HOW IT CREATES BUSINESS VALUE: A PROCESS THEORY SYNTHESIS

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Abstract

Mixed empirical results about the value of IT investments are an invitation to seek better theory. Recently, a number of researchers have proposed theoretical models that trace the path IT investment inputs take on the way to creating business value. Despite substantive differences, the theoretical models share some common elements — n particular, all of them contain a cause-effect argument of the "necessary, but not sufficient" form that characterizes process theories.

In this paper, we attempt our own process theory synthesis of these models, resolving some of their apparent contradictions, to serve as a platform for future research. One important implication of our process model is to highlight IT use and knowhow as intermediate outcomes requiring much further research.

1. INTRODUCTION

When, several years ago, economists pointed out an apparent "productivity paradox" with respect to investments in information technology (IT), information systems (IS) professionals and academics had a rude awakening. The "fact" that organizations were spending more and more on information technology with little to show for it in the output statistics forced practitioners to redouble their efforts to justify investments in technology. Empirical studies undertaken by IS researchers have yielded mixed results. Kauffman and Weill (1989), among others, have failed to find a convincing body of evidence that IT investment is always associated with superior performance. The most recent evidence is that IT is associated with increased output (thus refuting the productivity paradox), but not with business value as measured by return on asset and return on equity (Hitt and Brynjolffson 1994).

Mixed empirical results are always an invitation to seek better theory. We believe that a productive approach is to move from the question of whether IT creates value to how, when and why benefits occur or fail to do so. One of the first researchers to fill this theory gap was Weill (1992), who introduced the concept of "IT conversion effectiveness" to account for the failure of some of IT investments to reach the firm's bottom line. Since then, many researchers have proposed theoretical models that trace the path investment inputs take on the way to becoming the outputs of "productivity increases," "realized business value," "organizational performance improvements," and the like. Among those who have proposed such models are Lucas (1993), Grabowski and Lee (1993), Markus and Soh (1993), Sambamurthy and Zmud (1994), and Beath, Goodhue, and Ross (1994).

Despite substantive differences, the theoretical models listed above share some common elements. In particular, all of them contain, either explicitly or implicitly, a cause-effect argument of the "necessary, but not sufficient" form that characterizes process theories and differentiates them from variance theories (Markus and Robey 1988; Mohr 1982). While variance theories excel at explaining variations in the magnitude of a certain outcome, they tend not to do well in situations where the outcome is uncertain — sometimes occurring, sometimes not — a strong indicator that the necessary conditions are not sufficient to produce the outcome. By contrast, process theories can provide powerful explanations even when causal agents cannot be demonstrated to be sufficient for the outcome to occur. In cases of outcome uncertainty, as is

the case with studies of IT and business value, process theories have been shown to have distinct advantages over variance theories (Markus and Robey 1988).

The purpose of this paper is to propose a process theory of the relationship between IT investments and business value. The elements of our theory are not novel; throughout this paper, we will acknowledge our debt to the groundbreaking theoretical work of other authors. What we do claim as novel, however, is our rearrangement of these elements — their combination and synthesis into the process theory structure. We hope to show that a process theory of familiar conceptual elements not only accounts well for conflicting empirical results but also suggests important new lines of empirical research.

2. THEORETICAL ANALYSIS

The theoretical question addressed in this paper is: when, how, and why do a firm's investments in information technology result in improved organizational performance? Prior research and theorizing on this question provide strong reasons for believing that the conditions necessary to produce the outcome of improved organizational performance are not always sufficient to do so. For example, Lucas presents the model of IT performance shown in Figure 1. Reading this model without reading Lucas' text yields the following (incorrect) interpretation: "Well-designed IT" leads to (or causes or results in) "appropriate IT use," which in turn leads to improved organizational performance improvement (subject to the intervention of other external factors). However, Lucas explicitly notes that appropriate IT use does not always occur even when the IT is well designed. Thus, there is a discontinuity in his actual theoretical model, not adequately reflected in Figure 1, between the existence of a well-designed IT and the condition "appropriate use." The misinterpretation lies in our habitual understanding of "arrows connecting boxes" in terms of necessary and sufficient causal relationships.

The theoretical situation that Lucas intends to portray, in which a necessary condition (well-designed IT) is not sufficient for an outcome (appropriate use), is handled quite poorly by our habitual "variance theory" concepts (Mohr 1982), which both assume and require necessary and sufficient causal relationships. On the other hand, this situation is handled quite easily and elegantly by a "process theory" formulation (Mohr 1982). Generally speaking, conditions that are only necessary, but not sufficient, do not make for very satisfying theories, because they allow for the possibility of other, more powerful causal factors influencing the outcome, and evoke the possibility of spurious, epiphenomenal relationships. But process theories can make highly satisfying explanations. They do so by combining necessary conditions in a "recipe" (Mohr's term), involving a combination of necessary conditions with probabilistic processes in a specified time sequence.

Process theories differ from the more commonly-used variance theories in a number of ways summarized in Table 1 (adapted from Mohr [1982] and Markus and Robey [1988]). They have numerous advantages, the most important of which for our purposes here being that they accommodate empirical situations in which the outcome of interest is not the inevitable outcome of conditions that are necessary for it to occur.

