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IS Research Perspective

Business Value of IT: An Essay on Expanding Research Directions to Keep up with the Times *

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Abstract

Much of the work on the business value of IT has examined relationships between IT inputs and economic outcomes of the firm. Yet, business executives and researchers continue to question the value of IT investments. We argue that while the current trajectory of research in this important area is useful, it is limited. In order to address the evolving nature of IT and the novel contexts in which it is being exploited, we must create a discontinuity in our thinking of how IT value should be studied. After summarizing what we have learned thus far, we discuss key new research themes that must be addressed if IT is to be demonstrably relevant. Further, we identify specific research thrusts, areas for theoretical development, and research questions on IT-based value that must be included in our research agenda for the future. We conclude by challenging IT researchers to consider the consequences of status quo research themes versus an expanded set of research questions.

Key Words: *IT Value, IT payoff, Competitive Advantage, Complementary Investments.*

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Business Value of IT: An Essay on Expanding Research Directions to Keep up with the Times

1. Introduction

Recent years have seen a proliferation of research articles on the relationship between information technology (IT) and organizational performance. This stream can be described as IT valuation research, as it ascribes value to IT. Several salient works have made the case that IT valuation is a complex issue involving social action that can extend over a period of time (Farbey, Land and Targett, 1993) and hence should be studied in a more comprehensive fashion (House, 1980). We contend that evaluation research *should* have a centrality in our field, as it is germane to the existential debate on the field's core, especially given our sensitivity to IT value issues. Unfortunately, there have been some dissenting voices on the IT value question. "The Sinking CIO" read a headline on the cover of InformationWeek, a trade magazine. Citing the diminishing role of IT leaders, it went on to argue that IT failure to deliver innovation was to blame (Martin, 2007). Similarly, Nicholas Carr's (2003) provocative discourse entitled "IT doesn't matter" ruffled a few feathers. Regardless of the efficacy or scholarship of his arguments, the essay, the attention it drew, and its effect on praxis were disturbing to the IS research community, since it implied our reduced importance. Its innate logic implies to us that if IT is not valuable, then we are engaging in research on something that is not valuable, and hence *we are not valuable!*

Agarwal and Lucas (2005) suggest that demonstrating the value of investing in IT is fundamental to the contribution of the IS discipline. Therefore, the recent proliferation of work that deals directly with the value issue is a welcome development. A charter on demonstrating not only whether IT creates value, but how, when and why it does is a useful one. However, we do not believe that, even after extrapolating our current research schema, we are doing enough. We contend that IT is creating critical changes in the way business is organized and conducted. Investment decisions are often made beyond the purview of a single firm, and the value implications can extend to networks. IT is creating a plethora of information that needs to be harnessed in order to create or enhance value. And, IT investments are not monolithic; they are linked to one another in ways that need to be understood as a part of the value dictum. These changes, among others, suggest to us that studies on IT and value need to expand their scope and move in more productive directions in order to keep up with the times.

The aim of this essay is not to consolidate the substantial research of IT and organizational performance, or even challenge the credibility of findings. Our colleagues have done that quite effectively (e.g., Melville, Kraemer and Gurbaxani, 2004). Instead, we briefly summarize *what we know* and the trajectory of the research stream – and argue for injecting a discontinuity¹ – to encourage research progress in promising directions. We hope to set an agenda that expands current research in order to reflect prevailing trends and yield more fruitful outcomes in this important arena.

Before we do this, however, it is important to set the boundary conditions for IT value research. Failure to do so effectively would lead to the criticism that such research could include almost all IS work – since eventually all research purportedly deals with the central tenet of value through IT deployment and/or management. We argue that IT value research is an important slice of this work that can clearly be identified.

2. Framing IT Value Research

What is IT value research? We propose that IT value research represents an important stream of work that deals with business value. It deals with economic impacts of IT and its manifestations, and as such, the boundary conditions for our essay are restricted to examination of IT value at the level of the firm or network of firms. We do not include the economy or individual levels of IT investment,

¹ Discontinuity implies expanding our research horizon. Our goal is to stress the importance of not viewing future research as a linear extrapolation of the past. This does not imply that past research is not useful or that all future directions we propose are radically different.

unless they relate to or represent firm-level impacts. Further, this essay will not include IT value research with broader societal implications such as how eGovernment adds value to a nation's citizens. We acknowledge that all of these topics are important and that they are being dealt with by several disciplines.

Thus, in order to qualify for this stream, IT value research will satisfy at least the following two conditions:

There must be an:

1. IT variable, IT management variable or manifestation.
2. endogenous variable with IT economic impact.

Regarding (1), we use the term IT to represent hardware and software components of the system. However, we recognize that this IT may not be studied directly, but conceptualized as a broader concept, like a "digital option," or "infrastructural capability," or an IT management variable like "business-IT alignment." The term IS, despite its broader connotation, could be used in place of IT here, but we use IT value to better reflect the basic grounding of this stream in modern information technologies. The term IS long precedes the use of modern information technologies and could refer to manual information systems or even paper-based filing systems – which are obviously outside the scope of IT value research.²

Regarding condition (2), we argue that any research involving long causal chains that does not deal with economic value directly (e.g., top management support and quality of worklife) will classify as IT value research only if the chain leads to a variable dealing with economic impact (e.g., top management support → quality of IS worklife → profitability). Studies that focus on the early part of the chain only (e.g., system development methods → quality of systems) will not satisfy condition (2) since they are not linked to an ultimate economic value variable.³ In short, we will consider variables that have obvious and direct economic impact in the marketplace. For instance, a study dealing with the impact of web design on perceived service quality (PSQ) in an e-commerce context would not qualify as IT value research because the PSQ to economic value link cannot be assumed and could be subject to hypotheses testing. But a study that examines web design and Economic Value Added (EVA), abnormal stock returns or consumer surplus deals directly with economic value and therefore is considered within the scope of IT value research.

