its four dimensions. Becker, Klein, and Wetzels stated that higher-order constructs (a) reduce model complexity; (b) are explained by their lower-level dimensions; and (c) do not exist without lower-level dimensions (Becker, Klein, & Wetzels, 2012). Accordingly, the Business Value of IT construct is a formative, higher-order construct.

Also, Becker suggested that a "repeated indicator approach allows the ability to estimate all constructs simultaneously instead of estimating lower-order and higher-order dimensions separately . . . avoiding interpretational confounding " (Becker et al., 2012, p. 365). Because the constructs for IT Capability are reflective and the construct for the Business Value of IT is formative, the research model of this dissertation was identified as Reflective-Formative with Mode B (Becker et al., 2012; Hair et al., 2016).

Research Model Constructs: ITC and BVIT

This dissertation utilized the DeLone and McLean (DeLone & McLean, 1992, 2003) information systems success framework in its entirety as a set of independent variables. The framework's exogenous variables for quality (system, information, and service) determined the endogenous mediators of information use and user satisfaction that combined to define this study's construct, IT capability (ITC), and in so doing simplified matters and reduce potential confusion.

Crucial to understanding the business value of IT is a composite definition to measure the business value of IT. Weill's (Weill, 1992) research established three dimensions of business value for IT: (a) strategic, (b) transactional, and (c) informational. The fourth dimension, transformation value of IT, was identified by Gregor et al. (Gregor et al., 2006), Kobelsky et al. (Kobelsky et al., 2008) and Daulatkar and Sangle (Daulatkar & Sangle, 2016). Because (a) these four dimensions are not interchangeable, (b) each one captures a specific aspect of the construct, and (c) the dimensions are not expected to covary, they combine to form a comprehensive, composite definition (Hair et al., 2016) of the business value of IT and, moreover, create a comprehensive, composite, higher-order construct of the Business Value of IT (BVIT).

Primary versus Secondary Data

Kohli and Devaraj's (Kohli & Devaraj, 2003) research identified that the source of the data could affect the results when determining the relationship between IT investment and a firm's performance. Further, Kohli and Devaraj (Kohli & Devaraj, 2003) found that researchers are more likely to report positive relationships between IT

and performance when data samples are obtained directly from primary sources (e.g., from firms) versus secondary sources, inferring that the source of data can have a significant impact on results. Regarding secondary sources, Wang and Alam (Wang & Alam, 2007) expressed concern that data from a secondary source, such as the *Information Week 500,* could confound results; Wang and Alam also noted that the ranking methodology used in the *Information Week 500* varied throughout the sample years.

Development of the Survey

The research model required multiple steps to test the relationships among the constructs. The first step created the survey questions; the second step tested the survey questions through a pilot; the third step identified an appropriate study sample size; and the fourth step administered the survey to sample participants.

When DeLone and McLean initially introduced their framework (DeLone & McLean, 1992), they suggested that the constructs and measures used would create a complete and comprehensive model. It is acknowledged that DeLone and McLean's framework is the way to capture a comprehensive measure of IT success or capability, but for the measure of business value of IT, Hitt and Brynjofsson (Hitt & Brynjolfsson, 1996) maintained that its measurement is heavily dependent on the questions being asked. Therefore, the questions for this study were developed from a broad and comprehensive set of questions used in prior research (Appendix A) modified to ensure consistency in tense and modified to incorporate bias-free language related to specific phrasing in the questions.

Another concern when establishing the hypotheses for this study involved the impact from respondent bias. Dehning et al. (Dehning et al., 2007) pointed out that some studies use "perceived" business value (ascertained from a survey respondent's perception of performance) and others use "real" business value (reported from audited accounting financial statements) as indicators of firm performance. Tallon et al. observed that "business executives are in an ideal position to identify how and where IT creates value for the business" (Tallon et al., 2000, p. 146), making one to consider a respondent's perception as a viable approach to sample. Going a step further, Nicolian, Welch, Read, and Roberts stated that the executive's view may be different from other stakeholder's views (Nicolian, Welch, Read, & Roberts, 2015) and that the perceptions of executives may be more precise than actual data because of (a) an executive's close proximity to the overall business and (b) the lack of primary data sources. Also, Seddon (Seddon, 1997) used perceptual measures of usefulness and satisfaction to measure benefits of the DeLone and McLean model of information systems success. This study captured perceived value related to IT via an online survey deployed using a Qualtrics® panel.

The questions of the survey were developed after a review of existing literature on information technology and the business value of IT. Questions for each construct were extracted from prior surveys and adapted for use in this study; questions were modified to ensure consistency in tense and consistency in phrasing across the constructs; questions were evaluated for overlap and modified to sharpen each construct's focus. For the construct Information Quality, the survey questions were sourced from research by Gable

et al., Heo and Han, Sedera and Gable, Wang, and Wu and Wang (Gable et al., 2008; Heo & Han, 2003; Sedera & Gable, 2004; Y.-S. Wang, 2008; Wu & Wang, 2006). For the construct System Quality, the survey questions were sourced from research by Gable et al., Heo and Han, Mohammidi, Sedera and Gable, Wang, and Wu and Wang (Gable et al., 2008; Heo & Han, 2003; Mohammadi, 2015; Sedera & Gable, 2004; Y.-S. Wang, 2008; Wu & Wang, 2006). For the construct Service Quality, the survey questions were sourced from Mohammadi and Wang (Mohammadi, 2015; Y.-S. Wang, 2008). For the construct Information Use, the questions were sourced from Gable et al., Heo and Han, Sedera and Gable, and Wu and Wang (Gable et al., 2008; Heo & Han, 2003; Sedera & Gable, 2004; Wu & Wang, 2006). For the construct User Satisfaction, the survey questions were sourced from Heo and Han, Mohammadi, Wang, and Wu and Wang (Heo & Han, 2003; Mohammadi, 2015; Y.-S. Wang, 2008; Wu & Wang, 2006). For the construct IT Capability, the questions were sourced from Gable et al., and Sedera and Gable (Gable et al., 2008; Sedera & Gable, 2004). For the higher-level, formative construct Business Value of IT Strategic Value dimension, the questions were sourced from Gregor et al., Melville et al., and Mirani and Lederer (Gregor et al., 2006; Melville et al., 2004; Mirani & Lederer, 1998). Similarly, for the Business Value of IT Informational and Transactional dimensions, the questions were sourced from Gregor et al., Melville et al., Mirani and Lederer, and Petter, DeLone, and McLean (Gregor et al., 2006; Melville et al., 2004; Mirani & Lederer, 1998; Petter, DeLone, & McLean, 2013). And for the Business Value of IT Transformational dimension, the questions were sourced from Gregor et al. and Teo and Wong and (Gregor et al., 2006; Teo & Wong,

1998). All answers were measured on a 7-point Likert scale, with 1 = “Strongly Agree” and 7 = “Strongly Disagree”. Appendix B lists the questions of the survey.

Pilot Survey

Individuals within the author’s organization of employment participated in the pilot survey. Fifty-seven surveys were sent via Qualtrics® and thirty individuals responded. Thirty individuals responding aligned with prior studies by Johanson and Brooks (Johanson & Brooks, 2010) and Hertzog (Hertzog, 1978) that suggested a sample size for a pilot or feasibility study can be as small as 10 to 15 respondents and adequate at 20 to 25 respondents. The respondents of this study’s pilot were not included in the final study sample.

The primary objective of the pilot survey was to evaluate the survey’s questions and their effectiveness in capturing appropriate responses. Admittedly, the respondents of the pilot survey may have been biased as they were under the author’s organizational supervision. They were, nonetheless, a group of knowledgeable, “heavy IT users” from whom proper responses to the test questions could be expected. Moreover, as the respondents were known and were a relatively homogenous group, the validity of their answers to the survey questions was easier to assess.

Pilot survey questions were evaluated by assessing the outer loadings of the observed indicators, and any questions that did not yield answers consistent with the other observed indicators were discarded. There were only two questions that did not provide results consistent with the other observed indicators. Specifically, Question Q6.1 had outer loadings that were much lower than the other observed indicators for the

Information Use construct. Efforts were made to assess whether the coding was correct or not and if the wording of the question was appropriate. Recoding the question did not improve the results although the question was appropriate based on a comparison with its source; therefore, the question was eliminated as it had minimal impact on the reflective construct. Similarly, question Q12.5 resulted in outer loadings inconsistent with the other observed indicators for the transformational dimension of BVIT. Upon review, Question Q12.5 was deemed to be related to an organizational characteristic and outside the scope of this study. So, it, too, was not included in the final analysis.

Full Study Survey Sample Size

The target sample size of this dissertation survey was approximately 150 respondents based on a study similar to Ravichandran and Lertwongsatien (Ravichandran & Lertwongsatien, 2005) that correlated IT capability with a firm's performance using a partial least squares-structural equation methodology (PLS-SEM) methodology. Ravichandran and Lertwongsatien's study realized a return response of 127 surveys. The dissertation survey sampled individuals working at a multitude of companies ranging in size from 100 to over 1,000 employees and revenues from around $10 million per year to over $1 billion per year.