We believe that discontinuities and lack of inevitability pervade the theoretical writings in the "productivity paradox" domain. We further believe that paying explicit attention to the assumed nature of the causal relationships in these writings can help to clarify similarities and differences and to promote theoretical synthesis. To demonstrate this point, we first "read" some of the theoretical literature on this topic in the language of process theories. Specifically, we examine the five models depicted in Figures 1 through 5 (featuring work by Lucas [1993], Grabowski and Lee [1993], Markus and Soh [1993]. Beath, Goodhue, and Ross [1994] and Sambamurthy and Zmud [1994]). In the second part of this paper, we attempt our own process theory synthesis of these models.

2.1 Lucas — "Appropriate Use"

Lucas is concerned with how IT increases firm performance (see Figure 1). He proposes two conditions, occurring in sequence, that lead to the performance outcome. The first, necessary but not sufficient, condition is that IT be designed in such a way that it fits the firm's task effectively. An effective IT design is not, however, sufficient for organizational performance improvement, because technology cannot improve organizational performance unless the technology is used (see also Trice and Treacy 1986). Therefore, appropriate use of an effectively designed technology is also a necessary condition for improved organizational performance in Lucas' model.

Is appropriate use also a sufficient condition for improved organizational performance? Lucas acknowledges that factors other than appropriate use of an effectively designed technology may influence firm performance (e.g., competitor's reactions). However, we believe that Lucas views the relationship between appropriate IT use and firm performance as essentially a necessary and sufficient type relation in which "other things being equal" more use of an effective technology leads to greater performance improvement. This is particularly so when the performance outcome is closely tied to the technology in question.

In short, Lucas' model decomposes into two submodels. The first is a process theory explaining appropriate IT use. The second is a variance theory linking appropriate IT use to business value.

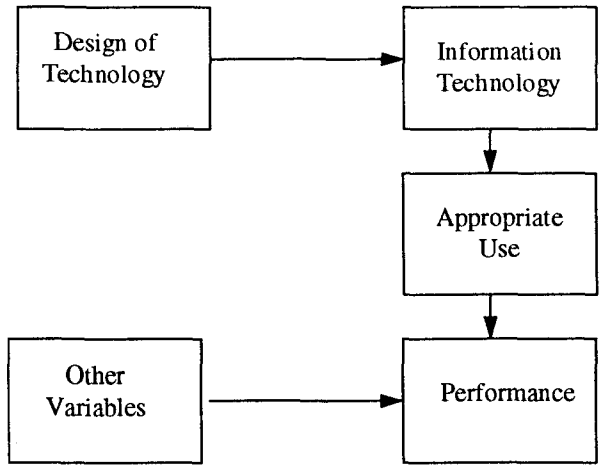

Figure 1. Lucas (1993) — "Appropriate Use"
(Source: Lucas 1993)

Table 1. Differences Between Variance Theories and Process Theories

Characteristic	Variance Theory	Process Theory
Outcome	A variable	A discrete occurrence
Logical Form	If X (independent variable, necessary and sufficient conditions), then Y (dependent variable); If more X, then more Y	If not-X (necessary conditions), then not-Y (outcome); Cannot be extended to "more X" or "more Y"
Assumptions	Outcome will invariably occur when necessary and sufficient conditions are present	Outcomes may not occur even when conditions are present unless a particular "recipe," involving external directional forces and probabilistic processes, unfolds
Role of time	Irrelevant; Necessary and sufficient conditions can occur in any order	Crucial; The time ordering in which necessary conditions combine is consequential
How to "read" the theory	The cause is necessary and sufficient to produce the effect	Causation consists of necessary conditions occurring in a particular sequence in which change and random events play a role

Adapted from Mohr (1982) and Markus and Robey (1988).

2.2 Grabowski and Lee — "Strategic Fit"

Like Lucas, Grabowski and Lee also pursue the idea that appropriate fit is necessary for favorable IT impacts (Figure 2). However, where Lucas is concerned with task fit, Grabowski and Lee focus on the fit between an organization's strategic type (using the Miles and Snow Prospector-Defender-Analyzer-Reactor typology), cost structure (internal and external coordination costs), and IS application portfolio. For example, Prospector firms have a broad and continuously changing business domain and monitor a wide range of environmental conditions. Their internal organizations are decentralized and informal in order to enable quick adaptation to change. The cost structures of such firms therefore have both high external coordination costs due to

the many external interfaces, as well as high internal coordination costs due to higher agency costs. In this model, the appropriate IS application portfolio is one that is relatively more diverse, reflecting their multi-product market orientation.

Grabowski and Lee consider fit between the application portfolio, strategic type, and cost structure to be a necessary, but not sufficient, condition for favorable organizational performance, because competitors may easily imitate the IS applications and remove any advantage. In short, this model posits a single process-type relationship between strategic fit and performance.