Most IT value research is *ex post* in nature. It deals with the outcome of past IT investments through post hoc analysis. Often, this work attempts to derive *ex ante* prescriptions regarding how IT value can be derived. There are, however, some *ex ante* general purpose tools that attempt to predict the outcome of IT investments, such as the Balanced Score Card (Kaplan and Norton, 1996). The main goal of all IT value research, regardless of the *ex post* or *ex ante* nature (or even research that involves the simultaneous study of the phenomenon), is to help managers use the practical findings to improve upon the value they derive from IT. Therefore, any research that satisfies the conditions above would qualify.⁴

3. Current and Future Research: An Overview

3.1. What We Know⁵

Most of what we know about IT and value at the firm level can be abridged in the form of the statements (assertions) briefly discussed below. We do this to succinctly consolidate existing knowledge, and as a benchmark for the expanded direction proposed later in the paper. Illustrative

² We recognize that IT is part of a broader system that could add value.

³ However, if this linkage extended to include an economic value variable (e.g., systems development methods → quality of systems → worker productivity → return on sales), then condition (2) would be satisfied.

⁴ Our boundary conditions are not intended to constrain the need to draw upon relevant research. We advocate that researchers in this area keep abreast of developments in adjacent fields. For instance, studies of IT success and failure could shed light on theory explaining risk of IT and its implications for economic impacts.

⁵ We use the pronoun "we" to refer to a collective view of the field as interpreted by the authors.

references are provided.

IT Does Create Value

The “whether” of IT value research now lies in the past. Many recent studies demonstrate that our interlude with the productivity paradox was an artifact of time and measurement (Brynjolfsson and Hitt, 2000; Kohli and Devaraj, 2003). We have now accumulated a critical mass of studies that demonstrate a relationship between IT and *some* aspect of firm value, whether it be financial (e.g., ROI), intermediate (e.g., process-related) or affective (e.g., perception-related) (Devaraj and Kohli, 2003; Santhanam and Hartono, 2003).

IT Creates Value under Certain Conditions

In our examination of the relationship between IT and some form of value, we have also accepted the complementarity argument. IT, as simply hardware and software tools, does not create value in isolation, but must be a part of a business value creating process with “other” IS and organizational factors operating in a synergistic manner (Melville et al., 2004; Wade and Hulland, 2004). These factors could be tied to the IT-based system that includes IT people and management, routines, and policies or the organizational system including non-IT people and management, business processes, knowledge assets, relationship assets, culture, structure, and policies.

IT-Based Value Manifests Itself in Many Ways

With the pervasiveness of IT, we have also learned that IT value could manifest itself in many ways. As a production machine, IT creates value in the form of productivity similar to other forms of capital. Value could also manifest itself in the form of process improvements (cycle time), profitability (return on assets), or consumer surplus (Barua and Mukhopadhyay, 2000). Finally, value can be created through improvements in supply chains or innovation at the inter-organizational level (Rai, 2006).

IT-Based Value Manifests Itself at Many Levels

We are also beginning to recognize that IT value manifests itself at many levels (e.g., individual, group, firm, industry, or process). Research at levels of analyses different from the firm often uses diverse models and theoretical frames – and does not meet our boundary conditions for IT value research. However, while studies such as those utilizing the Technology Acceptance Model (TAM) at the individual and group level predict IT usage, it is being recognized that greater IT usage at the individual level could be aggregated to the firm level and serve as a mediator between IT investment and firm value (Devaraj and Kohli, 2003).

IT-Based Value Is Not the Same As IT-Based Competitive Advantage

We now accept that there is a difference between creating value and creating differential value (Hitt and Brynjolfsson, 1996). Carr (2003) argues that differential firm value from IT is elusive since it can be copied and competed away — even though value can be created at the industry level that transcends competition. We have learned through the resource-based view that if we can leverage IT and complementarities, we can create resources and capabilities that are heterogeneous and imperfectly mobile, and we can create differential value (Bhatt and Grover, 2005). There is substantial ongoing research on conceptualizing and measuring IT-based capabilities.

IT-Based Value Could Be Latent

We accept that IT-based value creation is not immediate. The realities of adoption, implementation, and acceptance create a latency (lag) effect that can be in the order of years (Santhanam and Hartono, 2003). We also understand that IT (e.g., infrastructure) can be treated as an “option” that is valuable because it provides an opportunity to reap benefits if or when the need arises (Benaroch, 2002). This endows management with flexibility to embrace and manage uncertainty.

There are Numerous Factors Mediating IT and Value

There are a number of factors that we accept as important and necessary conditions in the chain of IT value creation. These include IS-Strategy alignment, organizational and process change, process performance, information sharing, and IT usage, among others. These are critical to our understanding of the translation process and conversion effectiveness of IT assets (Devaraj and Kohli, 2002).

Causality for IT Value is Elusive

We know that it is difficult to fully capture and properly attribute the value generated by IT investments. The tasks of obtaining granular data on IT investments, assessing changes in IT functionality and isolating effects on a value-based variable are onerous (Barua and Mukhopadhyay, 2000). The subjectivity of primary data, inaccessibility of reliable secondary data, unavailability of appropriate proxies, and use of cross sectional designs inhibit the study of IT value. However, with better understanding and use of experimental and statistical controls, we believe that we can progress in this area.

