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Value Frame, Paradox and Change: The Constructive Nature of Information Technology Business Value

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Abstract
The role of IT in the creation of business value has been considered from various perspectives, such as strategic alignment, sustained advantage, and infrastructure capability. In this paper, we try to extend these previous perspectives by describing a flexible sensemaking framework for valuing complex technological resources. This framework assumes that the nature of IT business value is pluralistic, paradoxical, and dynamic. We describe four modes of valuation that comprise this framework: Routinizing, Cost-structuring, Positioning, and Learning, and illustrate them using historical lessons from airline reservation systems. Findings suggest that IT-derived business value can be characterized by competing tensions across diverse value frames that are paradoxically structured and change over time. We propose that such a pluralistic approach will extend the vocabulary of IT-derived business value and will improve managerial capability for sensemaking across multiple frames.

Keywords: Value Frame, IT Business Value, Pluralism, Paradox, Sensemaking, Technological Change

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Introduction

Do companies use IT (Information Technology) productively? This question has received significant research attention, but results have been contradictory. Since economist Steven Roach first drew attention to the so-called productivity paradox of IT in the early 80s, researchers have sought to understand why high levels of IT investment appeared to have little or no economic payoff (Brynjolfsson, 1993; Loveman, 1994; Roach, 1991). Lately, in contrast, IT-driven productivity has been identified as an essential driver of the very strong economy (Reingold & Stepanek, 2000). This paper explores a theoretical rationale for this apparent shift in economic IT impacts.

Previous researchers have considered the relationship between IT investment and business value from various perspectives, such as sustained advantage (Bharadwaj, 2000; Clemons, 1986; Clemons & Row, 1991; Mata, Fuerst, & Barney, 1995; Ross, Beath, & Goodhue, 1996), strategic alignment (Chan, Huff, Barclay, & Copeland, 1997; Henderson & Venkatraman, 1994; Henderson, Venkatraman, & Oldach, 1996), and infrastructure capability (Weill & Broadbent, 1998; Weill & Vitale, 1999). While these provide valuable insight regarding IT value in organizations, the generation of business value from IT is often complex and paradoxical rather than direct and normative. These perspectives tend to emphasize the physical and structural aspects of IT resources apart from the sensemaking and active efforts of human managers to use IT for creating value.

An alternative perspective suggests that technologies provide unusual problems in sensemaking because their processes are often poorly understood and they are continually redesigned and reinterpreted. This equivocal nature of technology is a central precept of constructivist theories (Fulk, 1993; Weick, 1990). Technological systems are equivocal because they can be interpreted in multiple and even conflicting ways. To the extent that different managers understand and interpret the value proposition of a particular technology variously, the way that the technology is designed and implemented will also vary (Hirschheim & Smithson, 1988; Smithson & Hirschheim, 1998). In this sense, the way that managers interpret different aspects of a technology's value can play a crucial role in the trajectory that the technology will take in their organizations (Garud & Ahlstrom, 1997).

The purpose of this paper is to explore the equivocal phenomenon of achieving IT business value. To do this, we begin by introducing three theoretical concepts: *pluralism, change, and paradox*. First, it is important to understand that technological value is created on the basis of multiple perspectives. That is, the effort to derive benefits from IT needs to be understood within the context of diverse managerial beliefs. The first part of the paper is devoted to investigating this value pluralism. Secondly, these value perspectives are not consistent over time. That is, value perceptions based on a particular managerial belief structure are later redefined and reframed. This paper later discusses this dynamic aspect of IT business value. Third, the concept of paradox will be used to theoretically link these previous concepts of pluralism and change, because paradoxical tensions among multiple managerial beliefs are often described as a powerful, generative source for organizational change (Eisenhardt, 2000; Poole & Van de Ven, 1989; Quinn & Cameron, 1988). Paradoxical forces in IT value are also rooted in

the past debate over the IT productivity paradox, and we aim to further extend this debate.

The three theoretical concepts of pluralism, change, and paradox certainly are not new to organizational researchers. For instance, a special issue of the Academy of Management Review (AMR, October 2000) is devoted to these issues. However, a pluralistic approach to paradox has not received much attention in IS research. Robey and Boudreau's (1999) paper on contradiction in IT is a rare exception. These authors suggest that pluralism and paradox have the potential to resolve many inconsistent findings in research on the organizational consequences of IT.

In the next section, the concepts of pluralism and paradox are introduced in order to describe the phenomena of IT business value. Then, we describe two value dimensions adopted from traditional views of organization and strategy. Next, we outline ways that mangers might frame various means to derive business value from IT. Following this, we use the historical airline reservation systems case to illustrate the usefulness of this model for understanding IT value shifts. Finally, we discuss ways to improve our understanding of the IT value phenomenon.

Pluralism and Paradoxes in the Business Value of IT

Multiple perspectives regarding the value of technology seem to be central to understanding the equivocal nature of technological systems (Garud & Ahlstrom, 1997; Smithson & Hirschheim, 1998). On one hand, it is argued that researchers and others are objective in their assessment of the technologies they investigate. On the other hand, many argue that people are biased in their assessment of technologies (Bijker & Law, 1992; Latour, 1987). In this latter view, "both social and cognitive forces shape assessment and influence how problems are posed, what information is sought, and what criteria are used for evaluation" (Garud & Ahlstrom, 1997: p.26). From this perspective, it comes as no surprise that IT business value is a paradoxical phenomenon, and that this paradox remains despite extensive efforts to resolve it (Brynjolfsson, 1993; Brynjolfsson & Hitt, 1996; Hitt & Brynjolfsson, 1996; Loveman, 1994). We will expand on the paradoxical nature of IT value below to illustrate the utility of our proposed framework.

A great deal can be learned from polarizing and juxtaposing contradictory paradigms and theorizations. Cameron and Quinn (1988) suggest that paradox is the apparent contradiction and tension among multiple forces, and awareness of such tension will help understand the reality. The framing and reframing of these various forces over time can be crucial to understanding organizational change (Poole & Van de Ven 1989). In the context of organizational impacts of IT, a major research challenge results from inquiry based on multiple paradigms aiming at understanding opposing tensions and interpretations (Robey & Boudreau, 1999).

IT business value can be understood in terms of multiple value perspectives which are often contradictory. First, there is a paradoxical contradiction in the application of IT to efficiency gains. Although IT can contribute to increasing efficiencies in an organization (e.g. automation of routinized activities), such IT-based efficiencies are frequently replicated by other organizations. In such cases, efficiency enhancements do not reap profits for individual organizations, as they simply become the cost of doing business across the industry. A second paradox exists in the competitive use of IT. IT has often been used aggressively against competitors, and has sometimes reduced those competitors' revenues and profits rather than

	Efficiency	Effectiveness
Endogenous Valuation	***Efficiency perceived by looking inside of an organization*** ***Example of value:*** cost reduction, cost displacement, primary activity efficiency, support activity efficiency	***Effectiveness perceived by looking inside of an organization*** ***Example of value:*** competence enhancement, idiosyncratic capability, business network
Exogenous Valuation	***Efficiency perceived by comparing and positioning with other organizations*** ***Example of value:*** rents from structural advantage, cost leadership, economies of scale, economies of scope	***Effectiveness perceived by comparing and positioning with other organizations*** ***Example of value:*** market share, market preemptiveness, threat

Figure 1 - There are multiple modes of interpreting IT business value

increasing overall output of the industry (Landauer, 1995). A third paradox is associated with the potential of IT for inhibiting organizational flexibility. Just as all organizational learning can create inertia that inhibits unlearning (Argyris & Schön, 1978), when IT is used as a source of strategic competence, this competence can reduce the motivation and increase the effort required to learn new competencies. This in turn can dampen the learning potential and long-term performance of an organization (Davenport, 1998).

In order to examine these paradoxical and pluralistic IT value elements, our discussion is anchored in two traditional value concepts. From the strategy literature, we utilize an *endogenous versus exogenous* dimension; and from the organizational literature, we adopt the *efficiency versus effectiveness* perspective. We propose that interpretations of IT business value can vary in the extent to which they are endogenous, exogenous, efficient, and effective. Further, these interpretations contribute to organizational value in paradoxical and constructive ways, rather than simply accumulating linearly. Based on these two traditional value dimensions, we propose a two-by-two matrix model for IT value interpretation, as presented in Figure 1.