Additionally, full study sample size was assessed using "rule of thumb" measures and a power analysis for PLS-SEM. Rule of thumb measures are: (a) ten times the largest number of formative indicators measuring a single construct yields a sample size (e.g., 10 x 4 formative indicators = a sample size of 40), or (b) 10 times the largest number of structural paths into a latent construct in the structural model yields a sample size (e.g.,

10 x 4 structural paths = a sample size of 40) (Hair, Ringle, & Sarstedt, 2011). A power analysis indicated a sample size of 48. This calculation accounted for 6 independent variables at a statistical power of 80% to detect a R^2 of at least 0.25, yielding a sample size (Cohen, 1992). A sample size of 150 exceeded both the rule of thumb measures and the power analysis, indicating a reasonable sample size for the full study survey. The dissertation's survey sampled individuals contacted through an online panel (administered through Qualtrics®); 153 individuals completed the surveys out of 278 individuals attempting the surveys.

Full Study Respondent Characteristics

The characteristics of the respondents to the full study survey varied across job levels and functions, geographies, gender, and age (Table 2). Characteristics of the respondent organization were also gathered (Table 3), identifying organization size in terms of the number of people and revenue and organization industry. All organizational characteristics were identified by the respondents individually and anonymously; therefore, the study cannot track to individuals or be confirmed by additional sources.

TABLE 2: Respondent Characteristics

			Number of Answers	Percent
Respondent Characteristics				
Q15.2	Level of position			
	Staff		47	31%
	Manager		76	50%
	Director/VP		26	17%
	CxO		4	3%
		Total	**153**	**100%**
Q15.3	Gender			
	Male		80	52%
	Femal		72	47%
	Rather not identify		1	1%
		Total	**153**	**100%**
Q15.4	Age			
	Under 25		7	5%
	25 to 35		50	33%
	35 to 50		68	44%
	50 to 65		24	16%
	Over 65		3	2%
	Rather not identify		1	1%
		Total	**153**	**100%**
Q15.5	Job Function			
	Finance		25	16%
	Information Technology		38	25%
	Human Resources		13	8%
	Sales & Marketing		22	14%
	Operations & Distribution		19	12%
	Manufacturing		8	5%
	After-Market Service		1	1%
	Executive Management		6	4%
	None of the above		21	14%
		Total	**153**	**100%**
Q15.6	Geographic Area			
	Northeast		37	24%
	Mid-Atlantic		6	4%
	Southeast		31	20%
	Midwest		34	22%
	Northwest		16	10%
	Southwest		28	18%
	Outside the USA		1	1%
		Total	**153**	**100%**

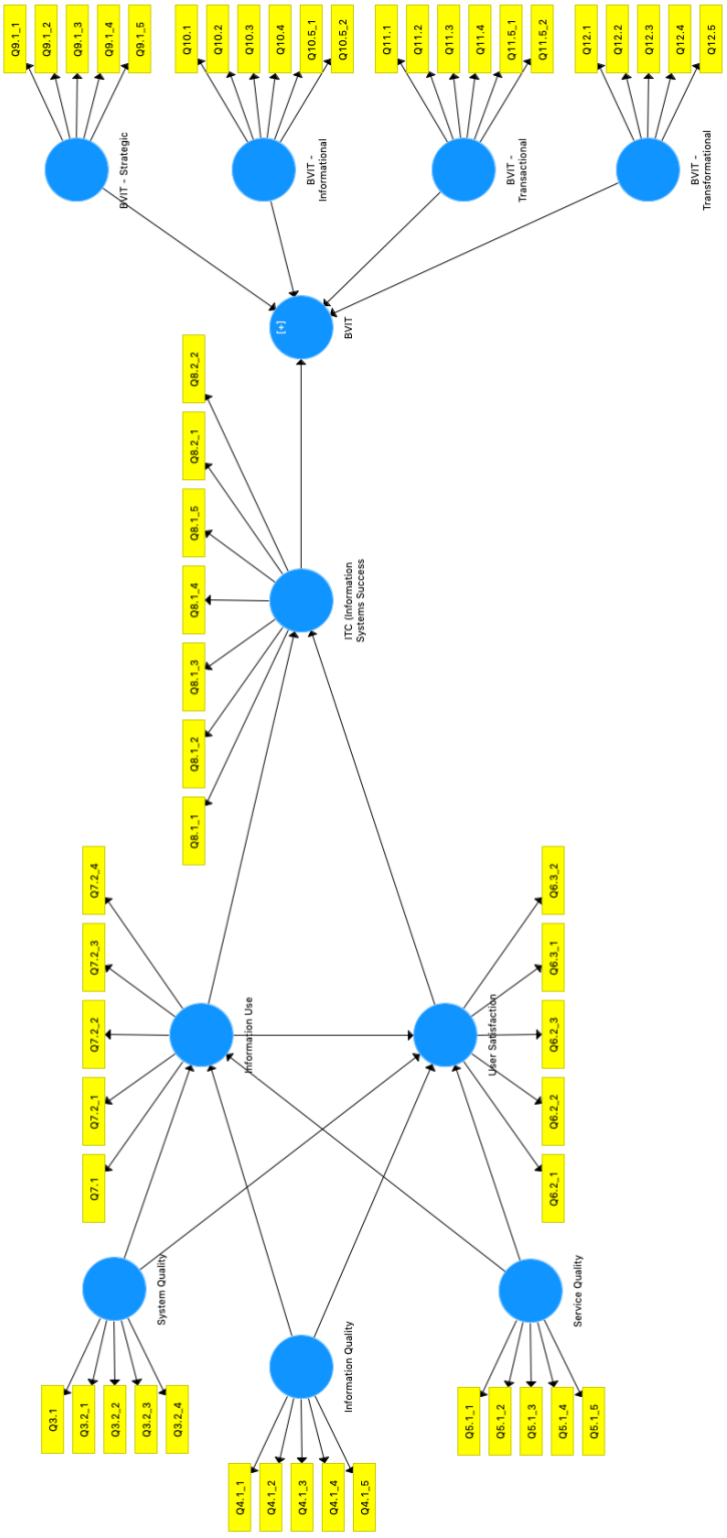
TABLE 3: Organizational Characteristics

		Number of Answers	Percent
Organizational Characteristics			
Q14.1	Size of Company (People)		
	Less than 50 people	0	0%
	50 to 100	7	5%
	100 to 500	48	31%
	500 to 1,000	36	24%
	Larger than 1,000	62	41%
	Total	**153**	**100%**
Q14.2	Size of Company (Revenue)		
	Less than $5 Million	0	0%
	$5 to $10 Million	15	10%
	$10 to $50 Million	22	14%
	$50 to $100 Million	29	19%
	$100 to $500 Million	31	20%
	$500 to $1B Million	20	13%
	Greater than $1Billion	36	24%
	Total	**153**	**100%**
Q14.3	Industry		
	Manufacturing	23	15%
	Distribution (Transportation & Warehousing)	5	3%
	Retail Trade	16	10%
	Health Care and Social Assistance	14	9%
	Information	21	14%
	Wholesale Trade	4	3%
	Professional, Scientific, and Technical Services	19	12%
	None of the above	51	33%
	Total	**153**	**100%**

Research Model Testing

The PLS-SEM regression analysis was chosen as the approach to test the dissertation's hypotheses because: (a) PLS-SEM minimizes the impact of sample size because its calculations are less susceptible to smaller samples (Petter, 2018); (b) PLS-SEM is a useful tool for studies that focus on theory development and prediction instead of exploration (Hair et al., 2011); and (c) PLS-SEM is the preferred tool when equations must be analyzed simultaneously (Lee et al., 2011).

The research model, a Reflective-Formative structural research model as defined by PLS-SEM (Hair et al., 2016), included IT Capability as the independent reflective construct and the Business Value of IT as a higher-order, formative construct. Smart PLS software (Hair et al., 2016) modeled the constructs and their relationships (Figure 5), an approach similar to those described by Ravichandran and Lertwongsatien (Ravichandran & Lertwongsatien, 2005) that correlated IT capability to firm performance utilizing a PLS-SEM regression analysis.



Note: Smart PLS Software (Hair et al., 2016)

FIGURE 5: Smart PLS Model IT Capability -> Business Value of IT

CHAPTER 4: RESULTS

This chapter reports the results of the evaluation of the research model. The evaluation tested survey responses from 158 respondents. The survey of the Information Technology Capabilities (ITC) –> Business Value of Information Technology (BVIT) model was conducted through an online Qualtrics® panel of 278 possible respondents. All survey responses with missing data were removed from the study sample (Hair et al., 2016) resulting in 153 completed responses. The average survey response time was 8.8 minutes with 95% of the respondents taking between 7.6 minutes and 9.97 minutes.