In sum, while the “how” and “why” questions remain understudied – we are trying to better understand the “what” (interventions) that can yield managerial insights on IT value generation. Figure 1 summarizes our current trajectory of research. Our current thesis is that *IT with its complementary resources can create value manifested at different levels and, while causality is elusive, we can understand how to create differential value by extending our knowledge of complementary and mediating factors in the value creation process.* Therefore, following this trajectory we will get a better understanding of how IT investments interact with mediating factors (e.g., organizational changes, complementary resources, alignment, capabilities) in order to create value of different types (productivity, processes, profit) and levels (individual, firm).

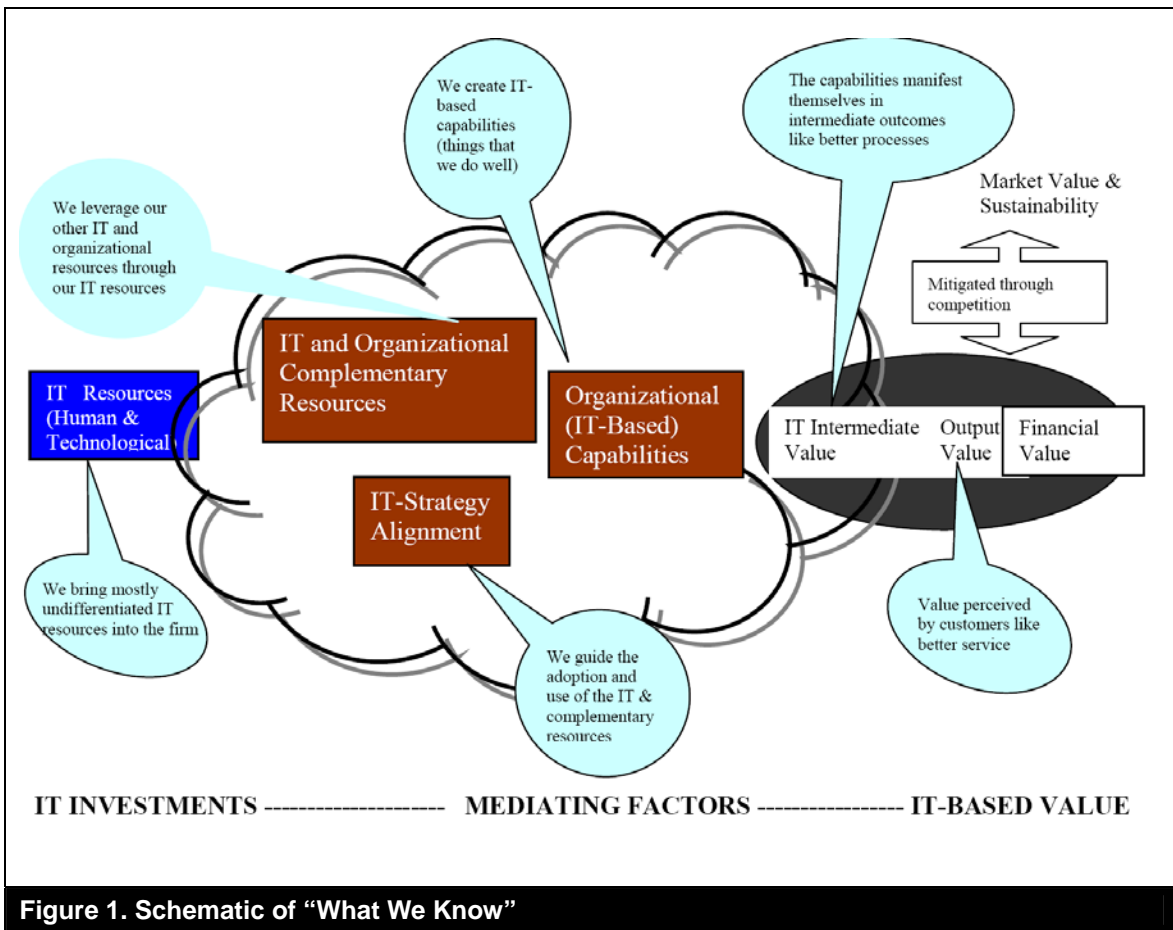


Figure 1. Schematic of “What We Know”

3.2. What We Need to Know

Although we have made considerable progress, we believe that the current paradigm of IT value is limited. Given the centrality of this topic to our field, we can do better. We need to explore the evolving role of IT and the changing nature of its contribution to organizational value creation. Unless

we can identify how and where IT is contributing to value creation, we cannot measure it; unless we can measure it, we cannot demonstrate value, thus failing to dispel prophecies of diminishing IT value.

We present four major themes to illustrate how IT's value is changing and what we must do to capture, measure and demonstrate it. These are – (1) IT-based Co-Creation of Value, (2) IT-Embeddedness, (3) Information Mindset, and (4) Value Expansion. These themes are not mutually exclusive, nor are they exhaustive; rather they are meant to initiate a discussion of how the IT community must rethink value propositions and expand the agenda for research. We recognize that there is a lot of activity underway in IT value research, some of it even within the themes presented below. However, we hope that we are injecting some discontinuity in the research program by presenting ideas that will, in our opinion, advance the currency, importance, and impact of this research stream. The key points in this discussion are summarized in Table 1.