Strategists that focus on achieving competitive advantage generally appreciate a firm's position and benefits relative to other firms. Such relative advantage is apparent in a firm's relationship with its industry, along with other environmental factors. Following Kim and Mauborgne (1999b) we call interpretation processes consistent with these externally-oriented values "exogenous". Others have viewed business value in terms of internal resources and the dynamic capabilities enabled by control of such resources. Interpretation processes that focus on these values are internally derived, hence we refer to them as "endogenous" (Kim & Mauborgne, 1999b; Romer, 1990; Romer, 1994).

In the organizational literature, distinctions have long been made between business efficiency and business effectiveness. For example, efficiency-oriented organizations try to reduce operational costs and to improve performance on a predefined set of goals. Effectiveness-oriented organizations focus on aligning with and tuning their goals to the

environment. Such distinctions underlie numerous organizational structure and design issues. In the next section, we develop justification for these two traditional value perspectives and apply them to the IT value domain.

The First Dimension: Endogenous Versus Exogenous Origins of Value

In this section we establish the importance of the two conceptual dimensions of our model. Then, based on these dimensions, we elaborate on our framework for pluralistic sensemaking processes that underlie IT-driven business value.

From the game theory literature we know that individual differences in motivation can affect behavior in ways that appear to derive from these motivations. For example, we can act to maximize our own gain, our joint (cooperative) gain, or our relative gain (Griesinger & Livingston, 1973; Messick & McClintock, 1968; Messick & Thorngate, 1967). That is, people have different preferences for how they choose to distribute benefits among themselves and others (Liebrand & van Run, 1985). These preferences have variously been called "motivational bases" (Messick & McClintock, 1968), "motivational orientations" (Kuhlmen & Marshello, 1975), "interpersonal motivations" (Griesinger and Livingston 1973), "social motives", and "value orientations" (Liebrand 1985).

Contrary to the common belief that humans act in ways that maximize their own gain, evidence suggests that people often behave in ways that support relative gain maximization. For instance, a person may seek to maximize the difference between his or her own gain and that of others'. Similarly, a manager in an organization may make decisions guided by the value she places on measures of market share and competitive advantage, as opposed to measures of internal organizational performance. In non-zero-sum situations such as the well-known prisoner's dilemma, individuals behaving cooperatively will maximize their own gain. In such situations, even selfish people ought to act cooperatively (Axelrod, 1984), since people who are guided by relative gain maximization tend to lose in the experimental game of the prisoner's dilemma (Axelrod, 1984; Dixit & Nalebuff, 1991).

In the field of strategy management, researchers have directed much attention to the distinction between internally versus externally focused value systems. For instance, both internal analyses of organizational strengths and weaknesses, and external analyses of environmental opportunities and threats, have been central to the conceptualization of competitive advantage (Barney, 1991). An organization's competitive advantage can be analyzed in terms of its internal resources versus its external positioning, described as internal versus comparative value (Barney, 1991). Traditional strategic implementation applies SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis, emphasizing the distinction between external and internal factors (Collis & Montgomery, 1998).

Porter's five-forces model (1980) emphasizes external positioning as essential to the strategic success of an organization. In contrast, the resource-based view of the firm tends to emphasize internal resources as a fundamental source of sustained competitive advantage (Barney, 1991; Wernerfelt, 1984). Dynamic capability theory (Teece, Pisano, & Shuen, 1997) and the value innovation model (Kim and Mauborgne 1999b) further emphasize the dynamic potential of internal resources in creating organizational value.

While some managers may be motivated by their firm's own interests (e.g. profitability), other managers are oriented towards dominating their competitors (e.g. market share), even when this contrasts with the interests of their own firm (Armstrong & Collopy, 1996). Kim and

Mauborgne (1999b) suggest that in a knowledge economy, strategists ought to focus on expanding existing markets or creating new ones, rather than dominating existing markets. They provide ample evidence that growing organizations tend to focus on this endogenous view of value creation and innovation (Kim & Mauborgne, 1997; Kim & Mauborgne, 1999b). Organizations with this perspective interpret the market not in terms of the logic of the existing external industry, but in terms of their assets and ways that they might use these to *expand* current markets – such that zero sum games are no longer so.

A war metaphor has traditionally been applied in which IT is identified as a weapon for wining zero-sum games. Terms such as 'strategic use of IT' and 'IT as a strategic weapon' are reminiscent of the exogenous interpretation of IT-based business value. However, it is now generally accepted that, after a short-term strategic advantage, use of IT in this way becomes a strategic necessity and an additional cost of doing business as competitors adopt similar strategies (Benjamin, de Long, & Morton, 1990; Clemons & Row, 1991). When this happens, IT does not contribute to the productivity of the industry over the long-term (Brynjolfsson, 1993). This suggests that, for both companies and industries in general, more effort needs to be devoted to finding ways to make the economic pie bigger rather than competing for fixed rewards.

The Second Dimension: Efficient Versus Effective Origins of Value

Traditionally, efficiency-oriented organizations are regarded as ones that "do things right", while effectiveness-oriented organizations are seen as "doing the right things" (Drucker 1964). Accordingly in organizational theory, effectiveness is conceptualized in terms of achieving organizational goals, whereas efficiency is conceived of as reducing inputs to produce a given output. In the IS literature, Hamilton and Chervany (1981) divide assessments of IS in terms of effectiveness-oriented measures and efficiency-oriented measures. They and other researchers (Chan et al., 1997; Hamilton & Chervany, 1981; Sethi & King, 1994) view system effectiveness as that which enables information systems to contribute to organizational objectives. In contrast, system efficiency is generally thought of in terms of tangible and directly quantifiable measures (Hamilton & Chervany 1981; Smithson & Hirschheim, 1998) that underlie cost-center approaches (Mukhopadhyay, Kekre, & Kalathur, 1995) and other techniques for assessing comparative cost advantage (Porter, 1980; Porter & Millar, 1985).

Drawing upon these concepts and for the purposes of this paper, we define the efficiency and effectiveness of IT as the following: *IT efficiency* encompasses IT-enabled activities that allow the organization to meet a pre-determined set of goals with minimal cost. *IT effectiveness* represents the IT-based capability of an organization to tune its objectives to the changing needs of its business environment. Under this definition, it is clear that efficiency is easier to quantify, because pre-defined goals are associated with predefined measures of those goals. Effectiveness tends to be difficult to measure due to its multidimensional and often changing nature (Cameron, 1986; Hamilton & Chervany, 1981).

The strategy literature also emphasizes efficiency and effectiveness as two essential sources of organizational capability that support cost advantage and differentiation (Porter 1980). The resource-based theory of the firm identifies essential rents that accrue both from fundamental firm-level efficiencies and from difficult-to-imitate competencies (Barney, 1991; Prahalad & Hamel, 1990).

The organizational literature has tended to view these two aspects of IT value as contrasting and even competing with one another. Managers are advised to choose between organization designs suited to routine, repetitive tasks and those suited to non-routine, innovative tasks (Adler, Goldoftas, & Levine, 1999). Organizational efficiency can be enhanced by standardizing processes and by developing organizational routines and programs (Cohen, 1994; Nelson & Winter, 1982). The machine metaphor underlies this notion of the need to create high levels of efficiency in such organizations (Morgan, 1997). In contrast, new organizational paradigms in support of agility and environmental responsiveness have given managers new options for organizational design. As firms move away from hierarchical, bureaucratic forms that strive for mass production efficiencies, they strive to develop effective learning organizations that continuously change and adapt through self-organizing processes (Daft & Lewin, 1993). In the following sections we describe how the creation of such capabilities can depend on managerial interpretation processes regarding the role of technology resources and the creative potential of them.

The Framing of Value

Based on the two dimensions, four modes of value framing are proposed: *routinizing, cost-structuring, positioning, and learning*. Figure 2 presents this integrative framework. Each of these value frames implies a different managerial interpretation of what value creation is and how it is achieved, and hence is supported by a distinct perceptual paradigm.