2.3 Markus and Soh — "IT Assets"

Building on Weill's (1992) concept of "conversion effectiveness," Markus and Soh argue that there cannot be a necessary and sufficient relationship between spending on information technology and improved organizational performance, because some of the investment may be wasted through poor internal IT management processes, such as failure to select the right IT projects to pursue or failure to manage them effectively (see Figure 3). Markus and Soh posit an intermediate outcome that they call "IT assets" between IT investments and organizational performance. Including IT infrastructure (including soft infrastructure such as expertise and experience) and a portfolio of applications, IT assets are described as the result of a conversion process in which IT spending is a necessary, but not a necessary and sufficient, condition.

Similarly, it is implicit in the Markus and Soh model that IT assets do not have a necessary and sufficient relationship to organizational performance, since know-how and infrastructure are claimed to have no direct performance outcomes. Furthermore, like Lucas, Markus and Soh argue that "structural factors" such as firm size and industry information intensity will affect the ability of the organization to convert IT assets into business value.

This model decomposes into two submodels, both process theories. The first explains how IT investments do or do not become IT assets. The second explains how IT assets do or do not yield improved organizational performance.

2.4 Beath, Goodhue, and Ross — "Leveraging IS Processes"

Beath, Goodhue, and Ross elaborate on Markus and Soh's view of IT assets as a necessary, but not sufficient, condition for business value (see Figure 4). In their view, IT assets consist of technology, human resources, and the relationships between IS and users (or clients). Beath, Goodhue and Ross explicitly argue that IT assets deliver business value by affecting three critical business processes: systems development, business operations, and planning. They argue that high quality IT assets are necessary, but not sufficient, for improvements in development cycle time, operations productivity, and alignment of business and IT planning, because process losses can reduce the effectiveness of these intermediate outcomes.

In the Beath, Goodhue and Ross model, there is also an explicit feedback loop, in that organizational commitment to improving any of the three business processes would require improvements in the quality of IT assets. For example, a decision to improve cycle time may require empowering staff (people asset) or having reusable components (technology asset).

Although important, the three intermediate outcomes in the Beath, Goodhue and Ross model are only necessary, but not sufficient, for achieving business value from IT assets. As in the Lucas model, Beath, Goodhue and Ross posit client use as conditioning the relationship between IT assets and business value. In short, the Beath, Goodhue and Ross model can be read as two process theories. The first connects IT assets with IT business processes. The second connects IT business processes with business value.

2.5 Sambamurthy and Zmud — "IT Impacts"

In Sambamurthy and Zmud's model, the box labeled "IT Management Roles and Processes" appears to be analogous to Markus and Soh's elaboration of Weill's conversion effectiveness concept. However, in the Sambamurthy and Zmud model, the result of the conversion process is not "assets" (as in the Markus and Soh model) or "business value" (as in the Beath, Goodhue and Ross model). Rather, the intermediate outcome in the Sambamurthy and Zmud model is "IT impacts" — of which four are specified: new/improved products and services, transformed business processes, enriched organizational intelligence, and dynamic organizational structures (see Figure 5).

In the Sambamurthy and Zmud model, raw materials (technology, knowledge, data) are necessary, but not sufficient, to produce impacts. In our interpretation, Sambamurthy and Zmud appear to view IT impacts as a necessary and sufficient condition for business value: the more new/improved products and services and the more transformed business processes, the greater the business value as measured by profitability, shareholder value, etc. We also believe that Sambamurthy and Zmud's model implies a necessary and sufficient relationship between IT management competencies and IT impacts: the greater the competencies, the greater the impact.

On the whole, we believe the Sambamurthy and Zmud model consists of three submodels. The first is a process model connecting raw material inputs to impacts. The second is a variance theory of IT management competencies and IT impacts. The third is a variance theory linking impacts and business value.

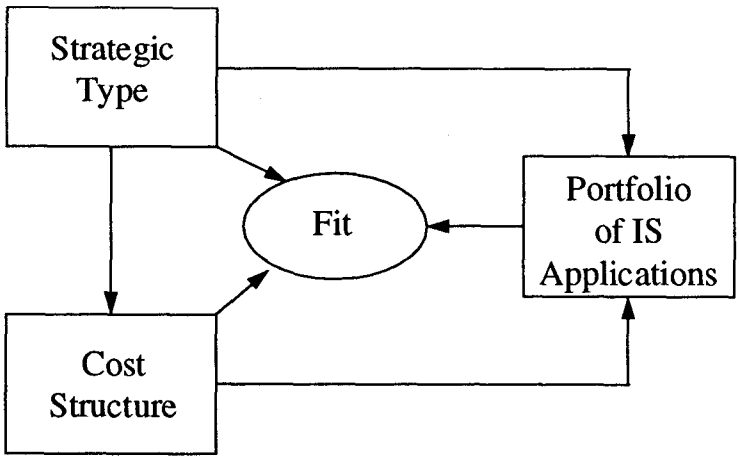

Figure 2. Grabowski and Lee (1993) — "Strategic Fit"
(Source: Grabowski and Lee 1993)