Theme 1: IT-Based Co-Creation of Value

Traditional boundaries of the firm are blurring. Firms have strategic relationships with other firms that range from loose outsourcing to seamless integration in which products and information flow smoothly. When firms invest in information technology to facilitate the exchange of information, it is unclear who *generates* value and how the benefits should be *distributed*. While recent work has shed light upon IT investment and benefits within inter-organizational networks, the next generation of IT value studies should focus on the co-creation of value through IT rather than on IT value alone. We refer to this as “IT-based co-creation of value.” Co-creation represents the idea that (a) IT value is increasingly being created and realized through actions of multiple parties, (b) value emanates from robust collaborative relationships among firms, and (c) structures and incentives for parties to partake in and equitably share emergent value are necessary to sustain co-creation.

Most prior research has viewed IT value from the perspective of a single firm with the premise that IT investment in a single firm leads to value for that firm. Multi-firm IT implementations have been generally considered in the context of transactions in inter-organizational systems (IOS) (Gebauer and Buxmann, 2000) or outsourcing arrangements (Dos Santos, 2003) in which the value research has primarily focused upon how each firm benefits from such relationships. However, the emphasis in most of these studies is on how IT has significantly reduced transaction inertia in multi-party arrangements. To address this issue, research in business strategy has studied reduced costs through efficient processes, products, and customer relationships (Amit and Zott, 2001; Kauffman and Walden, 2001). The issue of co-creation of value has been relatively understudied.

In recent times, IT investments are being made by multiple firms using open architectures that raise interesting issues for symbiotic resource sharing and co-creation of value. IT value research should focus on this emerging reality of value co-creation. As such we must distinguish between the various sources of value creation. If firms join together and create business value – that is not necessarily an IT value question. However, if IT is used as a tool or is instrumental in creating a product to co-create business value, then it falls within the domain of IT value research. An example of IT-based co-creation of value in a business process is the use of an IT tool -- Collaborative Planning, Forecasting and Replenishment (CPFR) — by business partners as in the case of mobile phone manufacturer Motorola, Inc. and a national mobile service retailer (Cederlund et al., 2007). In manufacturing a product with a life span of nine to 12 months, CPFR allowed Motorola to peek into the retailer's operations and gain deeper visibility into the supply chain. These two firms co-created supra-normal value by using IT to ensure fully stocked retail shelves and at the same time reduce leftover parts when a mobile phone model is upgraded. IT investment by the partners further co-created value in enabling vendor-managed inventory (VMI) in which the retailer eliminated stock carrying costs and Motorola eliminated the credit float and improved its cash flow, thus creating incentives for both parties.

On a larger scale, value co-creation through IT is evident among the partner firms of Rosettanet (<http://rosettanet.org/>), a consortium of firms in the electronics industry. The partner firms have strong relationships supported by information exchange standards that allow quick sense-and-respond to market demands by pricing, designing, sourcing, manufacturing, and distributing a product. This

creates value for all partners. This co-creation of value is different from that in an IOS, which focuses

Table 1: Themes for IT Value Research					
	Old Research Premise	New (Expanded) Research Premise	Contemporary Trends	Research Thrust	Theory Development Needed
<u>Theme 1: IT-Based Co-Creation of Value</u>	Better information flows & integration among partners leads to better business outcomes (value)	Multi-company relationships are diverse and can generate IT-based value that needs to be identified, incentivized and realized	<ul style="list-style-type: none"> Open Innovation Web Services 	How can companies with different or new IT resources co-create value and equitably partake in IT-based value?	<ul style="list-style-type: none"> integration of disparate IT resources alignment of IT investments and relationship structures incentives and bargaining positions on platform and proprietary IT resources models to co-create IT-based value
<u>Theme 2: IT-Embeddedness</u>	IT investment leads to IT capabilities which leads to performance	Capabilities required by the firm must take advantage of IT in order to achieve business value (creating digitized business capabilities)	<ul style="list-style-type: none"> Replication of Digitized Capabilities as Products IT Ubiquity 	How can we digitize various functional and dynamic business capabilities in order to increase business value under various conditions? Can these capabilities be replicated and sold as products?	<ul style="list-style-type: none"> identifying digital capabilities processes of digitization and IT-based capabilities contingencies under which digitization is more or less successful management of digital-capability- building risks
<u>Theme 3: Information Mindset</u>	IT Value subsumes information value; if you build IT capabilities, then you are building information capabilities too	Information capabilities should be considered distinctly from IT capabilities; Business capabilities are aligned with IT capabilities as well as information capabilities	<ul style="list-style-type: none"> Business Intelligence Data Mining Information Syndication and brokerage 	How can we create information capabilities that enhance and do not destroy digital business capabilities?	<ul style="list-style-type: none"> concept of information capabilities Distinguishing IT capabilities and information capabilities dysfunctional aspects of information information capabilities, digital capabilities and new business value
<u>Theme 4: Value Expansion</u>	IT Value is manifested in financial outcomes	There are indirect and intangible paths to financial value that are of increasing importance and must be understood	<ul style="list-style-type: none"> Information ubiquity Areas of non-financial value e.g. in hyper-competitive environments 	What are the indirect and intangible paths to economic value that can be influenced by information and IT capabilities, and how do we foster them?	<ul style="list-style-type: none"> typologies of IT-based value tradeoffs in using IT to achieve different value outcomes social, economic, and financial models of value temporal manifestations of IT-based value

on the smooth exchange of transaction data between parties. Rosettanet and CPFR have the potential to create new products and new processes that co-create value for all parties in ways that, until now, were not possible.