We discuss each cell in the context of prior theory and research in order to paint a conceptual picture of how each can become manifest in an organization's IT-based business value. In order to explicate the managerial behaviors that comprise these frames, we present them within a sensemaking framework. Sensemaking is a broad interactive process of sensing, interpreting, and acting (Daft & Weick, 1984; Thomas, Clark, & Gioia, 1993; Weick, 1995). IT-driven value perception and value creation are conceived of in terms of the processes for sensing (value perception), interpreting (interpretive schemes and cues), and acting (value creation), that are presented in each cell in Figure 2.

	Efficiency	Effectiveness
Endogenous Valuation	**Routinizing** ***Paradigms:*** scientific management, division of labor, value chain model ***Value Perception***: cost reduction, cost displacement, primary activity efficiency, support activity efficiency ***Value Creation:*** routinizing, automating, programming, reengineering	**Learning** ***Paradigms:*** knowledge-based view, dynamic capability organizational learning, ***Value Perception***: competence enhancement, idiosyncratic capability, business networks ***Value Creation:*** learning, enacting, knowing, networking
Exogenous Valuation	**Cost-structuring** ***Paradigms:*** transaction cost, business relatedness ***Value Perception***: rents from structural advantage, cost leadership, economies of scale, economies of scope ***Value Creation:*** make or buy decision, restructuring, relating businesses	**Positioning** ***Paradigms:*** competitive advantage, market competition ***Value Perception***: market share, market preemptiveness, threat ***Value Creation:*** increasing market share, creating switching cost, creating new-entry barriers

Figure 2 – Value frames used to perceive and create value vary on the two dimensions

Cognitive researchers suggest that both individuals and organizations retain cognitive sensemaking structures in order to interpret complex and equivocal phenomena (Walsh, 1995; Weick, 1995). Paradox is also such a mental construct in a sense that it doesn't exist 'out there', but is structured subjectively and interpersonally though ongoing interactions (Cameron and Quinn, 1988). These structures serve to reduce complexity and provide reference frames for interpreting the phenomena of interest. Such cognitive structures are variously termed paradigm, mental model, cognitive frame, schema, etc. Since the IT business value phenomenon is complex and equivocal, different managers as well as researchers interpret such phenomena on the basis of certain underlying schema or mental models. We refer to mental models used for interpreting value phenomena as *value frames:* These value frames relate to value creation and manifestation of organizational goals to the extent that they underlie managerial sensemaking processes. The framework presented in Figure 2 defines four IT value frames based on their location along the two dimensions of efficiency vs. effectiveness, and endogenous vs. exogenous valuation.

Each of the four frames of value perception and creation in this framework has its own paradoxical nature. Depending on its manifestation in a particular organizational context, a value aspect has the potential for generating both desirable and undesirable outcomes. Thus no one frame is inherently superior or inferior to the others. The analysis that follows suggests that the capability for sensemaking within and across multiple frames is most likely to provide the interpretive flexibility and balanced actions necessary to optimize value creation. We believe that such a capability provides an essential source of dynamic, IT-driven value.

Routinizing (Endogenous-Efficient Frame)

Routinizing, automating, and programming ideas are not new to the domain of IT. To the extent that these activities enhance organizational efficiency, they have long been discussed in terms of scientific management (Taylor, 1998), organizational routines (Nelson & Winter, 1982), and more recently, value chain analysis (Porter 1985) and business process reengineering (Hammer & Champy, 1993). IT has become synonymous with automation – we use IT to automate, routinize, and standardize activities. In applications ranging from transaction processing to managerial decision-making, IT's role in reducing costs and increasing efficiencies is largely undisputed. For example, ATM (Automatic Teller Machine) and POS (Point of Sales) systems reduce transaction costs by either replacing labor or reducing transaction times (Clemons & Kimbrough, 1986; Glaser, 1988; Landauer, 1995). Inter-organizational applications such as EDI (Electronic Data Interchange) reduce documentation time and inventory and transportation costs (Benjamin et al., 1990; Mukhopadhyay et al., 1995). At the managerial decision making level, database management systems have significantly reduced the time and energy required for retrieving analytic data and creating information.

However, some researchers question the extent of efficiency gains achieved due to IT automation (Dos Santos & Peffers, 1993; Landauer, 1995). Such efficiency gains, while substantial to manufacturing firms during the industrial era, may be less achievable in the service-dominated knowledge economy (Landauer 1995). That is, the efficiencies to be gained by applying IT to knowledge work may not be sufficient to produce visible productivity gains for an organization overall.

Organizational efficiencies achieved from the application of IT need to be assessed in terms of the replicability of a particular IT application by other firms in the market (Baily & Chakrabarti, 1988; Brynjolfsson, 1993; Clemons & Kimbrough, 1986; Landauer, 1995; Loveman, 1994; Roach, 1991). For example, to the management of a company, IT may appear to be a strong source of efficiency gains. However, when company managers consider these benefits relative to those of other companies in their industry, they may interpret the meaning and perceived gain from the IT investment differently. To the extent that other companies use similar IT applications, efficiencies attributable to that application will not be a unique advantage to any one company, as implementation of that application has become an additional cost of doing business in the industry.

Cost-structuring (Exogenous-Efficient Frame)

Traditional strategic paradigms such as transaction cost economics (Williamson, 1975), comparative cost advantage (Porter 1980), and business relatedness (Chatterjee & Wernerfelt, 1991; Prahalad & Hamel, 1990), inform us of essential structural elements of organizational success. These theories highlight the need for structural efficiency (eg. economies of scope and scale) of the firm within a particular market. People use such terms as "comparative cost advantage", "cost leadership" (Porter 1980), and "rents from firm-level efficiencies" (Teece et al. 1997) to describe the achievement of such comparative advantage.

Managers that value IT for its capability to change cost structures operate from this sensemaking perspective. This frame values IT for it's ability to affect transaction costs and consequently the nature of make-or-buy decisions by managers (Bakos & Treacy, 1986; Clemons & Row, 1991; Malone, Yates, & Benjamin, 1987). IT can be the source of economies of scale (Copeland & McKenney, 1988), and can also increase the extent to which products and services share resources and thus accrue advantages of scope (Porter & Millar 1985).

However, such a picture may be unrealistically optimistic. Cost-structuring activities can provide an essential source of rents, but are not without potential dangers. For example, aggressive restructuring efforts such as laying off employees and buying or selling businesses can result in discontinuities in organizational history, memory losses (Walsh & Ungson, 1991), and additional coordination costs (Williamson, 1999). Managers that focus mainly on cost structuring run the risk of overlooking potential gains earned through the continuous and accumulated practices of knowledge management (Coombs & Hull, 1998).

The two IT valuing frames discussed above lie on the efficiency side of our framework. We now present ways that managers interpret the value of IT primarily for its role in supporting firm effectiveness.

Positioning (Exogenous-Effective Frame)

Most companies follow the existing logic of competition in their industry. Nonaka and Takeuchi (1995, p.41) point out that managers are often required to measure up to explicit measures developed under preexisting competitive paradigms. At the top of the organization, emphasis tends to be put on logical and analytical thinking around pre-existing explicit knowledge. Such logic is exogenously derived from the current "logic of economy" (El Sawy, Malhotra, Gosain, & Young, 1999; Kim & Mauborgne, 1999a), and is generally presumed to be the right way of doing business.

IT has the potential to enhance factors defined by such explicit industry logic and the competitive position of a company. Managers with this IT value orientation view their firms relative to others in the industry with an eye to dominating them. Porter's (1980) "five forces model" emphasizes the actions that a firm can take to position itself most attractively within an industry, and even externally to that industry. According to this perspective, IT can help a firm enhance its bargaining power with customers and suppliers by increasing switching costs and so discourage them from moving to the firm's competitors.

Like the other IT value frames discussed above, this frame too has some negative implications. For example, one possible disadvantage of focusing on this means of creating IT-based value relates to the use of IT as a war metaphor, in which the aim is to defeat others rather than expand markets and create new ones. The tendency to focus on market share information (Armstrong & Collopy, 1996) and/or to compete within the paradigm of existing market logic (Kim & Mauborgne 1999b) can harm a firm's profitability by limiting the scope of its inquiry and experimentation. In another vein, to the extent that IT applications can lower customer search costs for alternative products and services, it can result in slimmer industry-wide profit margins (Bakos, 1991). This effect may be exacerbated by widespread posting of product information on the Internet, since this can further reduce customer search costs (Moore, 1996).