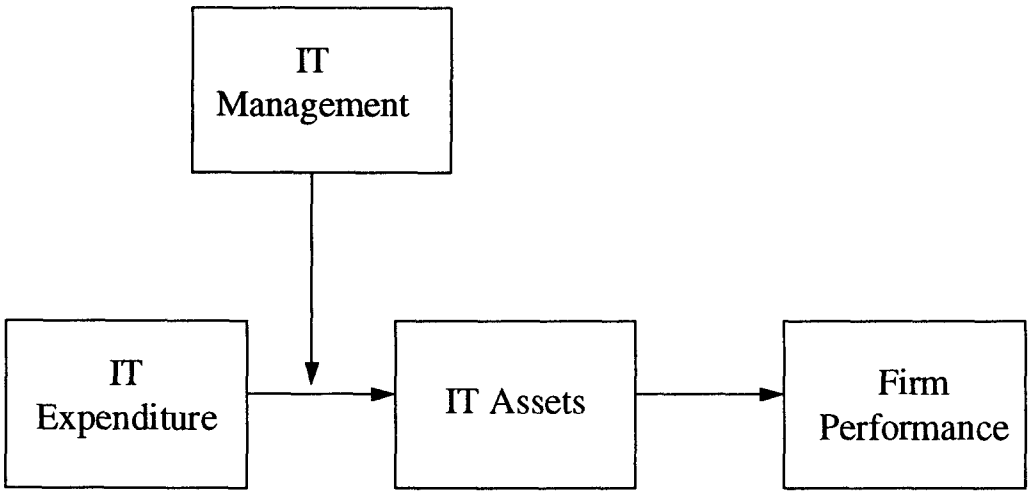

Figure 3. Markus and Soh (1993) — "IT Assets"
(Source: Markus and Soh 1993; as interpreted by authors)

2.6 Summary

Viewed in this way, the models described above differ quite substantially, not only in their concepts and concept definitions, but also in the kinds of causal relationships posited among the concepts. If this theoretical divergence continues, the prospects for cumulative knowledge in the research tradition of IT and business value will remain dim. At the same time, there are some clear points of convergence among the models that can be used as a basis for forward progress. Table 2 compares these five models against the criteria that distinguish between process theory and variance theory according to Mohr and Markus and Robey. Table 2 shows that while each of these five models does have some process theory elements, none can be said to be a complete process theory and most contain at least some variance theory elements.

Our review of the theoretical literature suggests the potential value of a better-developed sequence of "pure" process theories. Each element in such a theoretical chain would specify a sequence of necessary (but not sufficient) conditions in a "recipe" that explains how the outcome occurs when it does, while acknowledging that it does not always do so. Such models would not contain variance theory elements such as "variables," for these elements tend to dilute the simplicity and elegance of process theories (Mohr 1982).

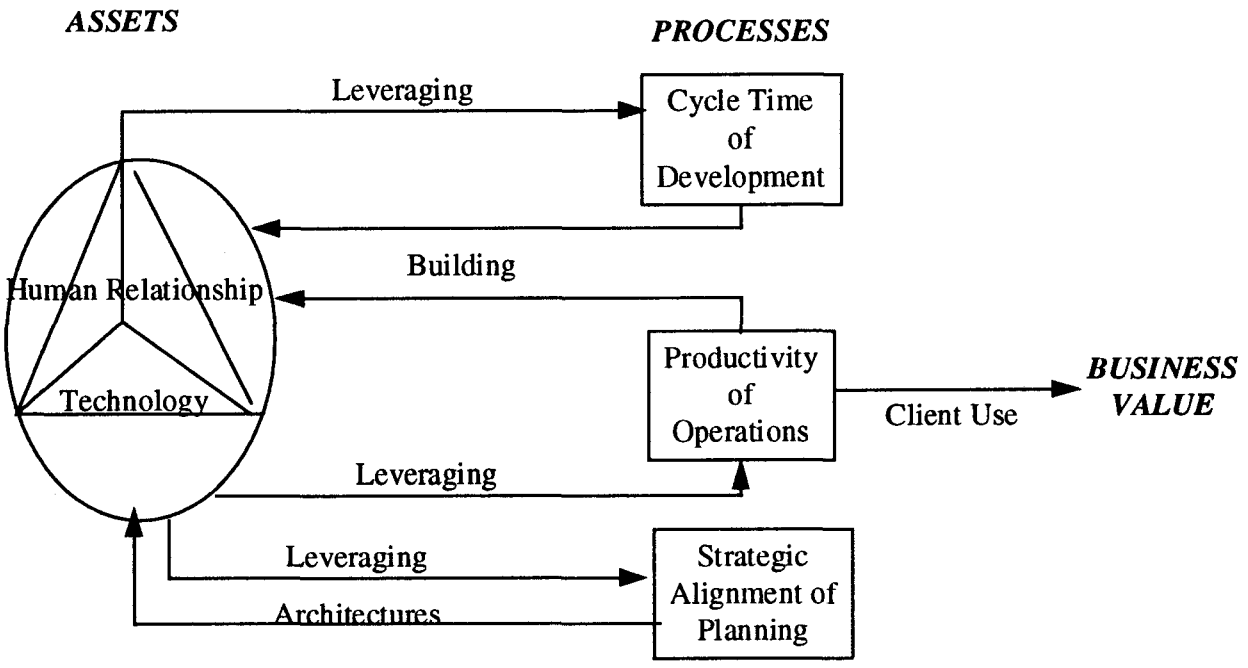

Figure 4. Beath, Goodhue and Ross (1994) — "Leveraging IS Processes"
(Source: Beath, Goodhue and Ross 1994)