The other aspect of this is the distribution of value. Economists have dealt with the issue of sharing the created value through bargaining theory and theory of incomplete contracts, (e.g., Bakos and Nault, 1997). The concerns of opportunism, incomplete contracts, and bargaining discussed in previous literature could provide a foundation in our understanding on the equitable distribution between partners of co-created value through IT in the short term as well as future value created in the long term. In sum, IT-based co-creation of value offers a rich set of research questions that should be addressed by IT value research.

Research Thrust 1:

How can companies with different or new IT resources equitably partake in co-creation of IT-based value?

To study this question, theoretical development will be required on several fronts (underlined for emphasis). For instance, *different* or *new* invites researchers to examine how integrating disparate IT resources with evolving functionality, aligning IT investments, or creating new relationship structures can lead to new opportunities of value. *Equitably partake* requires understanding the incentives and bargaining positions on platform and proprietary IT resources among partners. Understanding *co-creation* offers opportunities for researchers to develop models for joint creation of IT-based value. We propose that as organizations co-create IT-based value, there will be a tension between the opportunities for joint gains and unilateral exploitation of internal resources.

Theme 2: IT-Embeddedness

There has been a long tradition in IT value research of separating out IT investments and examining their interaction with organizational resources, and, ultimately, value as reflected in Figure 1. However, models that examine IT as the *driver* of capabilities appear to be out of sync with the evolving business reality. IT is increasingly deeply embedded in processes.⁶ So rather than separating out IT, we must understand capabilities (or digital capabilities) first. In other words, the question of “what business capability is needed” should come first. Then the resources required in building that capability comes next. The IT value question then emerges to address the support, incidence, and nature of IT as various resources that go into building the capability.

One way to conceptualize this is to examine how to “IT-ize” capabilities. In order to IT-ize a capability, we are proposing that researchers must first modify the commonly accepted progression of IT value, which suggests that a firm’s possession of resources will lead to the creation of capabilities. The erstwhile model views the IT value sequence as -- IT investment [IT]⁷ creates capabilities required [CR] which in turn create business value [BV], represented by [IT → CR → BV]. Firms must recognize that many factors in addition to IT, commonly referred to as complementary assets (Davern and Kauffman, 2000), go into building digital capabilities. We propose that firms must first uncover the capabilities required and then identify what it takes to build them. We do not exclude the possibility that IT can, and often will, play a role in the creation of such capabilities. However, the key point we make is that IT can serve as a magnifier or accelerator of desired business capabilities even when those capabilities do not directly involve IT. So, we encourage firms to first identify the capabilities required to execute a business imperative and then understand how to use the appropriate information or technology – a process we referred to above as “IT-izing.” Viewing opportunities from

⁶ In his book, *Alignment Effect*, Faisal Hoque describes his seven-year-long research program, arguing that superior companies like FedEx, Wal-Mart, Marriott, etc. don’t focus on alignment of IT with business, but on convergence where business needs come first, and IT is so intertwined with business that decisions are made jointly by business and IT executives (CIO Insight, Sept 19, 2007).

⁷ We use IT here to refer to IT-Capabilities. This would include all investments in technologies, people and systems that represent the ability of IT to be effectively deployed.

the vantage point of IT resources alone can restrict firms' view of emergent business value from enabling capabilities required through IT.

Consider the example of United Parcel Service (UPS), which spends over 70% of its IT investment in embedding and integrating IT into its operations so that the required business (not IT) capabilities are realized. When UPS customers demanded the ability to pre-calculate overseas shipping charges, UPS recognized that it needed the business capability to gather, aggregate, and deliver country-specific customs tariff, trans-shipment costs, and taxes to the shipping customer. Although UPS had the internal ability to calculate overseas shipping charges, providing the information to the customers in an instant required that UPS "IT-ize" this capability and make it a digitized *business capability*. Similarly, consider the auto insurance claim settlement process. Until recently, in the event of an automobile accident the insured customer was required to bring the automobile to a claims center where an adjuster calculated the extent of damage before a claim was settled. Customers had to deal with the uncertainty of the coverage and wait for a settlement check. Progressive Insurance Co. recognized the need to develop the business capability to quickly settle claims to increase customers' satisfaction. Of course, one option was that the adjuster arrived at the scene of the accident to assess the damage and then returned to the office to calculate the claim amount. However, by IT-izing the capability required, Progressive Insurance Co.'s agent is able to use a wireless link from the scene of the accident to connect with a central office computer, calculate the claim, write a settlement check, and even schedule repair service at a dealership. The business capability required (CR) to quickly settle a claim, accelerated by a wireless connected laptop computer (IT), created higher customer satisfaction and lower costs as sources of business value (BV). In extending the IT-ize idea, Progressive Insurance Co. recognized that it required the capability to offer "usage based" insurance. Using GPS and cellular data modems, Progressive IT-ized the capability to assess vehicle usage, which allowed customers to purchase insurance based upon their driving behavior (Tapscott and Bisker, 2006). Other examples of the IT-ization of business capabilities are accelerated bank loan approvals, rental car "parking lot" charge settlements, and drug interaction detection by pharmacies. It should be noted that each of these capabilities required by the business can, and does, exist without the IT. By viewing the business capability first and then embedding IT into these capabilities, the firms accelerated the business value from IT.