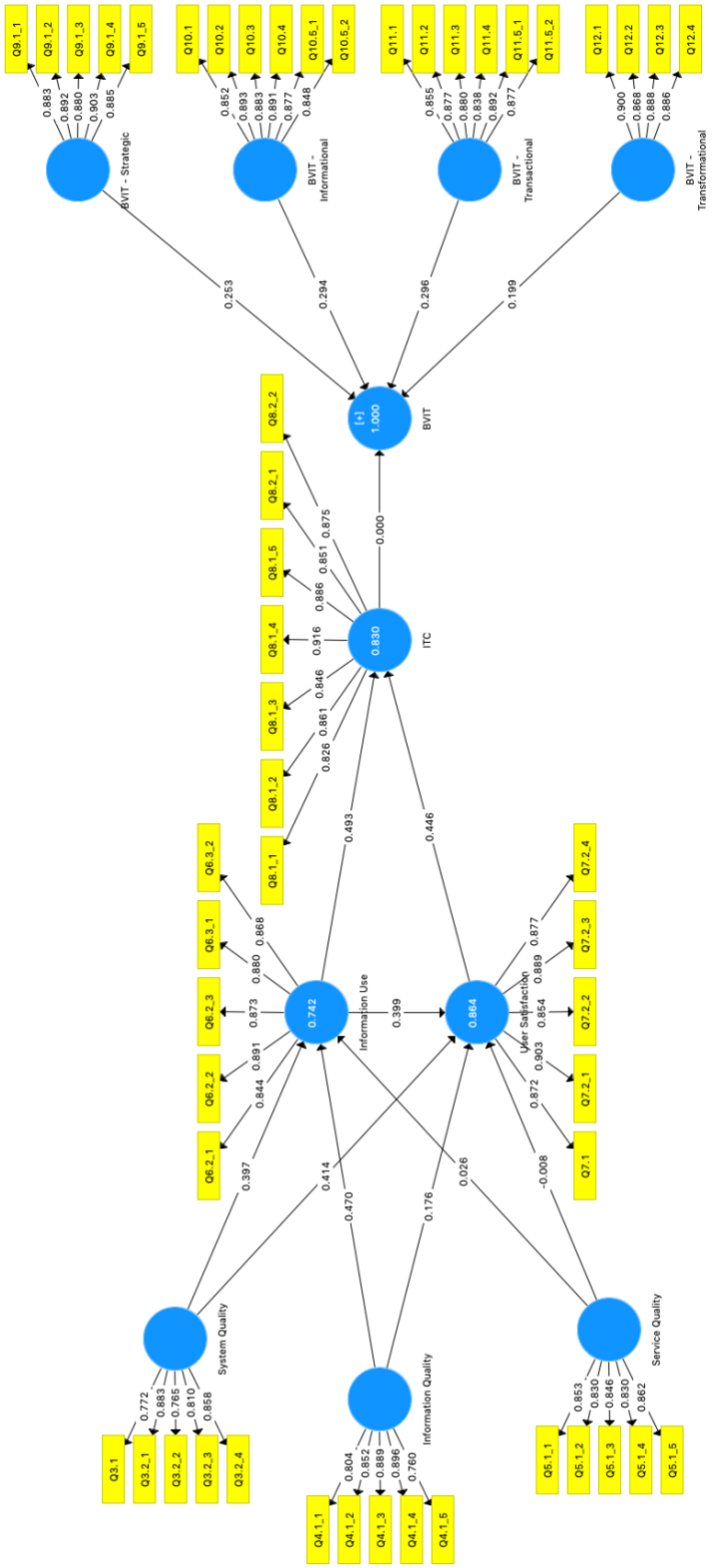
Tests were conducted for reliability, convergent validity, and discriminant validity of the reflective constructs. Convergent validity was used to measure how closely alternative measurements of the same construct were aligned, indicating if there was a commonality of influence on the construct. Indicator reliability and the AVE (average variance extracted) were also analyzed to determine convergent validity. Discriminant validity was also evaluated to determine if each construct was unique and not measuring the same phenomenon as other constructs. These tests were performed to determine if the constructs were reliable and valid before evaluating the results of the tests.

Cross-loadings were reviewed as an initial step with the higher loadings associated with the appropriate construct indicating an initial view of discriminant validity. The Fornell-Larcker criterion was evaluated to determine if the construct shared more variance with its indicators than with other constructs, and the Heterotrait-Monotrait ratios were evaluated to assess predictive capabilities and the relationships between the different constructs. Finally, the reliability and validity of the reflective

indicators to determine the appropriate path coefficients were analyzed for the size and statistical significance of the path coefficients. The R_2 values (explained variance), and the f_2 effect size were evaluated in order to identify the probability of the relationship between ITC and BVIT (Hair et al., 2016).

Outer Loadings and Weights

The first step was to evaluate the outer loadings of the reflective constructs. All of the indicators (Figure 6) for the reflective constructs had higher outer loadings for their observed indicators (above 0.708) signifying that that they had commonality of influence on the constructs (Hair et al., 2016). The reliability of the formative construct, BVIT, was assumed to be error-free; thus, consistency, reliability, convergent and discriminate validity were deemed acceptable (Hair et al., 2016). However, content validity was a prerequisite to evaluating the formative constructs and was established by defining the observed indicators as the result of prior research, as specified earlier in the Methods chapter, resulting in four dimensions of the business value of IT: (a) strategic, (b) transactional, (c) informational, and (d) transformational. These four dimensions provided input to the composite, higher-level, formative construct, BVIT, and were evaluated for collinearity later in the analysis.



Note: Smart PLS Software (Hair, Hult, Ringle, & Sarstedt, 2016)

FIGURE 6: Smart PLS Constructs and Observed Indicators

Internal and Convergent Reliability

Reliability and convergent validity were evaluated based on Cronbach's Alpha, composite reliability, and the Average Variance Extracted (AVE) (Table 4). Cronbach's Alpha measurements all showed high internal reliability with all scores >0.70 (Hair et al., 2016), establishing the internal consistency of the indicator variables with relation to their constructs and assuming that all indicators had equal input on the construct. However, many of the scores were greater than 0.90, although less than 0.95, suggesting that the constructs were measuring the same phenomenon (Hair et al., 2016).

TABLE 4: Construct Reliability and Validity

Construct Reliability and Validity

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
ITC	0.944	0.955	0.750
Information Quality	0.896	0.924	0.709
Information Use	0.921	0.940	0.759
Service Quality	0.899	0.925	0.713
System Quality	0.876	0.910	0.671
User Satisfaction	0.927	0.945	0.773

A composite reliability estimate was also calculated to take into account the different loadings of the indicators and to confirm the results of the Cronbach Alpha test. The results of all of the composite reliability scores were close to or greater than 0.90, signifying that the internal reliability of all the indicators was high and confirming the Cronbach Alpha scores (Hair et al., 2016). The average variance as expressed by the

Average Variance Extracted (AVE) was tested and showed that all of the constructs had a value greater than 0.50, illustrating that the observed indicators had high reliability and convergent reliability (Hair et al., 2016). The construct, System Quality, accounted for over 60% of the variance of the indicators, and the other reflective constructs accounted for over 70% of the variance of their respective indicators.

Discriminant Validity

To determine discriminant validity or that each construct was unique and not measuring the same phenomenon of the ITC –> BVIT relationship, three tests were completed: (a) Cross-loadings; (b) Fornell-Larcker; and (c) Heterotrait-Monotrait (HTMT) ratios (Hair et al., 2016). Cross-loadings (Table 5) were reviewed to show that that there were higher loadings associated with the appropriate construct and showed good discriminant validity (Hair et al., 2016). The Fornell-Larcker criterion (Table 6) was utilized to determine if the constructs shared more variance with their respective indicators than with other constructs. The Fornell-Larcker criterion determined there was good discriminant validity as almost all of the indicators are greater than 0.80 (Hair et al., 2016). However, Fornell-Larcker has come under criticism under partial least squares analysis as there can be a high degree of overlap between a construct and its indicators when the cross-loadings and the Forenell-Larcker criterion differ only slightly. As such, Heterotrait-Monotrait (HTMT) ratios have been proposed as a better approach to evaluate discriminant validity (Hair et al., 2016; Hensler, Ringle, & Sarstedt, 2015)(Table 7). The HTMT ratios were evaluated to determine the relationships between the constructs and

that the constructs were distinct from each other. Readings showed less than 0.90, indicating good discriminate validity (Hensler et al., 2015).

TABLE 5: Cross Loadings

Cross Loadings - Latent Variables

	BVIT	ITC	Information Quality	Information Use	Service Quality	System Quality	User Satisfaction
BVIT	1.000	0.930	0.856	0.876	0.817	0.856	0.890
ITC	0.930	1.000	0.850	0.886	0.845	0.836	0.881
Information Quality	0.856	0.850	1.000	0.837	0.884	0.868	0.861
Information Use	0.876	0.886	0.837	1.000	0.789	0.827	0.882
Service Quality	0.817	0.845	0.884	0.789	1.000	0.876	0.825
System Quality	0.856	0.836	0.868	0.827	0.876	1.000	0.889
User Satisfaction	0.890	0.881	0.861	0.882	0.825	0.889	1.000

TABLE 6: Fornell-Larcker Criterion

Fornell-Larcker Criterion - Latent Variables

	BVIT	ITC	Information Quality	Information Use	Service Quality	System Quality	User Satisfaction
BVIT	1.000						
ITC	0.930	1.000					
Information Quality	0.856	0.850	1.000				
Information Use	0.876	0.886	0.837	1.000			
Service Quality	0.817	0.845	0.884	0.789	1.000		
System Quality	0.856	0.836	0.868	0.827	0.876	1.000	
User Satisfaction	0.890	0.881	0.861	0.882	0.825	0.889	1.000

TABLE 7: Heterotrait-Monotrait Ratio (HTMT)

Heterotrait-Monotrait Ratio (HTMT) - Latent Variables

	BVIT	ITC	Information Quality	Information Use	Service Quality	System Quality	User Satisfaction
BVIT							
ITC	0.930						
Information Quality	0.856	0.850					
Information Use	0.876	0.886	0.837				
Service Quality	0.817	0.845	0.884	0.789			
System Quality	0.856	0.836	0.868	0.827	0.876		
User Satisfaction	0.890	0.881	0.861	0.882	0.825	0.889	

Collinearity Assessment

To assess collinearity in a formative model, the investigation focused on the Variation Inflation Factors (VIF). With formative constructs, unlike reflective constructs, there was not any expectation that the indicators were correlated to their respective

construct (Diamantopoulos & Siguaw, 2006). This research model used a higher-order, formative construct, BVIT, created from four dimensions of the business value of IT. Because of the lack of correlation across the dimensions, content validity was achieved by attention to the construction of the observed indicators of each dimension (Bollen & Lennox, 1991; Hair et al., 2016). The Inner VIF Values (Table 8) showed signs of high collinearity; the BVIT-Transactional dimension slightly exceeded 10.0 although acceptable ranges are less than 10 (Hair et al., 2016; Kock & Lynn, 2012). As an additional precaution to reduce concerns with high collinearity, the outer loadings of the lower level BVIT reflective constructs/dimensions of Strategic, Transactional, Informational, and Transformational were evaluated to ensure high levels of content correlation with their respective construct.