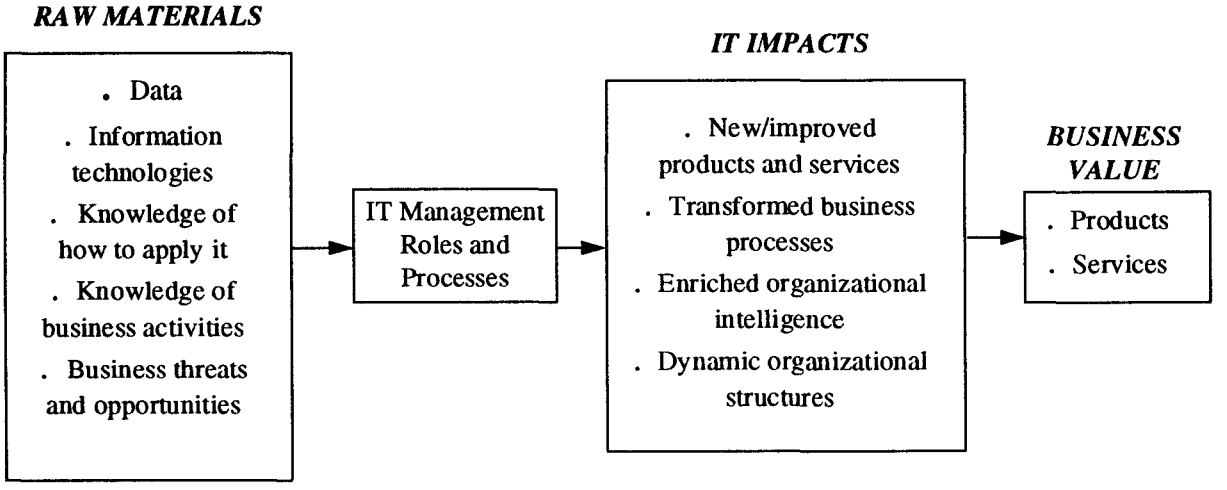

Figure 5. Sambamurthy and Zmud (1994) — "IT Impacts"
(Source: Sambamurthy and Zmud 1994)

Table 2. Process and Variance Theory Characteristics of the Five Models

Criteria	Lucas	Grabowski & Lee	Markus & Soh	Beath, Goodhue & Ross	Sambamurthy & Zmud
Outcome	Organizational performance (variable)	Organizational performance (variable)	Quality IT assets (discrete intermediate outcome) Improved organizational performance (discrete outcome)	Improved business processes (discrete intermediate outcome) Business value (variable)	IT impacts (intermediate variable outcome) Business value (variable)
Logical Form	If IT is not well designed, then appropriate use will not result (P) If appropriate IT use, then increased organizational performance (V)	If there is a poor fit among strategic type, cost structure and portfolio, then decreased organizational performance (P)	Without IT spending, there will be no IT assets (P) Without quality assets, no improvement in organizational performance (P)	Without high quality assets, no improved business process (P) Without improved business processes, no increase in business value (P)	Without raw materials, no IT impacts (P) Greater IT management competencies, greater IT impacts (V) Greater IT impacts lead to greater business value (V)
Assumptions	Good IT design may not lead to increased performance because it may be inappropriately used (P) Organizational performance will increase with more appropriate use of well designed IT (V)	Increased organizational performance may not occur even if there is a fit because of competitor actions (P)	Quality IT assets may not occur even with IT spending; effective conversion is dependent on management processes (P) Quality assets may not lead to improved performance, due to competitor actions (P)	Increase in business value may not occur even with quality IT assets and improved business processes because of process losses, and lack of use (P)	IT impacts may not occur with availability of raw materials, dependent on IT management processes (P) IT impacts occur when there are effective management processes (V) Business value results when there are favorable IT impacts (V)
Role of Time	Sequential ordering of IT design and implementation then use (P)	Not considered	Sequential ordering of IT spending, management processes, and IT assets (P)	Sequential ordering of IT assets, process improvement, and use (P)	Sequential ordering of raw materials, management processes, and IT impacts (P)

Note: (P) and (V) refer to process and variance characteristics respectively.

3. THEORETICAL SYNTHESIS

The foregoing discussion suggests the existence of several possible discontinuities or "lacks of inevitability" in Mohr's terms. In view of this, it seems advisable to begin at the end, rather than at the beginning, tracing backwards the intermediate outcomes necessary to arrive at a success — the situation in which IT investments have resulted in improved organizational performance. This strategy seems indicated because Mohr has noted that a different outcome (such as "lack of improved organizational performance") might well require a very different process theory. Following this strategy yields a chain of three different process models summarized in Figure 6 and Table 3. Reading backwards, one model links improved organizational

effectiveness to IT impacts, the second links IT impacts to assets, and the third links IT assets to IT expenditures. Together, we believe they comprise and synthesize some of the major insights from prior theoretical contributions, while clarifying some of the major gaps and points of disagreement. We discuss each in turn, but first we briefly mention the ultimate outcome of interest — improved organizational performance.