When identifying and building the business capabilities, rather than viewing this as an IT investment question, it is more useful to recognize that value occurs from accelerating capabilities with IT and the interaction with a variety of complementary assets such as process redesign, training, and incentive structures. While the complementarity approach is well articulated in IS research, our message is that slicing out IT investment or its value in the end result of firms' business processes is of limited use. This is contrary to research efforts that isolate the impact of IT from other investments. Not only are such efforts of marginal utility, they reflect an "us vs. them" relationship between IT and business colleagues rather than a joint effort to expand business value. Therefore, we propose that firms will find it useful to examine how digital capabilities are created and under what conditions they lead to firm value. In other words, similar to the goal of achieving a check mate on a chess board from the strategic positioning of the all the pieces, it is useful to view the collective impact of IT in the Capability Required ->IT->Business Value (CR->IT->BV) landscape rather than pondering upon the value of the location of each chess piece on the chess board. So, rather than allocating a given investment (e.g., IT) into the value system, the focus is upon identifying novel combinations that maximize value.

We label this "IT embeddedness" because in many cases the IT becomes an integral part of the process such that it becomes indistinguishable from the product. For example, the IT in a bank's capability of "instant credit check" is deeply embedded in the loan approval process and difficult to separate out. Neither is it of significant use in the long term to isolate the value due to IT. Instead of focusing upon IT investment and its link with capabilities and then on the value, it is useful to focus on digital business capabilities (i.e., digital logistics, digital customer service, and digital analytics) and how to maximize the business outcomes of these capabilities. This distinction, a subtle but important one, is a recognition that IT value is embedded and as such should be reflected in our value research models. By placing business capabilities, whether functional (fulfilling a business task) or dynamic

(adjusting to changing conditions), as the driver of the model, we can study the issue of “how to IT-ize” the capability so that it is better, faster, and results in greater business value. This value can be manifested through replication of the digital capabilities (e.g., in other portions of the organization) or even on the sale of these capabilities, once stabilized.

Research Thrust 2:

How can we digitize various functional and dynamic business capabilities in order to increase business value under various conditions?

To study this question, theoretical development will be required for identifying various *functional* processes and the *capabilities* and their attributes that make them ripe for digitization. Frameworks are needed to match IT-based capabilities with *various conditions* under which digitization is more or less successful in creating business value and aspects of this value that are sustainable in the face of competition.

Theme 3: Information Mindset

Various technological innovations such as railroads, radio, telephone, and computing condensed time and distance and forever changed the nature of business. Past research indicates that many previous innovations followed a pattern of irrational growth and rapid decline, then a slow revival – a pattern that was also exhibited during the dot-com phenomenon. However, at least one unique feature distinguishes IT from other technological innovations. While other innovations changed the nature of work, IT-based innovations have generated and captured *more* data while also changing the nature of businesses. Unlike other innovations, IT analyzes such data (e.g., through data mining) and generates even more information. Never before has a technological innovation given businesses the ability to incessantly assess and reinvent themselves. Zuboff (1988) recognized this and indicated that “the same systems that make it possible to automate also create a vast overview of an organization’s operations, with many levels of data coordinated and accessible for a variety of analytical efforts.” The ability to generate value from *information* is an increasingly important part of the fabric of a progressive business enterprise, but one that has been understudied.

We contend that the role of information in enabling business capabilities deserves a distinct place in the IT value research agenda. This is because information, with or without technology, can improve business capabilities and even creates new capabilities. IT-izing a capability (discussed above) has a dual impact on information value. First, the embedded IT enables a mechanism to gather continuous, consistent, and expansive data about processes, products, customers, and their interactions. For example, an embedded RFID chip is a part of the digital tracking capability for the movement and storage location of pallets of a chemical compound. However, it also enables information gathering that can be used to further improve this business capability (e.g., optimized routing of pallets) or create another one (e.g., better service through real time tracking by customers).

Firms should develop the ability to gain visibility into their processes so that they can react to problems or changes. Information plays an important role in enabling sensing, filtering, and sense-making capabilities. While the capability to gather data from the environment is critical to produce useful information, organizational value from information comes when the collected data are analyzed through data mining. Firms might possess good business capabilities, but to make a meaningful difference in operational excellence and competitive response, these capabilities can be enhanced not only by IT, but also by the ability to manage and exploit information to create *information capabilities*.

Davenport (2006) describes the ability to analyze data as a critical capability for contemporary organizations. Marchand and colleagues (2000) relate the success of a firm to its capabilities to effectively manage and use information. They refer to these capabilities as information orientation, which includes the ability to manage information effectively through sensing, collecting, organizing, and processing information. Thus, organizations need to better understand how best to exploit their data and convert them into information capabilities. Data mining is an IT-based tool and an asset for firms. The IS discipline has a tradition of conducting research in data mining and is well poised to

enable organizations to create business capabilities and new opportunities. It is also noteworthy that data mining to create value also opens avenues for studying *negative* implications of information such as overload, misinformation, power plays, and politics. We must explicitly recognize information capabilities and further research how we can create positive value from information capabilities and, conversely, how we can prevent negative value (e.g., Baskerville and Land, 2004).

It can be argued that better IT capabilities *and* better information capabilities are instrumental in fostering better digital (business) capabilities, and ultimately a firm's ability to differentiate. By explicitly focusing upon information capabilities required for a firm, we can then expand our understanding of which processes lead to those capabilities and result in increased business value.

Research Thrust 3:

How can we create information capabilities that enhance and do not destroy digital business capabilities?