Learning (Endogenous-Effective Frame)

The learning frame is distinct from both the efficiency-based frames and the exogenous frame we have addressed so far. It is distinct from the efficiency frame in its requirement that management provide slack resources in support of knowledge generation and learning. It is distinct from the exogenous frame in the sense that learning emphasizes internal knowledge and human experience.

The organizational literature suggests that two-levels of learning occur – often refer to as first-order learning and second-order learning. First-order learning is simple, adaptive and repetitive. It tends to follow existing codes and rules, in order to enhance short-term learning

curves. Second-order learning is complex in its cause-effect relationships, is more generative, and riskier than first-order learning. Second-order learning encompasses first-order learning outcomes, and engenders long-term effects. These two types of learning are also referred to as single vs. double loop learning (Argyris & Schön, 1978), and resemble the exploitation of known value versus the exploration of unknown opportunities (March, 1991). At any given point in time it is necessary for a firm to retain and sustain a balance between the two learning forms (March 1991). A sustained competitive advantage is likely to require both the exploitation of existing firm-specific capabilities and the development of new ones (Teece et al., 1997; Wernerfelt, 1984).

IT can contribute to first-order learning effects when it is designed to serve a repository of organizational experiences or transmissions of knowledge. Such IT applications provide sustainable organizational value when members use them to accumulate technology-related knowledge and skills (Clemons, 1986) or to generate experience through interactions with other managers (Mata et al., 1995). In this way integrated databases and communication networks foster information sharing and support the creation of partnerships and synergies without the cost of physically merging or moving the organizations involved.

In addition, managers may interpret IT value in terms of second-order learning effects when they see IT as essential for the serendipitous processes underlying successful innovation, and for creative responses to unanticipated changes of environment. Whereas those that make value interpretations from a positioning perspective tend to emphasize logical and analytical thinking, those operating from within a knowledge and learning paradigm embrace the potential of factors such as values, meaning, symbols, and stories for stimulating innovation and creativity (Nonaka & Takeuchi, 1995). Knowledge-based interpretation processes recognize that organizations learn and evolve over time, and that all types of social interactions and ties are fundamental to this process (Nonaka & Takeuchi, 1995). Pre-existing explicit knowledge is understood as potentially limiting (Polanyi, 1966), and the capability to generate new knowledge is viewed as the crucial competitive advantage (Nonaka & Takeuchi, 1995).

However, there are some negative implications for a learning oriented interpretation of IT-based business value. For instance, efficiency and organizational learning ability are often viewed as tradeoffs (Adler et al., 1999; Eisenhardt & Westcott, 1988). Focusing on learning can burn up resources with uncertain returns (March, 1991). The freedom inherent in learning organizations can cause confusion and communication difficulties among people with different values (Holtshouse, 1998).

Figure 3 summarizes this discussion of the strengths and weaknesses of each mode of value creation. The framework highlights ways that alternative outcomes of IT investment can result when the interpretation and value construction processes differ among managers and organizations. The weaknesses shown in Figure 3 can explain various reasons why paradoxical effects of IT investment can occur. In a given IT and business environment, value interpretations can occur in ways that reduce or overcome those weaknesses. Such value interpretations are essential for framing follow-up technological directions and consequent implementation behaviors. For these reasons, the value foci of IT applications can change throughout their developmental trajectory, depending on how managers and developers interpret and enact the particular IT environment. We now provide an example to illustrate how this occurred in one industry.

	Efficiency	Effectiveness
Endogenous Valuation	**Routinizing** ***Strengths:*** easy to automate, easy to program, enhance speed, reduce cost ***Weakness:*** easy to imitate, inhibit flexibility, constrain new opportunities	**Learning** ***Strengths:*** dynamic interpretation of capability create new market potential ***Weakness:*** high-level energy consumption potential confusion
Exogenous Valuation	**Cost-structuring** ***Strengths:*** structural advantages of cost, resource sharing, saving and focusing energies ***Weakness:*** memory lost, ignore dynamic potential of future, coordination cost	**Positioning** ***Strengths:*** market competition, creating positional advantages ***Weakness:*** competition within existing market, easy to imitate, thin profit margin

Figure 3 - Each value frame has its own strengths and weaknesses

Lessons Learned From a Historical Case: Airline Reservation Systems

In this section, we use the history of airline reservation systems to describe how the different IT-based value foci of our framework are selectively interpreted by different people – in this case primarily researchers – and how these foci change over time. Note that the purpose of this case illustration is not to test the ideas described in the previous section, but rather to demonstrate the usefulness of the framework and to clarify the role of the value frame concept. The following data were gathered from a review of existing research articles and cases pertaining to airline reservation systems, which we examined for instances and examples relevant to our framework.

Copeland and McKenney (1988) suggest in their historical case study of ARSs (Airline Reservations Systems) that the dominance of American and United airlines is neither an accident nor the result of extraordinary vision. It was rather the result of consistent exploitation of opportunities revealed during the evolution of adaptable systems. This argument is consistent with the social constructivist view of technology evolution, which emphasizes the interactions that take place between a technology as it is being created and the web of multiple social actors involved in creating it (Bijker, 1995; Bijker & Law, 1992).

The value of ARSs has been discussed in dramatically different ways over time, in both the IS literature and practitioner presses. We have argued above that these paradigms can be effectively characterized by routinizing, cost-structuring, positioning, and learning value frames. Appendix 1 presents short quotes from the IS literature describing each value frame. Below we present a historical illustration of the emergence of each new value foci over time, concurrently

with the evolution of ARSs. These stories explicate the underlying frames upon which different researchers have based their interpretations of the value proposition of this technology.

(1) Humble Beginning (1960s~1970s)

According to Copeland and McKenney (1988)[1], the early SABRE system initiated the "humble beginning" of ARSs technology. During the initial development period, from the early 1960s to the mid-1970s, the technology and its potential value to the airline industry had not been identified by researchers or the press. As Copeland and McKenney (1988) and Hopper (1990) later suggest, the value motivation of this period was to use ARSs primarily to streamline and routinize internal organizational operations. Airline reservation systems then, like many other technologies, were initially developed for such "humble" purposes as increasing operational efficiencies and reducing reservation costs, rather than for achieving strategic vision or competitive advantage per se. Although by the standards of the early 1960s ARSs were a major technological achievement, the general value motivation at that time was cost reduction achieved through automating inventory management processes (Hopper, 1990). ARSs took shape in response to the Airlines' inability to monitor inventory of available seats manually and to attach passenger names to booked seats (Hopper, 1990). By extending inventory management processes, ARSs also served to reduce the clerical costs of these processes (Copeland & McKenney, 1988). At this time, the value of ARSs was widely seen to be their *routinizing*, automating capability.

(2) Competitive Weapon (Early 1980s)

After this early period, ARSs caught the attention of several IS researchers who interpreted these systems as having effects beyond simply streamlining operations. By bringing a different mode of thinking to the assessment of ARS value, researchers presented these systems in ways that were quite different from the original understanding of them as tools for routinization and automation (Hopper 1990). At this time, in the early 1980s, McFarlan's study (1984) and Porter's famous five force model (1980) were highly influential, and IS researchers and consultants tended to adopt this competitive lens to interpret the real value of ARSs. Much of the writings on the potential of IT for strategic positioning grew out of this competitive advantage orientation towards ARSs. The dramatic success of ARSs were characterized in the IS literature and popular press in terms of their capability for gaining market share (McFarlan, 1984; Parsons, 1983), for locking in customers, and for increasing switching cost (Clemons, 1986; Vitale, 1986). At that time, the value of ARSs was thought to lie in their capability for extending the reach of the airline onto the travel agents' desks, where the airline then had the opportunity to position their products most effectively against those of their competitors. Thus this era is consistent with the *positioning* quadrant of our IT value framework.