TABLE 8: Inner VIF Values

Inner VIF Values - BVIT Formative Construct

	BVIT
BVIT	
BVIT - Informational	6.443
BVIT - Strategic	7.117
BVIT - Transactional	10.048
BVIT - Transformational	6.743

Coefficient of Determination (R_2 Value) and Path Analysis

Partial Least Squares-Structural Equation Modeling (PLS-SEM) was used for minimizing or identifying the unexplained variance of the endogenous constructs (Hulland, 1999). The R_2 value, the coefficient of determination, was an indicator of the

unexplained variance of the endogenous construct. The R_2 of the ITC -> BVIT model (Figure 7) showed a R_2 of 0.742 for the construct Information Use; a R_2 of 0.864 for User Satisfaction; and a R_2 of 0.830 for IT capability, all R_2 values illustrating a high level of predictability. The $R_{2\ Adjusted}$ factor (Table 9) showed little change over the R_2 results at 0.746 for Information Use, 0.864 for User Satisfaction, and 0.864 for ITC. The business value of IT (BVIT) showed a very high level of 0.866 indicating a high level of predictability. According to Hair (Hair et al., 2011), R_2 values higher than 0.75 for endogenous latent variables have a high level of predictability. All control variables were kept constant.

The primary path coefficients (Figure 7) showed that the construct Information Quality had a 0.47 predictability through Information Use and 0.492 through to ITC. System Quality showed a slightly higher predictability (0.414) through User Satisfaction than through Information Use (0.396) to ITC. ITC showed a 0.93 predictability for the BVIT construct indicating a high correlation between ITC and BVIT.

Interestingly, Service Quality had little impact on the endogenous constructs, User Satisfaction and Information Use, and thus on ITC and, ultimately, on BVIT. This was noteworthy because the inclusion of the exogenous construct, Service Quality, was one of the significant additions that DeLone and McLean made to their framework in 2003 (DeLone & McLean, 2003).

Mediation

There are two potential mediators included in the ITC -> BVIT path model. The endogenous constructs, Information Use and User Satisfaction, impacted the dependent

variable BVIT. A bootstrapping approach, with 5,000 samples, was undertaken to further analyze these mediators. Bootstrapping used the high number of random subsamples to provide a better estimate (Hair et al., 2016).

TABLE 9: R^2 and R^2 Adjusted

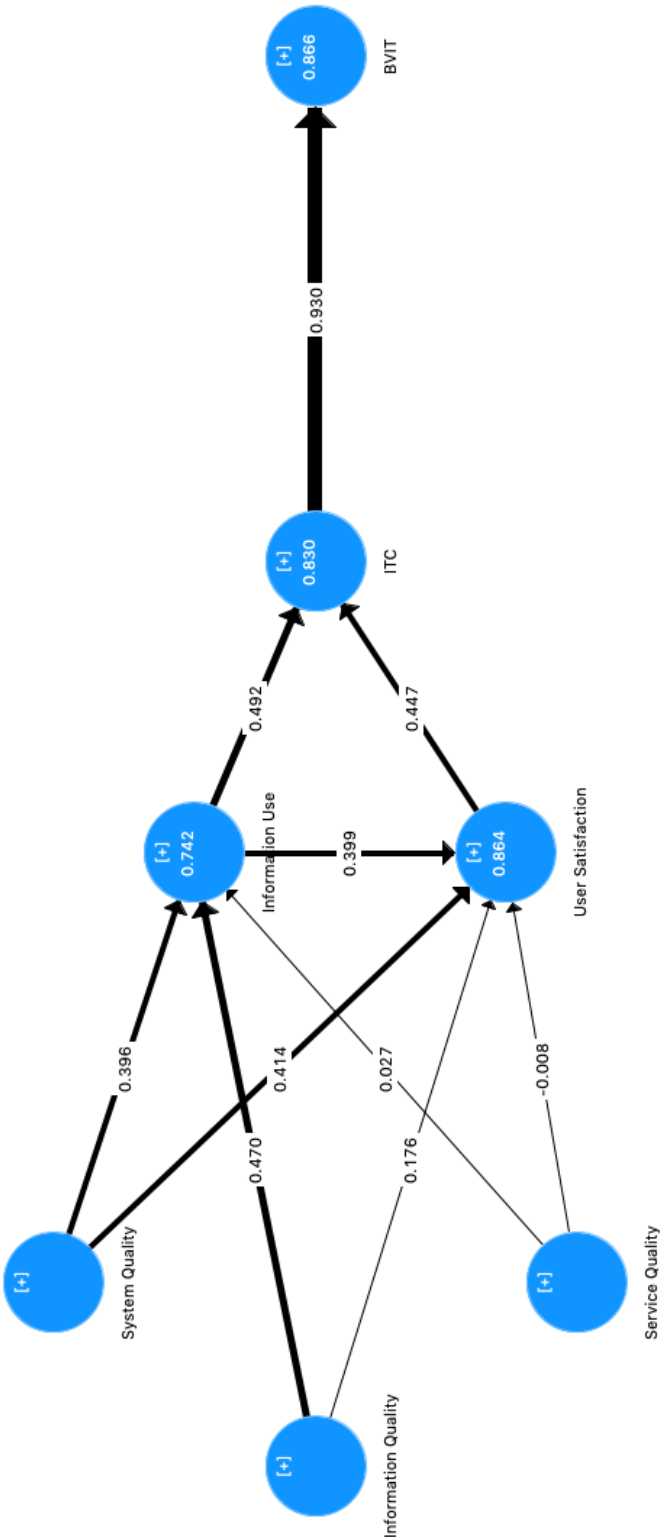
R Square - Latent Variables

	R Square	R Square Adjusted
BVIT	0.866	0.865
ITC	0.830	0.827
Information Use	0.742	0.737
User Satisfaction	0.864	0.860

The direct effects and the analysis of the mean, standard deviation, the t-values and the significance of the paths (Table 10) showed that not all of the paths were statistically significant (Hair et al., 2016). Specifically, the relationships of the pairs of (1) Information Quality and User Satisfaction, (2) Service Quality and Information Use, and (3) Service Quality and User Satisfaction were not statistically significant.

Effect Size (f^2)

Based on the path coefficients, especially those of the exogenous construct, Service Quality, the f^2 effect size (Table 11) was evaluated to determine if the absence of the exogenous constructs had an impact on the endogenous constructs. The f^2 effect size confirmed that Service Quality had no effect on Information Use or User Satisfaction. System Quality had a medium to large effect on User Satisfaction, confirming the path coefficient; however, there was a less than medium effect on Information Use using



Note: Smart PLS Software (Hair et al., 2016)

FIGURE 7: Higher Order Latent Variable Path and R_2

TABLE 10: Direct Effects

Mean, STDEV, T-Values, P-Values - Latent Variables/ Bootstrapped

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ITC -> BVIT	0.930	0.930	0.014	67.703	0.000
Information Quality -> Information Use	0.470	0.441	0.161	2.913	0.004
Information Quality -> User Satisfaction	0.176	0.167	0.097	1.816	0.069
Information Use -> ITC	0.492	0.493	0.083	5.969	0.000
Information Use -> User Satisfaction	0.399	0.377	0.105	3.786	0.000
Service Quality -> Information Use	0.027	0.073	0.218	0.123	0.902
Service Quality -> User Satisfaction	-0.008	0.024	0.125	0.063	0.949
System Quality -> Information Use	0.396	0.379	0.118	3.369	0.001
System Quality -> User Satisfaction	0.414	0.410	0.098	4.202	0.000
User Satisfaction -> ITC	0.447	0.447	0.081	5.545	0.000

Hair's guidelines (f^2 of 0.02 for small effect, 0.15 for medium effect, and 0.35 for large effects) (Hair et al., 2016). Information Quality had a medium effect on Information Use. The predecessor endogenous constructs, User Satisfaction and Information Use, had a large effect on IT capability which was consistent with the path coefficients. IT capability had a strong path coefficient and R^2 on BVIT that was confirmed by a very large f^2 effect size.