This research thrust will require theoretical development and expansion in the concepts of *information capabilities* with or without IT. Research is required in the dysfunctional aspects of information such that information capabilities *enhance and not destroy* digital capabilities in creating new business value.

Theme 4: Value Expansion

Earlier, we set the boundary conditions for IT value research as satisfying two conditions – (i) constructs proximal to IT and (ii) an economic endogenous variable. While this approach encompasses a large set of studies, it needs to reflect a broader representation of value based upon observation of practice. Businesses and customers are the final arbitrators of value creation, and by overemphasizing pure financial post hoc metrics or even ex ante market value, we underreport the true benefits of IT to these stakeholders. The “intangible” value created by IT is becoming increasingly important – and in many cases our measurement instruments are too blunt to capture it. So, while past research has focused on direct economic benefits (e.g., ROI, market share, and stock price), we propose that economic value must be expanded to include indirect and intangible value such as agility, flexibility, and first-to-market. While it may appear that, having defined boundary conditions in the previous themes we are now modifying them to expand the research agenda, we believe that the economic impact still holds, albeit with somewhat of a twist. Economic endogenous impact should include variables where the economic impact in the external marketplace is evident. Characteristics such as flexibility, agility, and customer service would meet the criteria, while endogenous variables that focus on internal characteristics of the firm (quality of employee life, user satisfaction, etc.) may not. By broadening the repertoire of economic variables, we can advocate research that recognizes the different types of economic impacts and perhaps their different antecedent variables.

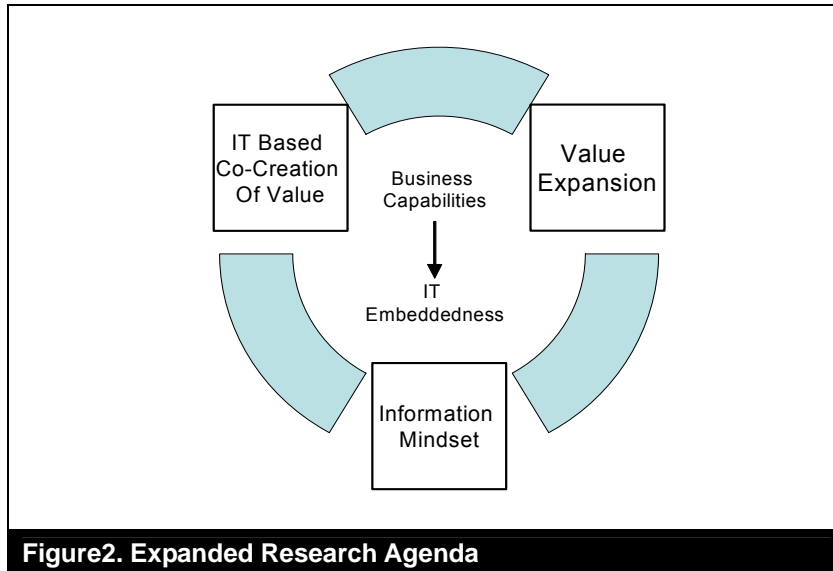
A model examining digital capabilities and flexibility could also inform us on IT value, as could a model examining information capabilities and ROI. Rich representations of tradeoffs in value (e.g., economic models that could be achieved through IT, lower prices through electronic markets, higher efficiency through information integration, cost vs. differentiation, flexibility vs. efficiency) can be studied as part of this research stream. While this genre of work is not a major departure from existing efforts, the emphasis here is on broadening the representation of economic value. We need better models to enhance our understanding of the various positive manifestations of IT because lacking that understanding so often results in underreported economic benefits. If theory and measurement are inhibiting progress here, then we should devote attention to developing them.

Research Thrust 4:

What are the indirect and intangible paths to economic value that can be influenced by information and IT capabilities, and how do we foster them?

Theory development in this area will include typologies of IT-based value that go beyond the paths articulated in the extant literature. *Indirect and intangible paths* will involve tradeoffs in using IT to

achieve different value outcomes -- social, economic, and financial models of value, and temporal manifestations of IT-based value. We encourage future research to *foster* new and yet unclear economic value by exploiting *information and IT capabilities*.



4. Expanded Research Agenda

The expanded research agenda is summarized in Figure 2. IT embeddedness is a central concept that is tied to co-creation of value, information mindset, and value expansion. It is important to note that desired business capabilities drive IT embeddedness. Therefore, effective convergence of desired business capabilities and IT capabilities is a prerequisite to realizing capabilities between organizations (co-creation), creating information value (information mindset), and ultimately realizing a wide repertoire of value (value expansion).

For instance, using the RFID as one of several potentially embedded information technologies, the question of RFID value can be viewed in a "traditional" sense or in a more expansive sense as we have proposed. Traditional study of RFID would examine investments and interactions with other resources and observe any effect on process or financial outcomes. This could be very insightful, as it could yield "contingencies" under which RFID does indeed realize value.

More expansive research would add deeper insight into RFID and value realization. By focusing on business capabilities and IT embeddedness, there is a direct recognition that value is realized by increasing the convergence of these capabilities. So, research questions include: when does RFID integrated with other systems (information or manufacturing) attain critical mass at which it enables desired business capabilities? What new business capabilities can be created to exploit RFID, IT infrastructure, and processes across firms? How do business capabilities tie into RFID capabilities and configurations? These questions, while not outside the scope of the traditional study of IT value, were obscured by the emphasis on IT as the driver of business capabilities.