(3) Cost Advantage and Accumulative Experience (Late 1980s)

During this period, academic writing on the value of ARSs began to focus on the potential they can have for affecting scale and scope economies. This took place as researchers began to view IT in general as an important source of economies of scale and scope, as larger

[1] The business value of ARSs during this period (1960s~1970s) was mainly discussed in a retrospective way later, e.g. Copeland and McKenney (1988), Hopper (1990), and Copeland, Mason and McKenney (1995). There was not any notable IS literature in that period which addressed business benefits of ARSs.

systems and their processing capacity were found to have scale effects on a firm. In this way American and United Airlines were able to achieve comparative cost advantages by creating co-host agreements with various smaller carriers (Copeland & McKenney 1988). Such activity confirms the theory that information technology can reduce transaction costs, and in so doing enable market-based transactions to be more cost effective than they would be if performed in-house. From this perspective, ARSs enabled co-host agreements that allowed for optimal price structuring. By reducing transaction costs, IT supports the higher levels of coordination that market-based transactions require, increasing the value of the coordinated resources through economies of scale and scope (Clemons & Row, 1991).

However, such cost-structuring effects provide only a partial explanation of the IT-based value propositions during this period, since learning effects and cumulative experience were also widely emphasized. For instance, the internal resources supporting ARS applications and the experiences accumulated around IT-driven processes were an important source of strategic competence (Clemons 1986, Copeland & McKenney 1988). Control of information flows and knowledge repositories became a competency as ARSs generated them in support of unique decision-making capabilities (Mata et al., 1995). When such IT resources were complementary and connected to other management processes (e.g. product development and marketing), these resources tended to be associated with higher company performance (Powell & Dent-Micallef, 1997). The IT related benefits from *cost-structuring* and *accumulative learning* became an important precursor to the role of ARSs in higher-order organizational leaning.

(4) Dynamic Network Capabilities (1990s)

During this period, the role of ARSs was not limited to the creation of static advantage for airline companies. Instead, the view of IT value was that it enabled ongoing changes in the nature of the airline business discovered through second-order learning. Such higher-order learning is generated through reinterpretation of and experimentation with resources and knowledge. One example that supports this perspective is that American Airlines now tailors services to its business travel customers - the most desirable customer segment - leaving the less lucrative segments to competitors (Nolan & Croson, 1995). By enabling this kind of niche marketing, the database built through ARSs enables American to learn from itself – to generate its own feedback that then informs future process decisions – and to use its learning capability to provide enhanced value to customers.

Such customer-driven learning capability is believed to have come second to internal learning processes supported by the information transfer capabilities of American's InterAAct platform. The platform serves to connect work groups and provides a corporate-wide communications link at every location in the company. This technology is an organizational resource that individuals and groups use to build new systems and procedures to do their jobs smarter, better and more creatively (Hopper 1990). It is clear that this interpretation of the value provided by the ARSs platform is one in which the organization's own resources are harnessed in the creative utilization of IT as a tool of knowledge management. Prahalad (1998) emphasizes the role of IT in higher order learning in terms of multilevel and multifunctional *collective learning*, and the capacity to share knowledge across business and geographical boundaries. This reflects the current emphasis on knowledge management that has grown out of a synthesis of IT and the learning organization (Fahey & Prusak, 1998). Learning and innovation are now viewed by IS researchers as *the sustainable competitive advantage*, and it comes as no surprise that both American Airline's Sabre reservation systems and United's Covia reservation systems

now feature Internet front-ends to provide customer-driven value added (Bradley & Nolan, 1998).

The historical development of ARSs suggests that beliefs about a technology and the technology itself evolve mutually as one affects the other, rather than linearly as is often assumed (Garud & Rappa, 1994; Weick, 1990). Over time, a belief supported by only a few people can become a major paradigm that alters our understanding of the value of IT within organizations. The interpretation and creative use of a particular technology can generate unanticipated business value (March & Sproull, 1990).

Accordingly, the way we interpret IT business value should co-evolve with our beliefs about the business potential of IT. Whereas previous approaches generally claim that their "new" perspective is the most appropriate lens with which to see and interpret IT value, we note that even among researchers, value recognition is selective and often contradictory. The shift in interpretation of the value proposition of ARSs over time is summarized in Figure 4. From this example it is clear that paradigms of IT-based value can shift radically as newer strategic and technological perspectives emerge. By working to frame and reframe IT-based business value, rather than limiting our perspective to a single value framework, we flex the muscles of our interpretation processes and move them closer to the reality of technology evolution itself - both in practice and in research. By allowing for and being open to multiple perspectives, we retain an interpretive flexibility well suited to identifying the value potential of future information technologies.

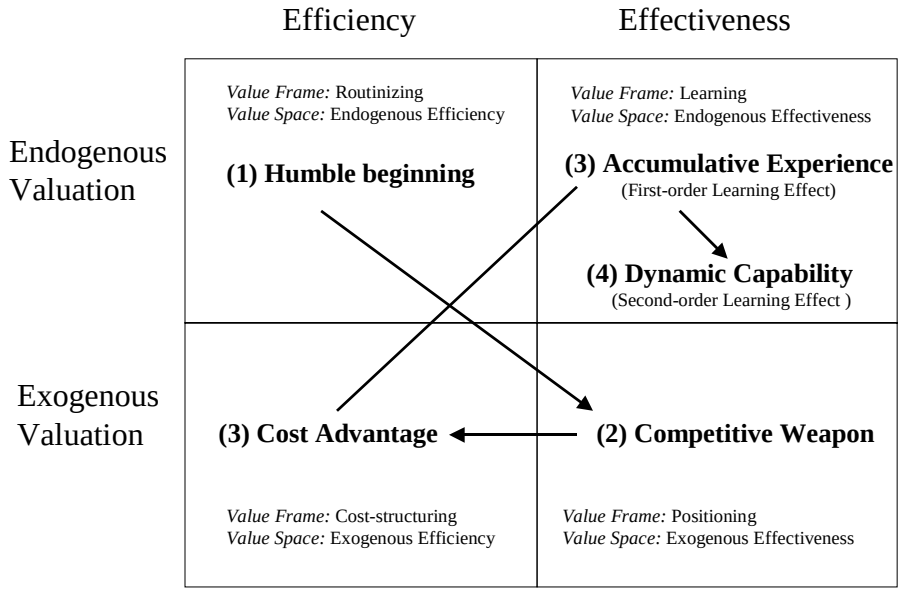

Figure 4 – The IS literature has reflected changes in the value frames used to understand ARSs

Discussion and Future Research

In this section, we discuss learning from this study as we elaborate limitations and expected contributions to IS research. Also we identify ways in which the pluralistic paradox approach to understanding IT value differs from previous approaches.

A limitation of this study and general pluralistic research is complexity. Weick (1984) suggests three criteria for assessing a theory – generality, simplicity, and accuracy. According to him, an emphasis on accuracy and generality causes theoretical complexity. Multi-paradigm research can succumb to this difficulty. However, this theoretical complexity is desirable when it is balanced with the other two criteria. As Poole and Van de Ven (1989) argue, contemporary research has emphasized theoretical consistency at the cost of accuracy in explaining multiplicity of a phenomenon. More balanced efforts, such as pluralistic approaches, should be encouraged.

Another limitation is that this study doesn't elaborate on the causes of the frame changes it illustrates. Analysis of such causes exceeds the scope of our purpose, but managerial and technological motivations underlying frame changes are certainly a fruitful area of research. Some of these issues have been discussed in previous literature (Copeland, Mason, & Mckenney, 1995; Copeland & McKenney, 1988; Hopper, 1990), and are left to follow-up research.

In spite of these limitations, we believe that this study achieves benefits of pluralistic paradox research by providing new insights without intending to replace single-paradigm research. It seeks to enhance communication across heterogeneous communities of knowing which can be as important as developing a paradigm within a homogenous community (Boland & Tenkasi, 1995). By acknowledging different assumptions and communicating across paradigms, additional understandings are generated that can serve to move the community forward.

Below, we summarize ways in which the pluralistic understanding of IT value can provide such additional insights. More specifically, this approach can be applied to future research in the following two potential areas of IT value inquiry: *synergistic integration*, and *time and space relationship*.

Synergistic Integration

One advantage of pluralistic research is that it allows for the investigation of paradoxical value structures (Robey & Boudreau, 1999). In the ARS illustration here, we see the existence of multiple value frames and how these frames can variously contribute to organizations. By considering such multiple value frames simultaneously, we can examine the extent to which they work synergistically or exclusively. While contemporary research has emphasized the search for one superior, theoretically consistent way (Lewis & Grimes, 1999), we need to gain a better understanding of how multiple, even contradictory, ways of IT valuation operate synergistically in real organizations.