TABLE 11: *f* Square

f Square - Latent Variables

	BVIT	ITC	Information Quality	Information Use	Service Quality	System Quality	User Satisfaction
BVIT							
ITC	6.452						
Information Quality				0.155			0.036
Information Use		0.317					0.301
Service Quality				0.000			0.000
System Quality				0.117			0.217
User Satisfaction		0.261					

Evaluating the Total Effects (Table 12) and the Total Indirect Effects (Table 13) after bootstrapping confirmed that Service Quality did not have a significant effect on the endogenous variables. The Specific Indirect Effects (Table 14) provided additional

TABLE 12: Total Effects

Mean, STDEV, T-Values, P-Values - Latent Variables/Bootstrapped

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ITC -> BVIT	0.930	0.930	0.014	67.703	0.000
Information Quality -> BVIT	0.366	0.340	0.121	3.014	0.003
Information Quality -> ITC	0.393	0.365	0.129	3.041	0.002
Information Quality -> Information Use	0.470	0.441	0.161	2.913	0.004
Information Quality -> User Satisfaction	0.363	0.339	0.140	2.596	0.009
Information Use -> BVIT	0.624	0.615	0.065	9.612	0.000
Information Use -> ITC	0.670	0.661	0.067	9.962	0.000
Information Use -> User Satisfaction	0.399	0.377	0.105	3.786	0.000
Service Quality -> BVIT	0.013	0.053	0.172	0.078	0.938
Service Quality -> ITC	0.014	0.058	0.185	0.077	0.938
Service Quality -> Information Use	0.027	0.073	0.218	0.123	0.902
Service Quality -> User Satisfaction	0.003	0.040	0.184	0.015	0.988
System Quality -> BVIT	0.419	0.408	0.085	4.953	0.000
System Quality -> ITC	0.450	0.438	0.088	5.106	0.000
System Quality -> Information Use	0.396	0.379	0.118	3.369	0.001
System Quality -> User Satisfaction	0.572	0.560	0.100	5.733	0.000
User Satisfaction -> BVIT	0.415	0.416	0.075	5.505	0.000
User Satisfaction -> ITC	0.447	0.447	0.081	5.545	0.000

TABLE 13: Total Indirect Effects

Mean, STDEV, T-Values, P-Values - Latent Variables/Bootstapped

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ITC -> BVIT					
Information Quality -> BVIT	0.366	0.340	0.121	3.014	0.003
Information Quality -> ITC	0.393	0.365	0.129	3.041	0.002
Information Quality -> Information Use					
Information Quality -> User Satisfaction	0.187	0.172	0.088	2.122	0.034
Information Use -> BVIT	0.624	0.615	0.065	9.612	0.000
Information Use -> ITC	0.178	0.168	0.057	3.103	0.002
Information Use -> User Satisfaction					
Service Quality -> BVIT	0.013	0.053	0.172	0.078	0.938
Service Quality -> ITC	0.014	0.058	0.185	0.077	0.938
Service Quality -> Information Use					
Service Quality -> User Satisfaction	0.011	0.015	0.079	0.135	0.893
System Quality -> BVIT	0.419	0.408	0.085	4.953	0.000
System Quality -> ITC	0.450	0.438	0.088	5.106	0.000
System Quality -> Information Use					
System Quality -> User Satisfaction	0.158	0.149	0.073	2.162	0.031
User Satisfaction -> BVIT	0.415	0.416	0.075	5.505	0.000
User Satisfaction -> ITC					

TABLE 14: Specific Indirect Effects

Mean, STDEV, T-Values, P-Values - Latent Variables/Bootstapping

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Information Quality -> Information Use -> ITC	0.231	0.214	0.082	2.831	0.005
Information Quality -> Information Use -> ITC -> BVIT	0.215	0.199	0.077	2.811	0.005
Information Quality -> Information Use -> User Satisfaction	0.187	0.172	0.088	2.122	0.034
Information Quality -> Information Use -> User Satisfaction -> ITC	0.084	0.078	0.045	1.858	0.063
Information Quality -> Information Use -> User Satisfaction -> ITC -> BVIT	0.078	0.073	0.042	1.839	0.066
Information Quality -> User Satisfaction -> ITC	0.079	0.073	0.043	1.844	0.065
Information Quality -> User Satisfaction -> ITC -> BVIT	0.073	0.068	0.040	1.849	0.064
Information Use -> ITC -> BVIT	0.458	0.458	0.077	5.970	0.000
Information Use -> User Satisfaction -> ITC	0.178	0.168	0.057	3.103	0.002
Information Use -> User Satisfaction -> ITC -> BVIT	0.166	0.157	0.054	3.058	0.002
Service Quality -> Information Use -> ITC	0.013	0.040	0.111	0.119	0.906
Service Quality -> Information Use -> ITC -> BVIT	0.012	0.036	0.103	0.119	0.905
Service Quality -> Information Use -> User Satisfaction	0.011	0.015	0.079	0.135	0.893
Service Quality -> Information Use -> User Satisfaction -> ITC	0.005	0.006	0.036	0.134	0.893
Service Quality -> Information Use -> User Satisfaction -> ITC -> BVIT	0.004	0.005	0.033	0.134	0.894
Service Quality -> User Satisfaction -> ITC	-0.004	0.012	0.057	0.062	0.950
Service Quality -> User Satisfaction -> ITC -> BVIT	-0.003	0.011	0.053	0.062	0.950
System Quality -> Information Use -> ITC	0.195	0.187	0.067	2.932	0.003
System Quality -> Information Use -> ITC -> BVIT	0.182	0.174	0.063	2.899	0.004
System Quality -> Information Use -> User Satisfaction	0.158	0.149	0.073	2.162	0.031
System Quality -> Information Use -> User Satisfaction -> ITC	0.071	0.067	0.035	1.991	0.047
System Quality -> Information Use -> User Satisfaction -> ITC -> BVIT	0.066	0.062	0.033	1.968	0.049
System Quality -> User Satisfaction -> ITC	0.185	0.185	0.057	3.218	0.001
System Quality -> User Satisfaction -> ITC -> BVIT	0.172	0.172	0.054	3.197	0.001
User Satisfaction -> ITC -> BVIT	0.415	0.416	0.075	5.505	0.000

insight into those paths that identified mediators of the endogenous variables. The Specific Indirect Effects showed that the paths from Information Quality through Information Use and User Satisfaction to both ITC and BVIT were not significant. So, neither Information Use nor User Satisfaction were mediators for the exogenous construct Information Quality on the endogenous constructs of ITC or BVIT. Comparing the Direct Effects and Total Indirect Effects showed that partial mediation occurred for the exogenous construct Systems Quality by the endogenous constructs, Information Use and User Satisfaction.

A total of nine hypotheses were proposed in this dissertation. This study showed that the primary hypothesis H_1 was supported and there was a strong correlation between ITC and BVIT (Table 15). This showed that there was a causal relationship between IT

capability and the business value of IT, as proposed by Kohli and Grover (Kohli & Grover, 2008). Hypotheses H_4 and H_5 also showed a significant relationship between the independent variables of Information Use and User Satisfaction to ITC. The hypotheses from the exogenous variable of System Quality to the endogenous construct of Information Use (H_{2a}) and Information Quality to the endogenous variables of Information Use (H_{2b}), were found to be supported. The hypotheses from the exogenous variable of System Quality to both Information Use (H_{2c}) and User Satisfaction (H_{2f}), as well as from the exogenous construct Information Quality to User Satisfaction (H_{2e})were not supported.

TABLE 15: Hypotheses Results

Dependent Variable	R^2	Independent Variables	Path Coefficient	Standard Error	T-Statistic	*p* - Value	Hypothesis	Supported (Yes/No)
BVIT	0.866	ITC	0.930	0.014	67.703	0.000	H1	Yes
ITC	0.830	Information Use	0.492	0.083	5.969	0.000	H4	Yes
		User Satisfaction	0.447	0.081	5.545	0.000	H5	Yes
Information Use	0.742	System Quality	0.396	0.118	3.369	0.001	H_{2a}	Yes
		Information Quality	0.470	0.161	2.913	0.004	H_{2b}	Yes
		Service Quality	0.027	0.218	0.123	0.902	H_{2c}	No
User Satisfaction	0.864	System Quality	0.414	0.098	4.202	0.000	H_{2d}	Yes
		Information Quality	0.176	0.097	1.816	0.069	H_{2e}	No
		Service Quality	-0.008	0.125	0.063	0.949	H_{2f}	No

CHAPTER 5: DISCUSSION

Chapter 5 consists of three sections: (a) the findings of study in relation to existing research and what that means for both the academic and practitioner communities; (b) limitations of the study; and (c) ideas for future research.

Findings

Kohli and Grover (Kohli & Grover, 2008) proposed that there should be a relationship between IT capability and the business value of IT. This dissertation demonstrates that the relationship does exist, and that there is a strong correlation between IT capability and the business value of IT. The strength of this study rests on (a) its development of a comprehensive set of definitions to evaluate the relationships, (b) the identification of an appropriate research method, and (c) the use of primary data. A full set of constructs (information quality, system quality, service quality, information use, and user satisfaction) from DeLone and McLean's framework for information systems success forms the endogenous variable IT capability. Further, the composite, higher-level, formative construct for the business value of IT with its four dimensions of strategic, transactional, informational, and transformational value of IT demonstrates the strong impact IT capability has on the creation of the business value of IT.

Although there are no prior studies that tested this exact combination of constructs, there are a few studies that come close in concept or utilize subsets of constructs where comparisons can be made. For example, Seddon (Seddon, 1997) found a path coefficient from System Quality to Usefulness of 0.35; this dissertation finds a similar, slightly higher path coefficient of 0.396 from System Quality to Information Use.

Also, Seddon found the path coefficient from Usefulness to User Satisfaction of 0.349; this dissertation finds a similar, slightly higher path coefficient of 0.399 from Information Use to User Satisfaction. Similar findings of the path coefficients in studies, such as Seddon, that used constructs close in definition of this dissertation help validate the results of the dissertation.