The expansive model might also focus on the increasingly connected business context, recognizing that RFID value might require co-creation by bridging capabilities among partners and equitable sharing of disparate resources. For instance, processes that afford greater efficiency in supply chains through RFID will create further value by reducing the "bull-whip effect" because information sharing between partners may lead to smaller lot sizes and more timely delivery to the shop floor (Veeramani, 2005). Also, once embedded, RFID technology is the front door entry to a significant dataset which, when combined with managerial experience, can uncover waste, unnecessary transportation, and premature product decay due to improper storage. It could also be the source of new value-added

Table 2: Cross-Theme Research			
	IT-Embeddedness Capability Required ->IT->Business Value	Information Mindset Information as an asset	Value Expansion Indirect and intangible value agility and flexibility
Co-Creation of Value <ul style="list-style-type: none"> multiple parties relationships among firms structures and incentives 	<i>Issues on Inter-firm digital capabilities</i> <ul style="list-style-type: none"> Sources of barriers to entry Tighter integration of digital products Joint IT-based programs 	<i>Issues on information and knowledge sharing</i> <ul style="list-style-type: none"> Jointly identify new customer leads Process efficiency Revise product development and delivery models Forecast demands upon the partners 	<i>Issues on economic and non-economic value allocation</i> <ul style="list-style-type: none"> Build a system to absorb market shocks (resilience) Respond jointly to changing demands (agility) Refocus energy to compete in value added areas e.g. GHX expanded and co-created value for all partners by removing product search as a market force (Applegate and Ladge, 2003)
IT-Embeddedness Capability Required -> IT-> Business Value		<i>Issues on creating information (e.g., sensing, filtering) capabilities</i> <ul style="list-style-type: none"> Real-time information gathering in hypercompetitive or time sensitive environments (e.g. On Star, BMW can sense automobile trouble and respond) How does "information" enable business capabilities that lead to business value (e.g., vendor managed inventory (VMI) capability was enabled by embedding CPFR) 	<i>Issues on ambidextrous capabilities that enable efficiency and innovation.</i> <ul style="list-style-type: none"> How to decouple operations from innovation? e.g. UPS enables innovative capabilities while delivering day after day Focus on business capability rather than IT What are the capabilities required among actors within a value network?
Information Mindset Information as an asset Business Intelligence			<i>Issues on information value chain and economic and non-economic outcomes</i> <ul style="list-style-type: none"> Knowledge based products – e.g., information on product performance, efficacy of investment portfolio, customers' credit history and propensity to buy products or services How to identify information and customers most likely to support viral marketing? Identify and support product attributes that add intrinsic value to consumers e.g. will business customers pay for internet access at an airport lounge?

services. Furthermore, data gathered from the customers' warehouse can be analyzed for patterns of usage in relation to other products. Boundary-spanning managers can utilize RFID-gathered data to generate business intelligence to lower manufacturing and shipping costs through better packaging, and improved service from customer demand forecasting. Although business executives recognize the importance of information (Luftman and McLean, 2004), the potential uses of information as a capability-generating resource are yet to be fully exploited. Finally, the expansive model would foster research on other aspects of value. RFID capabilities, information capabilities and co-creation of value could result in superior customer service and *a priori* anticipation and responsiveness to stock-out situations.

In addition to those described above, rich research opportunities for IT value research emerge at the intersections of our four research themes. Researchers can examine possibilities for research such as those cited in Table 2. For instance, the intersection of IT-embeddedness with the other three themes yield issues of inter-firm digital capabilities and how IT facilitates synergistic value through seamless structures and processes. Such relationships can generate data that each party can share and further expand the value including non-economic relationships such as resilience and ability to absorb market shocks by forecasting and modeling market conditions. Similarly, the intersection of IT-embeddedness with the information mindset and value expansion offers novel areas for research. IT-embeddedness provides an infrastructure for ongoing data gathering, while the information mindset enables the exploitation of that information, thus providing rich opportunities to build sense-and-respond capabilities and expand value from innovative business processes and new information-based products.

5. Conclusion

The intention of this essay is to serve as a catalyst for a broader and richer agenda of IT value research. We believe that this is a particularly critical research area for IS, as it goes to the essence of our value as a discipline. The themes described here are somewhat nuanced, but introduce important departures from prior research in this area. For instance, in IT-based co-creation of value, the subtle shift we suggest is from IT co-value creation to IT co-creation of value. This indicates that by emphasizing how joint value is created, we can evolve from the largely transactional perspective and begin examining how different companies with different IT can join together and create new value. Our theme on IT-embeddedness suggests that we recognize that IT is not necessarily the driver of capabilities, but that business capabilities are the primary driver of value, and getting a better grasp on how we IT-ize these capabilities should be a major thrust. The third theme on information mindset reflects a change in the role of information from supportive to active, where (if leveraged appropriately) information could have value in and of itself. And finally, we suggest that by under-researching intangible value in the marketplace, we correspondingly under-represent IT value. Therefore, it is important to recognize other intangible aspects of economic value that legitimately fall within this stream.

It is important to note again that we are not denigrating prior research. It has contributed significantly to our understanding of IT value. However, we believe that by raising important points of change, we could prevent prior work from reaching a point of diminishing returns. The research agenda described in this essay focuses on a richer understanding of IT value in an environment characterized by networks of inter-firm relationships, increasing prevalence of data and sophisticated analytics, and hyper-competition that requires agility and responsiveness as critical outcomes in the marketplace. Our expanded agenda recognizes these trends and encourages researchers to respond by increasing theoretical development and empirics in certain areas, and ultimately increase the "value" of their IT value research.

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