3.1 The Ultimate Outcome: Improved Organizational Performance

The outcome of interest to us in this paper is improved organizational performance due to IT investment. In empirical studies of IT and organizational performance, this outcome has most often been measured by financial indicators such as return on investment (Mahmood and Mann 1991; Weill and Olson 1989), return on assets (Turner 1983; Weill 1992) and ratio of expenses to income (Bender 1986; Harris and Katz 1991; Markus and Soh 1993).

n contrast to this excessively financial focus, however, the literature on organizational effectiveness shows that the definition of organizational performance varies depending on how we view organizations (Bedeian and Zammuto 1991). There are at least three main perspectives on organizational performance. If we view organizations as rational, goal-seeking entities, successful goal accomplishment is the appropriate measure of performance. Second, organizations may be viewed as coalitions of power constituencies; measures of performance appropriate for this view include degree of satisfaction of constituents such as employees and customers. Finally, a third major perspective holds organizations to be entities "involved in a bargaining relationship with their surroundings, importing various scarce resources to be returned as valued outputs" (Bedeian 1984, p. 147). Here, the measure of effective performance is the organization's ability to garner scarce resources and productively turn them into valued outputs.

Clearly, performance is a multi-dimensional construct, since all three major perspectives of organizations are simultaneously valid in most organizations. Conceptually, the three views can be integrated. Broadly speaking, the systems resource and strategic constituencies perspectives can be subsumed under the goal model. Obtaining resources from the environment and satisfying key stakeholders are simply additional goals for the organization. Ideally, therefore, when we speak of organizational performance, we should consider a set of outcomes that reflect the different perspectives.

A process theory of this set of outcomes must explicitly acknowledge that favorable outcomes do not always occur. Such a theory would specify the chain of events necessary for the outcome set; at any point in the chain, some events necessary for the outcome set may fail to occur, derailing all or some of the desired outcomes. Thus, a process theory of improved organizational performance due to IT investment shows what happens when the desired outcomes occur, but it does not necessarily describe or explain why the outcomes fail to occur. Further, future refinements of the process theory may be required to explain the different dimensions of improved organizational performance.

3.2 The First Process Model: The Competitive Process

Working backward from improved organizational performance due to investment in IT, it seems clear that the first necessary condition is what Sambamurthy and Zmud have called "IT impacts." In other words, the organization must have achieved a state — we call it an intermediate outcome — in which one or more of the following statements, derived from Sambamurthy and Zmud is true:

1) IT has been incorporated into new products or services leading to a number of organizational performance outcomes such as increased customer satisfaction, etc.

2) Business processes have been redesigned using IT in such a way that the processes are more efficient or effective, leading to organizational outcomes such as increased productivity, employee satisfaction, etc.

3) IT has enabled organizational decision makers to improve their understanding of resource markets and of customers leading to better sourcing of inputs, better product/service design, etc.

4) IT has enabled flexible and adaptive organizational structures among organizational members and with customers and suppliers potentially leading to decreased lead time in product/service development/delivery, leading to increased market share, etc.

However essential these impacts are to improved organizational performance, they cannot be sufficient, because any number of factors outside the firm's control might result in failure to realize them (Arthur 1990). If, for example, the organization achieved positive impacts somewhat after its key competitors did so, the outcomes of increased productivity and value to customer may be achieved, but any potential bottom line results might be competed away. Put differently, impacts can only result in improved organizational performance if business conditions are favorable. Many such conditions have been discussed in the literature on IT and competitive advantage, including a strong initial competitive position (Porter 1980; Cash and Konsynski 1985; Choudhury 1988), non-response or slow response from competitors (Clemons 1987), and luck.