Studies by Ravichandran and Lertwongsatien (Ravichandran & Lertwongsatien, 2005) created a construct of IS Capabilities as the antecedent to IT Support for Core Capabilities followed by Firm Performance for the dependent variable. Ravichandran and Lertwongsatien found path coefficients from IS Capabilities to IT Support for Core Competencies of 0.56 and from IT Support for Core Competencies to Firm Performance of 0.55. This dissertation finds a much stronger path from ITC to BVIT of 0.930. Also, Ravichandran and Lertwongsatien (Ravichandran & Lertwongsatien, 2005) found a R_2 for ITC of 0.52 for IS capabilities. This dissertation finds a R_2 of 0.830 for ITC. Although the constructs of Ravichandran and Lertwongsatien's study and this dissertation are not exact matches, the higher R_2 of this dissertation uses narrower parameters and focuses only the impact of IT, whereas Ravichandran and Lertwongsatien have a dependent variable, firm performance, that could be affected by many other latent variables.

Research by Wixom and Todd (Wixom & Todd, 2005) focused on Information Quality and System Quality as antecedents to Information Satisfaction and System Satisfaction found R_2 values of 0.75 and 0.74, respectively, and to the endogenous variables of Usefulness and Ease of Use of R_2 values of 0.67 and 0.65, respectively. Wu and Wang (Wu & Wang, 2006) used System Quality, Knowledge/Information Quality

and perceived knowledge management system found a R_2 of 0.69 for User Satisfaction and R_2 of 0.64 for System Use. This dissertation finds similar results of 0.864 to User Satisfaction and 0.742 for Information Use.

Wang, Liang, Zhong, Xue, and Xiao (Wang, Liang, Zhong, Xue, & Xiao, 2012) studying multiple industries in China focused on the creation of the business value of IT (as measured through firm performance), found a path leading to Firm Performance with a coefficient of 0.365 and a path from Core Competencies to Firm Performance with a coefficient of 0.245. For this dissertation and its values of 0.93 from ITC to BVIT, there appears to be a stronger correlation between ITC and BVIT than between IT capability and firm performance. Further, higher R_2 scores were evident in the research of Gregor et al. (Gregor et al., 2006). Gregor et al. found a R_2 of 0.94 for the organizational benefit from transformational change that included three dimensional objectives of strategic, informational, and transactional value of IT that demonstrated the impact of a composite measure of value.

A study by Weill (Weill, 1992) comparing the investment in IT focused on labor improvements resulted in a R_2 of 0.47; however, when those investments related to transactional IT were restricted, R_2 increased to 0.60. Hence, Weill's research showed that focusing on the business objective (proposed value) increases R_2. Results of this dissertation's tests of ITC to BVIT show that when focusing on business value, there is a higher correlation to capability than investment, which is supported by Bharadwaj (Bharadwaj, 2000), and suggests IT capability, instead of IT investment, creates IT value.

Lastly, there are surprising findings from this study. The limited impact that Information Quality has on User Satisfaction and the limited impact Service Quality has on IT capability and, subsequently, the business value of IT. The lack of a relationship between Service Quality and the endogenous constructs runs counter to the reasons why DeLone and McLean included Service Quality in their revised 2003 framework (DeLone & McLean, 2003).

The implications of these findings for the academic and the practitioner communities are important because they establish that there is a relationship between IT capability and the business value of IT. This relationship aligns with RBV which proposed that capabilities are required to build competitive advantage. For practitioners, this link is important because building IT capability is not always understood as having a relationship to the business value of IT. Further, the implications of the limited impact of Service Quality on IT capability and the business value of IT could point to a shift in the perceptions of IT from the early 2000s when Service Quality was added to DeLone and McLean's Information Systems Success framework. The driver(s) of this change: quality of systems, new technology, or a change in attitudes is yet to be determined.

Limitations

The limitations for this study fall into five categories. First, how to measure the business value of information technology remains unclear. Second, selected control variables are not utilized in this study. Third, actual relevant data with which to analyze firms across time is not readily available. Fourth, evolving technology, especially

information technology, may make ideas developed for it twenty or thirty years ago irrelevant today. And fifth, there may be unintentional bias in the results.

Limitation 1: Measuring business value

How to measure the business value of IT remains unclear. For example, many definitions for the business value of IT exist. This study identified one definition and used it, but the findings based on this definition may not relate to other studies utilizing other definitions. Similarly, is it appropriate to measure IT value and investment without understanding the business goals of the firm? Also, the constructs identified by Sabherwal and Jeyaraj (IT alignment, IT adoption, and inter-organizational IT) as having an effect on the relationship between IT investment and the business value of IT are not dealt with in this study (Sabherwal & Jeyaraj, 2015). If they had been included, the results might differ. Further, there are still more permutations of latent variables to consider, including latent variables not yet identified or tested. And lastly, there are the nagging questions, "Does the level of investment affect the value derived?" and "Is investment a better measure of success than the business value of IT?"

Limitation 2: Control variables

Selected control variables were not utilized in this study; instead, they were kept constant and not tested as moderators. Many researchers (Muhanna & Stoel, 2010; Porter, 1979; Wernerfelt & Montgomery, 1988) identify (a) industry, (b) size of company, (c) geography, (d) organizational role, and (e) level of respondents as variables that could have an impact on the results of the tests incorporated in a study. However, not all researchers are in agreement that control variables improve the results as they are not

direct measurements of the variables of interest (Spector & Brannick, 2011). As such, the testing of control variables was not included as part of the study.

Limitation 3: Lack of data

Actual relevant data to analyze firms (firm-to-firm and/or across industry) over time is not readily available. Moreover, detailed data on the totality of IT expenditures is generally unavailable. Then, too, the accounting profession identifies measures, such as ROI and ROA, but such measures may confound business value with its historical cost calculations. Also, generally agreed upon financial metrics for this area of IT research are lacking. Lastly, endogeneity, a concern that the variables are affected and correlated with their error, becomes an issue when conducting simultaneous analysis using partial least squares regressions.

Limitation 4: Evolving technology

Ever evolving technology may make ideas developed for technology-oriented research from twenty or thirty years ago irrelevant today, limiting the work of this study because so much of the study is based on work from that period. To illustrate, the DeLone and McLean framework is dated; it was created in the 1990's and the state of IT in terms of technology and systems has changed significantly since then. The framework may even contain questions that require additional clarification or even removal, such as, "Do you use the information systems because you want to or need to?", identified by Heo and Han for removal from the construct Information Use (Heo & Han, 2003). Also, currently there are definitions of IT capability other than DeLone and McLean's Information Systems Success framework. Further, technology-based assets as defined by

Wade and Hulland (Wade & Hulland, 2004) have evolved and the constructs may not reflect the changing nature of software, hardware, and systems process. And technology adoption may also affect results as suggested by Davis (Davis, 1989) and Wixom and Todd (Wixom & Todd, 2005). As IT evolves, it is difficult to use existing and/or dated theoretical frameworks to study the business value of IT.

Limitation 5: Bias in the data

Finally, there may be unintentional bias in the results for several reasons. First, measurement in the survey was based on subjective perceptions of capability and value by collecting survey data rather than objective data. Second, this study administered its survey via Qualtrics®, a survey tool that samples employee experiences using paid respondents. Third, while there was significant effort to identify a cross section of industries, job functions, and organizational levels for the survey respondents, the respondents were gathered, nonetheless, through the Qualtrics® network and sourced through the same approach. Fourth, the survey did not inquire about a respondent's tenure with IT. Fifth, survey respondents were "forced" to answer questions instead of leaving the question blank; they were, however, allowed to abandon the entire survey. Sixth, responses to some survey questions (approximately 5%) were very short and others very long, perhaps, impacting the results. Seventh, respondents were not identified by firm name, making it difficult to identify any particular firm bias. Eighth, because definitions of information systems success could change over time, definitions of IT capability could change, producing different results.

Future Research

Certainly, an area for future research is this study's finding that support for Service Quality as an antecedent of information systems success is lacking. This construct was added in DeLone and McLean's (DeLone & McLean, 2003) 2003 revision of the framework, but almost fifteen years later, the data does not support it as an exogenous variable. What has changed? Could the inclusion in the 2003 revision have been too aggressive? Has technology changed that much? What is causing this reduced impact of Service Quality? Clearly, further research is needed.

Another possibility for future research involves the testing of moderators against this study's structural research model. For example, could the control variables of industry and size of company have an effect on the results? Many authors, starting with Weill (Weill, 1992), described different types of IT investments, infrastructure being one category. Could different types of IT assets affect the results of this study's ITC-BVIT research model? As technology has evolved over the past fifty years, each new generation brings different capabilities and costs, which could have an impact on the results (Koellinger, 2008). Consider the advent of cloud technologies and its implications. Cloud technologies would require an analysis and re-categorization of the types of IT investments and IT assets as there are many disparate definitions that could confound the results. Additionally, the four dimensions of business value were compiled into a composite construct, but the impact of IT capability on each of these dimensions has not been tested. Future work would enhance research by Weill (Weill, 1992) and Gregor et

al. (Gregor et al., 2006) through examination of the effects of antecedent constructs on the business value of IT.

This study was based on the perceptions of the business value of IT; it did not distinguish between respondents' level or function within an organization and their views. A future study might provide additional insight into how external stakeholders could better understand the business value of IT. Also, another study might focus on the objective of the firm, for instance, questioning whether the firm is driven towards sales growth or operational efficiency and examining the resulting impact on the business value of IT (Tallon et al., 2000; Teo & Wong, 2000).