For instance, pluralistic research can be designed to answer different research questions than can single paradigm research. Whereas the latter seeks prescriptions consistent with its assumptions and theoretical requirements, organizations often live with practically inconsistent and even contradictory necessities. Examples include concurrent organizational needs for exploitation and exploration; competition and cooperation; and cost advantage and quality differentiation. March (1991) suggests that achieving both *exploration and exploitation* of capabilities is necessary for long-term survivability of an organization. Brandenburger & Nalebuff (1996) uses co-opetition to address simultaneous needs for *competition and*

cooperation. Apparent contradictions and trade-off between *cost advantage and quality differentiation* are not always so (Adler et al., 1999; Hill, 1988).

Researchers need approaches for investigating and understanding these simultaneously contradictory aspects of IT business value. For example, discussions of the IT productivity paradox have encompassed the necessity of sustaining idiosyncratic capabilities, and also of exploring unforeseen value potentials. By accepting the notion of multiplicity in value, we can investigate the extent that these different orientations synergistically or exclusively contribute to organizational performance. We believe that such inquiries can broaden our understanding of IT value phenomena.

Time and Space Relationship (Framing and Reframing of IT value)

As discussed above and depicted in Figure 4, ways of valuation and the space of values can move and evolve over time. Consequently, we view the framing and reframing of IT value as crucial managerial activities, which not only allow managers to evaluate existing technologies but also to guide their future directions.

The value potential of IT resources is not easy to anticipate and plan for in advance. For instance, the ARSs were originally developed for the efficient reservation and allocation of customer seats, but were later applied to the pursuit of radically different value purposes. Technological tracks in achieving such diverse values may be better understood as trial-and-error efforts rather than as long-term visioning. Unless a technology reaches a certain level of development, it is hard to reasonably expect that it will fulfill its potential (Copeland & McKenney, 1988). Moreover, many argue that IT applications today are not only helping companies improve their position in the existing industry, but also providing the means to rearrange the competitive ground itself (Nolan & Croson, 1995: p.8). As paradigms continue to change, it is essential that managers revise their existing value frames to take new ones into account.

For these reasons, we believe that acceptance of multiple value frames will broaden the potential of future technology development. As we illustrate in the ARSs case, the value of IT resources can be interpreted in various ways, and diverse paths for achieving it are available. We have seen that a multi-paradigm approach can give insights into such alternatives and provide for changing potentials (Bartunek, 1988). This approach also enriches the practical and theoretical dialog in terms of framing and reframing the prospect of IT business value for organizations.

Conclusion

We have discussed the complex and equivocal problem of creating business value from IT. Through an example, we illustrated how the perception and creation of IT-based business value consists of paradoxical value perspectives and processes of framing and reframing them over time. Consultants and IT researchers play an important role in this process by constructing accounts of organizational value creation processes. This perspective contrasts with the dominant view that IT-based business value is achieved due to characteristics of the technology that are enacted through designed long-term planning and visioning processes.

In service of the pluralistic perspective, we have built a scheme for understanding four valuation frames of IT-based value. We developed these four modes of value framing in terms of the different assumptions and motivations related to each mode, and placed their development

in a historical context. This framework enhances our understanding of the constructive processes of IT-based value creation used across organizations over time. In addition to managerial sensemaking processes, organizations too have mechanisms to make sense out of their resources and their relationships with the environment (Thomas et al., 1993; Weick, 1995). Clearly the value interpretation frames described above are outgrowths of the various alternative paradigms under which organizations function more generally. An important avenue for future research is investigation of relationships between the capability to traverse multiple IT value frames and organizational flexibility and performance.

The proposed framework is intended to provide a vehicle for discussion about the ways in which our paradigms affect our system design and implementation choices. It serves as a useful communication tool for IT managers and practitioners as they consider competing paradoxical tensions. Since IT-based value perception and creation are highly dependent on the different motives and previous experiences of the IT managers involved in the interpretation, the model offers a means of communicating about these differences. By providing a sensemaking framework around business-level IT value, this paper illustrates how people and organizations perceive benefits from IT differently, why these differences matter, and how to creatively utilize such ambivalence. In this way, practitioner communities as well as researchers can come to understand and examine their technology resources in a more flexible manner and ensure that their choices are not merely the result of hidden assumptions and biases.

References

Adler, P. S., Goldoftas, B., and Levine, D. I. (1999) Flexibility versus efficiency? A case study of model changeovers in the Toyota production system, *Organization Science*, 10, 1, 43-68.

Andersen, E. (1992) *American Airlines: The InterAAct project (B)* (9-193-014): Harvard Business School Case.

Argyris, C., and Schön, D. A. (1978) *Organizational Learning: A Theory of Action Perspective*, Addison-Wesley, Reading.

Armstrong, J. S., and Collopy, F. (1996) Competitor orientation: Effects of objectives and information on managerial decisions and profitability, *JMR, Journal of Marketing Research*, 33, 2, 188-199.

Axelrod, R. (1984) *The Evolution of Cooperation*, Basic Books, New York.

Baily, M. N., and Chakrabarti, A. K. (1988) *Innovation and the productivity crisis*, Brookings Institution, Washington, D.C.

Bakos, J. Y. (1991) A strategic analysis of electronic marketplaces, *MIS Quarterly*, 15, 3, 295-310.

Bakos, J. Y., and Treacy, M. E. (1986) Information technology and corporate strategy: A research perspective, *MIS Quarterly*, 10, 2, 107-119.

Barney, J. (1991) Firm resources and sustained competitive advantage, *Journal of Management*, 17, 1, 99-120.

Bartunek, J. M. (1988) The dynamics of personal and organizational reframing, in R. E. Quinn and K. S. Cameron (eds.), *Paradox and Transformation*, Ballinger Publishing Company, Cambridge, Mass.

Benjamin, R. I., de Long, D. W., and Morton, M. S. S. (1990) Electronic Data Interchange: How Much Competitive Advantage?, *Long Range Planning* , 23, 1, 29-40.

Bharadwaj, A. S. (2000) A resource-based perspective on information technology capability and firm performance: An empirical investigation, *MIS Quarterly*, 24, 1, 169-196.

Bijker, W. E. (1995) *Of Bicycle, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*, The MIT Press, Cambridge, MA.

Bijker, W. E., and Law, J. (eds.) (1992) *Shaping Technology/ Building Society: Studies in Sociotechnical Change*, The MIT Press, Cambridge.

Boland, R. J., Jr., and Tenkasi, R. V. (1995) Perspective making and perspective taking in communities of knowing, *Organization Science*, 6, 4, 350-372.

Bradley, S. P., and Nolan, R. L. (1998) Capturing value in the network era, in S. P. Bradley and R. L. Nolan (eds.), *Sense & Respond: Capturing value in the network era*, Harvard Business School Press, Boston, Mass.

Brandenburger, A. M., and Nalebuff, B. J. (1996) *Co-opetition*, Currency Doubleday, New York.

Brynjolfsson, E. (1993) The productivity paradox of information technology, *Communications of the ACM*, 36, 12, 67-77.

Brynjolfsson, E., and Hitt, L. (1996) Paradox lost? Firm-level evidence on the returns to information systems spending, *Management Science*, 42, 4, 541-558.

Cameron, K. S. (1986) Effectiveness as Paradox: Consensus and Conflict in Conceptions of Organizational Effectiveness, *Management Science*, 32, 5, 539-553.

Cameron, K. S., and Quinn, R. E. (1988) Organizational paradox and transformation, in R. E. Quinn and K. S. Cameron (eds.), Paradox and Transformation, Ballinger Publishing Company, Cambridge, Mass.

Chan, Y. E., Huff, S. L., Barclay, D. W., and Copeland, D. G. (1997) Business strategic orientation, information systems strategic orientation, and strategic alignment, *Information Systems Research*, 8, 2, 125-150.

Chatterjee, S., and Wernerfelt, B. (1991) The Link Between Resources and Type of Diversification: Theory and Evidence, *Strategic Management Journal*, 12, 1, 33-48.

Clemons, E. K. (1986) Information Systems for Sustainable Competitive Advantage, *Information & Management* , 11, 3, 131-136.