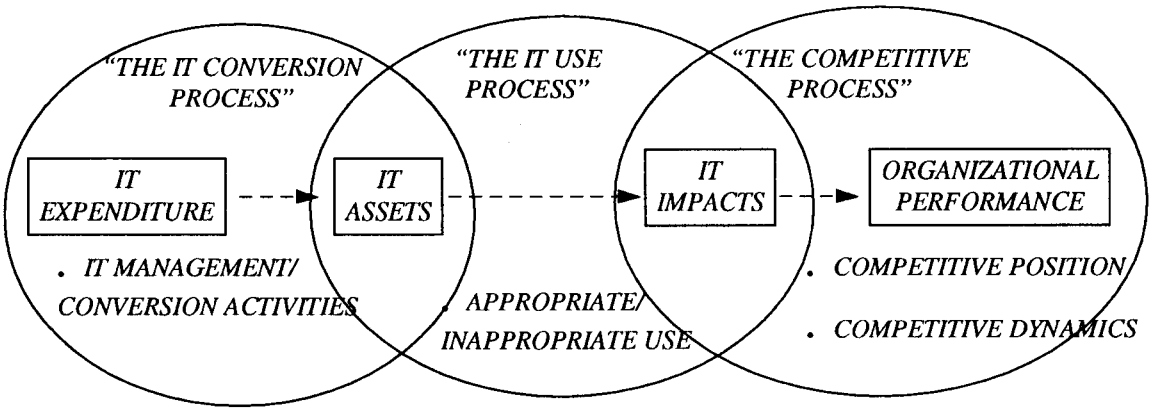

Figure 6. How IT Creates Business Value: A Process Theory

Table 3. The Process Theory Described in this Paper

Process Theory and Focal Unit	Outcome	Necessary Conditions	Probabilistic Processes	Recipe for Outcomes
Enhanced organizational effectiveness; Focal unit is the organization in its industry or environment	Improved organizational performance due to IT investment: (1) financial (2) stakeholder value (3) productivity	Organizational impacts due to IT investment	Competitive dynamics; Competitor and customer reactions	Outcome occurs when organizational impacts due to IT investment combine with favorable economic and environmental conditions
IT impacts; Focal unit is the organization or some subset (business unit, functional area, business process)	Organizational impact due to IT investment: (1) new products/services (2) redesigned business processes (3) better decision-making (4) improved coordination flexibility	IT assets	Individual discretion in complying with organizational directives, including those pertaining to IT adoption and use	Impacts occur when people and organizational units use IT assets (technology and skills) appropriately, a process affected by organizational structures, processes and culture
IT assets; Focal unit is the IT acquisition or deployment project/process	IT assets: (1) useful, well-designed applications (2) flexible IT infrastructure with good "reach" and "range" (3) high levels of user IT knowledge and skill	IT expenditures	"Process losses" or conversion ineffectiveness – due to poor IT management policies or to inconsistent application of good policies; stakeholder politics; including external vendors	IT assets occur when IT expenditures are converted efficiently and effectively, a process influenced by policies and politics

Adapted from Mohr (1982).

In short, the recipe that connects the necessary ingredient of IT impacts with the uncertain outcome of enhanced organizational effectiveness includes the tournament of organizational competition, in which organizations attempt to improve their outcomes by preplanning and capitalizing on unplanned events.

3.3 The Second Process Model: The IT Use Process

Working backward again, it is clear that IT impacts are themselves an uncertain outcome of a conversion process with its own intermediate necessary, but not sufficient, conditions. A necessary condition for organizations to experience the IT impacts of new products/services, redesigned business processes, better decision-making and improved coordination and flexibility, is quality IT assets. IT assets comprise the applications portfolio, IT infrastructure and user skill (Markus and Soh 1993). The applications portfolio consists of all uses of IT in the organization, measurable in terms of the applications software it has deployed. IT infrastructure comprises the basic building blocks of hardware and operating systems, shared services such as networking services, and expertise of IT personnel (Weill 1992 b). User skill — what users actually know how to do with their applications and infrastructure — is also a critical IT asset, since without user skill, the potential of the portfolio and the infrastructure can never be realized.

While necessary, quality IT assets are not sufficient for IT impacts to occur. As Lucas (1993), McKeen and Smith (1993), Trice and Treacy (1986) and many others have observed, impacts from IT require "appropriate" IT use. The very word "appropriate" signifies that the relationship between IT assets and impacts is not necessary and sufficient. Furthermore, it is not entirely clear that IT use is appropriately conceptualized as an "intervening variable." Some threshold level of IT use must be achieved before an impact can be observed but, beyond that level, more use does not necessarily lead to more or better impacts. In addition, certain kinds of usage — "ineffective" or "inappropriate usage" — are often believed to prevent or undo hoped for positive impacts (Markus 1994). For example, indiscriminate use of management information systems may simply result in information overload. Finally, the nature of "appropriate" use is likely to differ considerably across the four types of impacts identified by Sambamurthy and Zmud. For example, to produce new products/services with embedded IT might require IT use only of product developers and their outside advisors, but not of employees who produce the product or service or even of customers.

IT use and the contributions of IT use to IT impacts are curiously understudied in the IS field. Most treatments of the topic have assumed variance theory formulations of the "greater IT use leads to greater IT impacts" form. A large body of research on technology implementation and reinvention (Bikson and Eveland 1991; Leonard-Barton 1988; Tornatzky and Fleisher 1990) and a growing literature on the social definitions and meanings of technology (Markus 1994a; Orlikowski and Gash 1994) suggest the value of reconceptualizing IT use as a probabilistic process that affects whether and how IT assets become IT impacts rather than as an input variable in a necessary and sufficient relationship.

3.4 The Third Process Model: The IT Conversion Process

IT assets are the result of IT expenditures. However, not all organizations are able to convert their IT dollars into IT assets with the same efficiency (Weill 1992 a). For a given level of IT expenditure, some organizations may be able to obtain an applications portfolio of greater breadth (number of business activities supported) and depth (levels of management supported), and a better infrastructure (more and easier user access to shared computing resources and services, and IT staff with appropriate levels of technical and business knowledge). Hence, IT expenditure is a necessary, but not sufficient, condition for IT assets.

The "process" by which an organization converts IT expenditures into IT assets can be described as "IT management." Drawing on prior work, Markus and Soh defined four areas of IT management heavily implicated in IT conversion effectiveness: 1) formulating IT strategy, 2) selecting appropriate organizational structures for executing IT strategy, 3) selecting the right IT projects, and 4) managing IT projects effectively.