Lastly, this study focused on the resource-based view and the need for firms to develop competitive advantage from resources, but there are potentially other reasons why firms invest in information technology. Improving operational effectiveness or continuity of operations may be reasons to invest and the subject of future study. Future research could define a multi-dimensional rationale as to why firms invest in IT and assume it is not always about increasing competitive advantage.

Summary and Conclusions

This study begins with Kohli and Grover's (Kohli & Grover, 2008) proposed causal relationship between IT capability and the business value of IT and examines these two components to determine if a relationship exists, the first step is to explain why there can be increased business value from IT. Competitive advantage, as defined in the resource-based view, provides an underlying rationale as to why business value is

created, but it does not explain how business value of IT can be increased by IT capability.

To understand how the business value of IT can be increased by IT capability requires exploration of measurements such as those used in accounting and others like the Balanced Scorecard. However, while these measurements provide insight into IT investments, they do not measure the value of information technology. To provide an appropriate measure of value, comprehensive definitions of IT capability and the business value of IT are required. DeLone and McLean's Information Systems Success framework is utilized for IT capability and four dimensions: (a) strategic value of IT; (b) transactional value of IT; (c) informational value of IT; and (d) transformational value of IT create a composite construct of the business value of IT. The IT capability and business value of IT definitions and their associated constructs create the structural research model that test the dissertation's hypotheses.

A partial least squares regression tested the structural research model to reveal a positive correlation between IT capability and the business value of IT. Surprisingly, Service Quality, an exogenous construct of DeLone and McLean's information systems success framework (DeLone & McLean, 2003), did not have a significant effect on the endogenous constructs of Information Use, User Satisfaction, or IT capability and subsequent business value related to IT. This later finding, although not the primary objective of the study, raises questions as to why Service Quality is no longer a determinant of information systems success. Both findings are significant for IT research: (a) a confirmation that a proposed relationship between IT capability and the business

value of IT exists and (b) a finding that overturns an established relationship of an antecedent independent variable to the dependent variable of information systems success. The probability of future research is high.

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APPENDIX A: QUESTIONAIRE SOURCES

Construct	Dimension	Question			Sedera & Gable 2004	Wang 2008	Wu & Wang 2006	Mohammadi 2015	Heo & Han 2003	Petter, DeLone, & McLean 2013	Teo & Wong 2000	Gable, Sedera, & Chan 2008	Mirani &Lederer 1998	Gregor et al 2006	Melville et al 2004
Information Quality															
				The information provided by the systems are:	x	x	x					x			
		Q4.1-1		Accurate								x			
		Q4.1-2		Timely								x			
		Q4.1-3		Complete					x						
		Q4.1-4		Reliable					x						
		Q4.1-5		Understandable								x			
System Quality															
		Q3.1		The systems' response time is acceptable			x								
		Q3.2-1		The systems are reliable				x				x			
		Q3.2-2		The systems' are secure				x	x						
		Q3.2-3		The systems' are easy to use	x	x						x			
		Q3.2-4		The systems' are available when I need them					x						
Service Quality															
				When you have a problem, the IT organization:											
		Q5.1-1		Is able to resolve your issue in a timely manner		x									
		Q5.1-2		Is able to resolve your issue to your satisfaction		x									
		Q5.1-3		Always willing to help you		x									
		Q5.1-4		Responds in a cooperative manner				x							
		Q5.1-5		Understands your specific needs		x									
Information Use															
				Do the Information Systems help you do your job more											
		Q6.3-1		Efficiently			x								
		Q6.3-2		Effectively			x								
		Q6.1		Not using the systems impacts the ability to perform my job					x						
		Q6.2-1		The systems help in (my) decision effectiveness	x							x			
		Q6.2-2		The systems help in (my) individual productivity	x										
		Q6.2-3		The systems (help increase my) capacity (to perform my job)	x							x			
User Satisifaction															
		Q7.1		The systems meet my information processing needs		x	x		x						
		Q7.2-1		I am satisfied with the efficiency of the systems			x								
		Q7.2-2		I am satisfied with the effectiveness of the systems			x								
		Q7.2-3		I am satisfied with the performance of the system				x							
		Q7.2-4		Are you satisfied with the IT systems?		x									
IT Capability															
		Q8.1-1		The systems contribute to the improved financial performance of the company					x						
		Q8.1-2		The systems contribute to managing staff	x							x			
		Q8.2-2		The systems provide increased capability and capacity for the company	x							x			
		Q8.1-3		The systems help to manage organizational costs	x							x			
		Q8.1-4		The systems help the business change	x							x			
		Q8.2-1		The systems provide increased capacity	x							x			
		Q8.1-5		The systems help business process change	x							x			

Construct	Dimension	Question			Sedera & Gable 2004	Wang 2008	Wu & Wang 2006	Mohammadi 2015	Heo & Han 2003	Petter, DeLone, & McLean 2013	Teo & Wong 2000	Gable, Sedera, & Chan 2008	Mirani &Lederer 1998	Gregor et al 2006	Melville et al 2004
Business Value of IT															
	Strategic														
		Q9.1-1	Does IT provide strategic value?										x		
		Q9.1-2	Does IT enhance competitiveness or create strategic advantage?										x		
		Q9.1-3	Does IT enable the organization to catch up to competitors?										x		
		Q9.1-4	Does IT create competitive advantage											x	
		Q9.1-5	Does IT help tie the organization together? (establish useful linkages with other organizations?)										x	x	x
	Informational														
		Q10.1	Does IT provide necessary information to operate the company?							x					
		Q10.5-1,2	Does IT enable faster retrieval or delivery of information?										x	x	
		Q10.2	Does IT enable easier access to information?										x	x	
		Q10.3	Does IT improve the acuracy or reliability of information?										x	x	
		Q10.4	Does IT present information in a more concise manner or better format?										x	x	
	Transactional														
		Q11.1	Does IT provide the capability to run the company in an efficient manner?							x			x	x	x
		Q11.2	Does IT reduce operating costs?							x				x	
		Q11.3	Does IT save money by avoiding the need to increase the work force?										x	x	
		Q11.5-1,2	Does IT enhance employee productivity or business efficiency?										x	x	x
		Q11.4	Does IT speed up transactions or shorten product life-cycles?										x		
	Transformational														
		Q12.1	Does IT facilitate the transformation of the company?								x				
		Q12.2	Does IT help to enter new businesses?											x	
		Q12.3	Does IT expand the capabilities of the organization?											x	
		Q12.4	Does IT improve the organziational structure and process?											x	
		Q12.5	Which of the following best describes the role of information technology (IT) in your organization?								x				
			a	Traditional Role: IT supports operations, decision making and administrative functions, but is not strategy related							x				
			b	Evolving IT: IT supports business strategy, but is not an integral part of the strategy formulation process							x				
			c	Integral role: IT is integral to business strategy, whereby information systems (IS) and business management work together to formulate organizational strategies.							x				

APPENDIX B: ITC-BVIT SURVEY QUESTIONS

ITC vs BVIT - Qualtrics Version for 150 Respondents

Start of Block: Consent & Introduction

Q1.1 Thank you for participating in my research study.

As mentioned in the email, this study will identify the relationships between the success of [your company's] IT systems and the business value derived from [your company's] IT systems. Your participation in the study will help advance research in this area, and the results of the study will be published in a peer-reviewed journal.

The study utilizes an online survey that consists of approximately 40 questions and takes a little over 10 minutes to complete.

Your participation in this survey is completely anonymous, and there is no risk to you by participating in the survey. You may discontinue the survey at any time.

The Consent Form to participate in this survey is attached and available for downloading. Please read the Consent Form before you proceed further. Again, participation in this research study is completely voluntary, and there are no negative consequences should you decide not to participate.

By selecting "Accept," you agree to participate in the study and will proceed to the survey questions. By selecting "Reject," you will not participate in the study, and no responses or activity will be recorded.

- ○ Accept and proceed to the survey. (1)
- ○ Reject survey request. (2)

Skip To: End of Block If Q1.1 = Reject survey request.

Page Break

End of Block: Consent & Introduction

Start of Block: Please indicate your level of agreement

Q57 We care about the quality of the survey data and hope to receive the most accurate measures of your opinions, so it is important to us that you thoughtfully provide your best answer to each question in the survey. Do you commit to providing your thoughtful and honest answers to the questions in this survey?

- I will provide my best answers (1)
- I will not provide my best answers (2)
- I can't promise either way (3)

Skip To: End of Block If Q57 != I will provide my best answers

Q14.1 How big is your company?

- Less than 50 people (5)
- 50 to 100 people (1)
- 100 to 500 people (2)
- 500 to 1,000 people (3)
- Larger than 1,000 people (4)

Skip To: End of Block If Q14.1 = Less than 50 people

Q14.2 What is the annual revenue of your company? (Your best guess, please.)

- ○ < $5 Million (7)
- ○ $5 to $10 Million (1)
- ○ $10 to $50 Million (2)
- ○ $50 to $100 Million (3)
- ○ $100 to $500 Million (4)
- ○ $500 to $1 Billion (5)
- ○ Greater than $1 Billion (6)

Skip To: End of Block If Q14.2 = < $5 Million

Q14.3 What Industry best describes your company?

- ○ Manufacturing (1)
- ○ Distribution (Transportation & Warehousing) (2)
- ○ Retail Trade (3)
- ○ Health Care and Social Assistance (4)
- ○ Information (5)
- ○ Wholesale Trade (6)
- ○ Professional, Scientific, and Technical Services (7)
- ○ None of the above (8)

Q15.2 Please indicate the level of your position within your company.