Clemons, E. K., and Kimbrough, S. O. (1986) Information systems, telecommunications and their effects on industrial organizations, *Proceedings of the Proceedings of the 7th ICIS*, San Diego, Dec., 99-108.

Clemons, E. K., and Row, M. C. (1991) Sustaining IT advantage: The role of structural differences, *MIS Quarterly*, 15, 3, 275-292.

Cohen, M. D. B. P. (1994) Organizational routines are stored as procedural memory: Evidence from a laboratory study, *Organization Science*, 5, 4, 554-568.

Collis, D. J., and Montgomery, C. A. (1998) *Corporate strategy: A resource-based approach*, Irwin/McGraw-Hill, Boston, Mass.

Coombs, R., and Hull, R. (1998) 'Knowledge management practices' and path-dependency in innovation, *Research Policy* , 27, 3, 237-253.

Copeland, D. G., Mason, R. O., and Mckenney, J. L. (1995) Sabre: The development of information-based competence and execution of information-based competition, *IEEE Annals of the history of computing*, 17, 3, 30-57.

Copeland, D. G., and McKenney, J. L. (1988) Airline Reservations Systems: Lessons from History, *MIS Quarterly*, 12, 3, 353-370.

Daft, R. L., and Lewin, A. Y. (1993, November). Where Are the Theories for the "New" Organizational Forms? An Editorial Essay. *Organization Science, 4*, i-vi.

Daft, R. L., and Weick, K. E. (1984) Toward a Model of Organizations as Interpretation Systems, *Academy of Management. The Academy of Management Review*, 9, 2, 284-295.

Davenport, T. H. (1998) Putting the enterprise into the enterprise system, *Harvard Business Review* , 76, 4, 121-131.

Dixit, A. K., and Nalebuff, B. J. (1991) *Thinking strategically: The competitive edge in business, politics, and everyday life*, W. W. Norton & Company, New York, NY.

Dos Santos, B. L., and Peffers, K. (1993) Firm level performance effects: A framework for information technology evaluation research, in R. D. Banker, J. A. Kauffman, and M. A. Mahmood (eds.), *Strategic Information Technology Management: Perspectives on Organizational Growth and Competitive Advantage*, Idea Group Publishing, Harrisburg, PA, 515-546.

Drucker, P. F. (1964) *The effective business, the effective executive*, British Institute of Management, London.

Eisenhardt, K. M. (2000) Paradox, spirals, ambivalence: The new language of change and pluralism, *Academy of Management Review*, 25, 4, 703-705.

Eisenhardt, K. M., and Westcott, B. J. (1988) Paradoxical demands and the creation of excellence: the case of just-in-time manufacturing, in R. E. Quinn and K. S. Cameron (eds.), *Paradox and Transformation*, Ballinger Publishing Company, Cambridge, Mass.

El Sawy, O. A., Malhotra, A., Gosain, S., and Young, K. M. (1999) IT-intensive value innovation in the electronic economy: Insights from Marshall Industries, *MIS Quarterly*, 23, 3, 305-335.

Fahey, L., and Prusak, L. (1998) The Eleven Deadliest Sins of Knowledge Management, *California Management Review*, 40, 3, 277-286.

Fulk, J. (1993) Social construction of communication technology, *Academy of Management Journal*, 36, 5, 921-950.

Garud, R., and Ahlstrom, D. (1997) Technology assessment: A socio-cognitive perspective, *Journal of Engineering and Technology Management*, 14, 1, 25-48.

Garud, R., and Rappa, M. A. (1994) A socio-cognitive model of technology evolution: The case of cochlear implants, *Organization Science*, 5, 3, 344-362.

Glaser, P. F. (1988) Using technology for competitive advantage: The ATM experience at citicorp, in B. R. Guile and J. B. Quinn (eds.), *Managing innovation: Cases from the services industries*, National Academy Press, Washington, DC.

Griesinger, D. W., and Livingston, J. W. (1973) Toward a model of interpersonal motivation in experimental games, *Behavioral Science*, 18, 3, 173-188.

Hamilton, S., and Chervany, N. L. (1981) Evaluating Information Systems Effectiveness - Part I: Comparing Evaluation Approaches, *MIS Quarterly*, Sep., 55-69.

Hammer, M., and Champy, J. (1993) *Reeingineering the Corporation: A Manifesto for Business Revolution*, Harper Business, New York.

Henderson, J. C., and Venkatraman, N. (1994) Strategic Alignment: A Model for Organizational Transformation via Information Technology, in T. Allen and M. Scott Morton (eds.), *Information Technology and the Corporation of the 1990's: Research Studies*, Oxford University Press, New York, NY, 202-220.

Henderson, J. C., Venkatraman, N., and Oldach, S. (1996) Aligning business and IT strategies, in J. F. Luftman (ed.), *Competing in the Information Age: Strategic Alignment in Practice*, Oxford University Press, New York, 21-42.

Hill, C. W. (1988) Differentiation versus low cost or differentiation and low cost: A contingency framework, *Academy of Management Review*, 13, 3, 401-412.

Hirschheim, R., and Smithson, S. (1988) A critical analysis of information systems evaluation, in N. Bjorn-Andersen and G. B. Davis (eds.), *Information Systems Assessment: Issues and Challenges*, North Holland, Amsterdam, 17-37.

Hitt, L. M., and Brynjolfsson, E. (1996) Productivity, business profitability, and consumer surplus: Three different measures of information technology value, *MIS Quarterly*, 20, 2, 121-142.

Holtshouse, D. (1998) Knowledge Research Issues, *California Management Review*, 40, 3, 277-286.

Hopper, M. D. (1990) Rattling SABRE - New Ways to Compete on Information, *Harvard Business Review*, 68, 3, 118-125.

Johnston, H. R., and R., V. M. (1988) Creating Competitive Advantage With Interorganizational Information Systems, *MIS Quarterly*, 12, 2, 153-165.

Kim, W. C., and Mauborgne, R. (1997) Value innovation: The strategic logic of high growth, *Harvard Business Review*, 75, 1, 102-112.

Kim, W. C., and Mauborgne, R. (1999a) Creating new market space, *Harvard Business Review* , 77, 1, 83-93.

Kim, W. C., and Mauborgne, R. (1999b) Strategy, value innovation, and the knowledge economy, *Sloan Management Review*, 40, 3, 41-54.

Kuhlmen, D. M., and Marshello, A. F. J. (1975) Individual differences in game motivation as moderators of preprogrammed strategy effects in prisoner's dilemma, *Journal of personality and social psychology*, 32, 5, 922-31.

Landauer, T. K. (1995) *The Trouble with Computers: Usefulness, usability, and productivity*, MIT Press, Cambridge, MA.

Latour, B. (1987) *Science In Action*, Harvard U. Press, Cambridge.

Lewis, M. W., and Grimes, A., J. (1999) Metatriangulation: building theory from multiple paradigms, *Academy of Management Review*, 24, 4, 672-690.

Liebrand, W. B. G., and van Run, G. J. (1985) The effects of social motives on behavior in social dilemmas in two cultures, *Journal of experimental social psychology*, 21, 1, 86-102.

Loveman, G. (1994) An assessment of the productivity impact of information technologies, in T. Allen and M. Scott Morton (eds.), *Information Technology and the Corporation of the 1990s: Research Studies*, Oxford University Press, New York, 84-110.

Malone, T. W., Yates, J., and Benjamin, R. I. (1987) Electronic Markets and Electronic Hierarchies, *Communications of the ACM*, 30, 6, 484-497.

March, J. G. (1991) Exploration and Exploitation in Organizational Learning, *Organization Science*, 2, 1, 71-87.

March, J. G., and Sproull, L. S. (1990) Technology, management and competitive advantage, in P. Goodman and L. S. Sproull (eds.), *Technology and organizations*, Jossey-Bass, San Francisco, 144-173.

Mata, F. J., Fuerst, W. L., and Barney, J. B. (1995) Information technology and sustained competitive advantage: A resource-based analysis, *MIS Quarterly*, 19, 4, 487-505.