Much IS research has addressed each areas of effective IT management. For example, there are many techniques for IT strategy formulation such as Critical Success Factors (Rockart 1979) and Business Systems Planning (Zachman 1982). The wisdom of centralizing IT services has also been long debated (King 1983; Gurbaxani and Whang 1991); more recently, the focus of the debate has shifted to outsourcing (Ang and Beath 1993; Loh and Venkatraman 1992). Project selection research ranges from discussions of the merits of various quantitative versus qualitative approaches (Ginzberg 1979; Buzz 1983; Melone and Wharton 1984) to the common pitfalls of "technological utopianism" (Stinchcomb 1990, Chapter 5), and "paving over the cow-paths" (Davenport and Short 1990). Poor project management is one of the best known threats to IT conversion effectiveness and has been studied from a number of perspectives (Albretch and Gaffey 1983; Abdel-Hamid 1988; Nidumolu 1991; Neo and Leong 1991; Banker and Kemerer 1992).

However, while much has been learned, IT management is likely to remain error-prone and uncertain. First of all, the IT management strategies adopted by an organization are a complex reaction to the many special circumstances facing it. Second, the selection and implementation of IT management policies are

unlikely to be solely a rational exercise in optimization, since stakeholder politics often play a powerful shaping role (Davenport, Eccles, and Prusak 1992). Finally, IT management activities interact, sometimes reinforcing and sometimes interfering with each other. Thus, it is probably useful to treat "IT management/resources conversion" as a "process" in which IT expenditures are a necessary, but not sufficient, condition for producing IT assets.

4. SUMMARY AND IMPLICATIONS FOR RESEARCH

This paper has presented a process model of how, when and why IT investment is converted to favorable organizational performance. We believe, from our review of prior models of IT value creation with process elements, that this process model captures the major ingredients of the recipe for transforming IT investment into organizational performance. Having constructed the model by working backwards from the final outcome, we may now summarize it from the beginning. The recipe comprises necessary conditions and probabilistic processes in the following sequence: organizations spend on IT and, subject to the varying degrees of effectiveness during the IT management process, obtain IT assets. Quality IT assets, if combined with the process of appropriate IT use, then yield favorable IT impacts. Favorable IT impacts, if not adversely affected during the competitive process, lead to improved organizational performance.

There are a number of important benefits arising from articulating a relatively complete process model of IT and the creation of business value. First, it helps us to understand why IT investment does not always lead to improved organizational performance, and thus helps to move the research focus away from simple relationships between spending and performance. Second, it provides a framework for testing the IT conditions and processes that are associated with improved organizational performance. In particular, it highlights areas where further research is most needed. We believe that IS researchers have learned a great deal about the first process of IT management and conversion — what it takes to turn IT spending into useful and potentially productive IT assets. Through careful extensions of the strategy literature, we have learned much about the third process, what it takes for IT impacts to become a realized business value. The process model described in this paper, however, reveals a huge lacuna in the middle. The central process connecting IT assets to IT impacts begs many questions about what constitutes appropriate use, how appropriate use differs across the different types of IT assets, how organizations promote appropriate use, and how use skill and appropriate use translate into IT impacts. Third, the results of such empirical work based on the model will provide practical guidance to practitioners on critical areas such as key IT management processes, type and quality of IT assets, specification of appropriate IT use, and IT impacts.

We have begun empirical validation of the model and find that methods for testing process theories are not particularly well established. We are thus pursuing a number of complementary approaches to theory testing. First, attempting to trace the chain of processes from IT expenditure to organizational performance is probably too ambitious at this point. We have found it helpful to break the model down into the three subprocesses for the purpose of testing. As indicated in our earlier discussion, we believe that the middle process requires more empirical work because less is known about it. Second, variance type predictions can be made from process theories. That is, it is possible to propose and test hypotheses about the conditions under which the outcome specified in a process theory is more or less likely to occur. For example, if we take the middle process of converting IT assets to IT impacts, we may hypothesize that organizations with favorable IT impacts exhibit high quality IT assets, whereas those without favorable IT impacts will not exhibit high quality IT assets. What is important to note is that this proposition represents a variance theory implication of a process theory, testable by variance theory methods. It is not part of the process theory. Such propositions, if verified empirically, while not proving the process theory per se, add to its credibility. Third, true process studies would require in-depth case studies over time. Using the process theory concept of states, we would select organizations experiencing high or low IT impacts and examine IT use within the organization. Process measures of IT use over time would be collected. Following Monge (1990), dimensions of process measures include magnitude, rate of change, and periodicity. Using these dimensions, patterns of use can thus be identified and those associated with favorable IT impacts are of particular interest.

In summary, we see that the complete process theory that we have attempted to develop in this paper not only provides an explanation of how and why IT spending becomes improved organizational performance, but also highlights specific areas of research, such as the process of appropriate use, that must be addressed in order to fill in the gaps in our understanding on IT and business value, and finally, motivates the search and application of research methods that are suitable for process theory testing.

5. BIBLIOGRAPHY

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6. ENDNOTE

1. The outcome of interest, improved organizational performance, is conceptualized not as a continuous variable that can take a range of values but as a dichotomous variable that either is or is not achieved. For example, organizations either get an acceptable rate of return on their financial performance or they do not. Our theoretical concern is with what recipe of events distinguishes between those who achieve better performance and those who do not, not with the covariates of greater or lesser performance.