- Staff (1)
- Manager (2)
- Director / VP (3)
- CxO (4)

Q15.5 Please select the category that best describes your job function.

- Finance (1)
- Information Technology (2)
- Human Resources (3)
- Sales & Marketing (4)
- Operations & Distribution (5)
- Manufacturing (6)
- After-Market Service (7)
- Executive Management (8)
- None of the above (9)

Q2.1 ***For the statements that follow, please indicate your level of agreement.***

End of Block: Please indicate your level of agreement

Start of Block: System Quality - SQ

Q3.1 The response time for my company's IT systems is acceptable.

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.2 My company's IT systems are

	Strongly agree (18)	Agree (19)	Somewhat agree (20)	Neither agree nor disagree (21)	Somewhat disagree (22)	Disagree (23)	Strongly disagree (24)
reliable. (1)	○	○	○	○	○	○	○
secure. (2)	○	○	○	○	○	○	○
easy to use. (3)	○	○	○	○	○	○	○
available when I need them. (4)	○	○	○	○	○	○	○

Q5.1 When I have an IT-related problem, my company's IT organization

	Strongly agree (1)	Agree (2)	Somewhat agree (3)	Neither agree nor disagree (4)	Somewhat disagree (5)	Disagree (6)	Strongly disagree (7)
resolves my issue in a timely manner. (1)	○	○	○	○	○	○	○
resolves my issue to my satisfaction. (2)	○	○	○	○	○	○	○
is always willing to help me. (3)	○	○	○	○	○	○	○
responds in a cooperative manner. (4)	○	○	○	○	○	○	○
understands my specific needs. (5)	○	○	○	○	○	○	○

Q6.1 My company's IT systems impact my ability to perform my job.

- Strongly agree (8)
- Agree (9)
- Somewhat agree (10)
- Neither agree nor disagree (11)
- Somewhat disagree (12)
- Disagree (13)
- Strongly disagree (14)

Q4.1 The information provided by my company's IT systems is

	Strongly agree (8)	Agree (9)	Somewhat agree (10)	Neither agree nor disagree (11)	Somewhat disagree (12)	Disagree (13)	Strongly disagree (14)
accurate. (3)	○	○	○	○	○	○	○
timely. (4)	○	○	○	○	○	○	○
complete. (5)	○	○	○	○	○	○	○
reliable. (6)	○	○	○	○	○	○	○
understandable. (7)	○	○	○	○	○	○	○

Q7.1 My company's IT systems meet my information processing needs.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q6.3 I believe my company's IT helps me perform my job

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
efficiently. (8)	○	○	○	○	○	○	○
effectively. (9)	○	○	○	○	○	○	○

Q71. I am satisfied with	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
the efficiency of my company's information systems. (1)	○	○	○	○	○	○	○
the effectiveness of my company's information systems. (2)	○	○	○	○	○	○	○
the performance of my company's information systems. (3)	○	○	○	○	○	○	○
my company's information systems overall. (4)	○	○	○	○	○	○	○

Q8.2 My company's IT systems provide increased

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
capacity for the company's business. (8)	○	○	○	○	○	○	○
capability for the company's business. (9)	○	○	○	○	○	○	○

Q10.1 I believe my company's IT systems provide the necessary information to operate the company.

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Page Break

Q9.1 My company's information technology

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
provides strategic value. (1)	○	○	○	○	○	○	○
enhances or creates strategic advantage. (2)	○	○	○	○	○	○	○
enables the organization to be competitive. (3)	○	○	○	○	○	○	○
creates competitive advantages. (4)	○	○	○	○	○	○	○
helps bring the organization together. (5)	○	○	○	○	○	○	○

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Q10.2 I believe my company's IT systems enable easy access to information.

- Strongly agree (8)
- Agree (9)
- Somewhat agree (10)
- Neither agree nor disagree (11)
- Somewhat disagree (12)
- Disagree (13)
- Strongly disagree (14)

Q6.2 My company's IT systems help

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
in my decision making effectiveness. (8)	○	○	○	○	○	○	○
in my individual productivity. (9)	○	○	○	○	○	○	○
increase my capacity to perform my job. (15)	○	○	○	○	○	○	○

Q10.3 I believe my company's IT systems provide accurate and reliable information.

- ○ Strongly agree (8)
- ○ Agree (9)
- ○ Somewhat agree (10)
- ○ Neither agree nor disagree (11)
- ○ Somewhat disagree (12)
- ○ Disagree (13)
- ○ Strongly disagree (14)

Q8.1 My company's IT systems contribute to the	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
improved financial performance of my company. (1)	○	○	○	○	○	○	○
ability to manage the staff. (2)	○	○	○	○	○	○	○
ability to manage organizational costs. (8)	○	○	○	○	○	○	○
ability of the business to accommodate change. (9)	○	○	○	○	○	○	○
ability to change business processes. (10)	○	○	○	○	○	○	○

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Q10.4 I believe my company's IT systems present information in a concise, well-formatted manner.

- Strongly agree (8)
- Agree (9)
- Somewhat agree (10)
- Neither agree nor disagree (11)
- Somewhat disagree (12)
- Disagree (13)
- Strongly disagree (14)

Q10.5 I believe my company's IT systems enable fast

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
retrieval of information. (1)	○	○	○	○	○	○	○
delivery of information. (2)	○	○	○	○	○	○	○

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Q11.1 I believe my company's IT systems provide the capability to run the company in an efficient manner.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q11.2 I believe my company's IT systems reduce the company's operating costs.

- Strongly agree (8)
- Agree (9)
- Somewhat agree (10)
- Neither agree nor disagree (11)
- Somewhat disagree (12)
- Disagree (13)
- Strongly disagree (14)

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Q11.3 I believe my company's IT systems save the company money by eliminating the need to increase the company's work force.

- Strongly agree (8)
- Agree (9)
- Somewhat agree (10)
- Neither agree nor disagree (11)
- Somewhat disagree (12)
- Disagree (13)
- Strongly disagree (14)

Q11.4 I believe my company's IT systems speed up transactions or shorten product life cycles.

- Strongly agree (8)
- Agree (9)
- Somewhat agree (10)
- Neither agree nor disagree (11)
- Somewhat disagree (12)
- Disagree (13)
- Strongly disagree (14)

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Q11.5 I believe my company's IT systems enhance

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
employee productivity. (1)	○	○	○	○	○	○	○
business efficiency. (2)	○	○	○	○	○	○	○

Q12.1 I believe my company's IT systems facilitate the company's ability to transform.

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

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Q12.2 I believe my company's IT systems enable the company to enter new business segments or whole businesses.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q12.3 I believe my company's IT systems expand the capabilities of the company.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

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Q12.4 I believe my company's IT systems improve the company's business processes.

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q12.5 Please choose ONE of the following statements that best describes the role of information technology in your company.

- My company's IT systems support routine decision making and operations and administrative functions, but they are not at all strategy-related. (1)
- My company's IT systems support defined business strategies, but they are not integral to the strategy formulation process (2)
- My company's IT systems are integral to the formulation of business strategy, that is, my company's IT systems and its business management team work together to formulate organizational strategies. (3)

Q13.1 Please estimate the number of people that work in your company's IT organization.

- Less than 10 people (1)
- Between 10 and 25 people (2)
- Between 25 and 50 people (3)
- Between 50 and 100 people (4)
- Between 100 and 500 people (5)
- Larger than 500 people (6)

Q13.2 Please estimate the number of people that DO NOT formally work in your company's IT organization, but perform IT functions ("shadow IT").

- Less than 5 people (1)
- Between 5 and 10 people (2)
- Between 10 and 25 people (3)
- Between 25 and 50 people (4)
- Between 50 and 100 people (5)
- Larger than 100 people (6)
- I do not know. (7)

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Q13.3 Please estimate how much money your company spent on IT in the past 12 months. Express your estimate as a percentage of your company's revenue. Use the slide bar to indicate your your percentage estimate from 0 to 10%.

0 1 2 3 4 5 6 7 8 9 10

13 ()	

Q13.4 Please estimate how your company's IT budget is spent. Consider the four areas listed below and express your estimate as a percentage of the total IT budget. Use the slide bars to indicate your percentage estimates; the four areas must total to 100%.

_____ IT infrastructure (1)
_____ Enterprise systems (2)
_____ Systems to grow and maintain customers (3)
_____ Systems requested by customers or contracts (4)

Q15.1 Please select the statement that better describes your company.

- My company focuses on achieving its sales revenue as its top priority. (1)
- My company focuses on achieving operational efficiency first and foremost. (2)

Q15.3 Please select the gender you identify with.

- Male (1)
- Female (2)
- I would rather not identify. (4)

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Q15.4 Please select your age group.

- Under 25 years old (1)
- 25 to 35 years old (2)
- 35 to 50 years old (3)
- 50 to 65 years old (4)
- Over 65 years old (5)
- I would rather not identify. (6)

Q15.6 Please select the region of the USA where you usually work.

- Northeast (1)
- Mid-Atlantic (2)
- Southeast (3)
- Midwest (4)
- Northwest (5)
- Southwest (6)
- Outside the continental USA (7)

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Q16.1 Please provide any additional comments, questions, or follow-up information you feel is important in the space below.

_____

_____

_____

_____

_____

Q16.2 If you know of other individuals who are well-suited to complete this survey, please list their names, email addresses, job titles, and organizations below.

_____