McFarlan, F. W. (1984) Information Technology Changes the Way You Compete, *Harvard Business Review,* May-June, 98-103.
Messick, D. M., and McClintock, C. G. (1968) Motivational bases of choice in experimental games, *Journal of Experimental Social Psychology,* 4, 1, 1-25.
Messick, D. M., and Thorngate, W. B. (1967) Relative Gain Maximization in Experimental Games, *Journal of Experimental Social Psychology,* 3, 1, 85-105.
Moore, J. F. (1996) *The Death of Competition*, HarperBusiness, New York.
Morgan, G. (1997) *Images of organization*, SAGE Publications, Thousand Oaks.
Mukhopadhyay, T., Kekre, S., and Kalathur, S. (1995) Business value of information technology: A study of electronic data interchange, *MIS Quarterly,* 19, 2, 137-156.
Nelson, R. R., and Winter, S. G. (1982) *An evolutionary theory of economic change*, The Belknap Press of Harvard University Press, Cambridge.
Nolan, R. L., and Croson, D. C. (1995) *Creative Destruction: A six-stage process for transforming the organization*, Harvard Business School Press, Boston, Mass.
Nonaka, I., and Takeuchi, H. (1995) *The knowledge-creating company: how Japanese companies create the dynamics of innovation*, Oxford University Press, New York.
Parsons, G. L. (1983) Information Technology: A New Competitive Weapon, *Sloan Management Review ,* 25, 1, 3-14.
Polanyi, M. (1966) *The Tacit Dimension*, Anchor Day Books, New York.
Poole, M. S., and Van de Ven, A. H. (1989) Using paradox to build management and organization theories, *Academy of Management Review,* 14, 4, 562-578.
Porter, M. E. (1980) *Competitive strategy*, The Free Press, New York.
Porter, M. E., and Millar, V. E. (1985) How information gives you competitive advantage, *Harvard Business Review,* 64, 4, 149-160.
Powell, T. C., and Dent-Micallef, A. (1997) Information technology as competitive advantage: The role of human, business, and technology resources, *Strategic Management Journal,* 18, 5, 375-405.
Prahalad, C. K. (1998) Managing discontinuities: The Emerging Challenges, Research Technology Management, 41, 3, 14-22.
Prahalad, C. K., and Hamel, G. (1990) The core competence of the corporation, *Harvard Business Review [HBR],* 68, 3, 79-91.
Quinn, R. E., and Cameron, K. S. (eds.) (1988) *Paradox and Transformation*, Ballinger Publishing Company, Cambridge, Mass.
Reingold, J., and Stepanek, M. (2000, Feb. 14). Why the productivity revolution will spread. *Business Week,* 112-118.
Roach, S. S. (1991) Services under siege: The restructuring imperative, *Harvard Business Review,* 69, 5, 82-91.
Robey, D., and Boudreau, M.-C. (1999) Accounting for the contradictory organizational consequences of information technology: theoretical directions and methodological implications, *Information Systems Research,* 10, 2, 167-185.
Romer, P. M. (1990) Endogenous technological change, *Journal of Political Economy,* 98, Oct., S71-S102.
Romer, P. M. (1994) The Origins of Endogenous Growth, *Journal of Economic Perspectives,* 8, winter, 3-22.
Ross, J. W., Beath, C. M., and Goodhue, D. L. (1996) Develop long-term competitiveness through IT assets, *Sloan Management Review,* Fall, 31-42.

Sethi, V., and King, W. R. (1994) Development of Measures to Assess the Extent to Which an Information Technology Application Provides Competitive Advantage, *Management Science*, 40, 12 (December), 1601-1627.

Smithson, S., and Hirschheim, R. (1998) Analysing information systems evaluation: another look at an old problem, *European Journal of Information Systems*, 7, 158-174.

Taylor, F. W. (1998) *The Principles of Scientific Management*, Dover Publications, Inc., Mineola, NY.

Teece, D. J., Pisano, G., and Shuen, A. (1997) Dynamic capabilities and strategic management, *Strategic management journal*, 18, 7, 509-533.

Thomas, J. B., Clark, S. M., and Gioia, D. A. (1993) Strategic sensemaking and organizational performance: Linkages among scanning, interpretation, action, and outcomes, *Academy of Management Journal*, 36, 2, 239-270.

Vitale, M. R. (1986) The Growing Risks of Information Systems Success, *MIS Quarterly*, 10, 4, 327-334.

Walsh, J. P. (1995) Managerial and organizational cognition: Notes from a trip down memory lane, *Organization Science*, 6, 3, 280-321.

Walsh, J. P., and Ungson, G. R. (1991) Organizational Memory, *Academy of Management Review*, 16, 1, 57-91.

Weick, K. (1984) Theoretical assumptions and research methodology selection, in W. McFarlan (ed.), *The Infromation Systems Research Challenge*, Harvard Business School Press, Boston, 111-134.

Weick, K. E. (1990) Technology as equivoque: Sensemaking in new technologies, in P. S. Goodman, L. E. Sproull, and Associates (eds.), *Technology and Organizations*, Jossey-Bass., San Francisco, 1-44.

Weick, K. E. (1995) *Sensemaking in organizations*, SAGE Publications, Thousand Oaks.

Weill, P., and Broadbent, M. (1998) *Leveraging the new infrastructure: how market leaders capitalize on information technology*, Harvard Business School Press, Boston, Mass.

Weill, P., and Vitale, M. (1999) Assessing the health of an information systems applications portfolio: An example from process manufacturing, *MIS Quarterly*, 23, 4, 601-624.

Wernerfelt, B. (1984) A resource-based view of the firm, *Strategic Management Journal*, 5, 2, 171-180.

Williamson, O. E. (1975) *Markets and hierarchies: Analysis and antitrust implications: A study in the economics of internal organization*, The free press, New York.

Williamson, O. E. (1999) Strategy research: Governance and competence perspectives, *Strategic Management Journal* , 20, 12, 1087-1108.

Appendix 1. An Example of Divergent and Changing Values in the IS literature: Airline (Reservation) Systems

Time Period	Authors (year)	IT Values from ***Routinizing***	IT Values from ***Cost-structuring***	IT Values from ***Positioning***	IT Vales from ***Learning***
1960s ~ 1970s: Humble Beginning		"cost reduction from automating the inventory process"[2] "reduce clerical costs"[3]			
Early 1980s: Competitive Weapon	Parsons (1983)			"Competitive advantage by listing their own flights ahead of competitors' flights and by negatively promoting competitors flights"	
	McFarlan (1984)			"Competitive pricing service action" "Increase in markets share and competition"	
	Vitale (1986)			"Level of (market) penetration" "Switching Cost"	
Late 1980s: Cost Advantage & Accumulative	Clemons (1986)	"Reduced transaction cost"	"Scale on scope advantage" "Cost advantage of leveraging similar resources" *(Economies of scope)*	"Switching costs" "Gain marketing information of competitors" "Judging market responses"	"Superior skill base in information technology" "Superior experience in exploiting innovation" *(Accumulative experience)*

[2] This quote comes from a retrospective study, Hopper (1990). The article was based on the real experience of the author as a project manager of SABRE – the airline reservation systems at American Airline.

[3] This quote comes from another retrospective study, Copeland and McKenney (1988). This study was a part of the Harvard Business School MIS History Project.

Experience	Copeland and McKenney (1988)		"Only relatively large carriers could use systems profitably" "A source of economies of scale and scope" *(Economies of scale and scope)*		"Technological experiences and skills" "Learned to exploit emergent (management) opportunities" *(Accumulative experience)*
	Johnston & Vitale (1988)	"Reduced costs by speeding up customer service" "by performing book keeping, billing, and similar back-office tasks"	"Combination of convenience" *(Economies of scope)*		
1990s: Dynamic network capabilities	Hopper (1990)		"Scale economics" "Add new services (hotels, rail, rental cars)" *(Economies of scope)*		"Access to the entire (company) system" "Connecting all managerial levels" "Connectable enough to other companies' platforms" (Dynamic network capability)
	Bakos (1991)		"Low marginal cost" "Economies of the large communication network" *(Economies of scale)*	"Retaliatory response" "Discourage price comparison"	"Superior utilization of the Info." *(Accumulative experience, Dynamic network capability)*
	Clemons & Row (1991)		"Combining several aspects of travel" *(Economies of scope)* "Reduced search costs" *(Transaction cost)*		
	Andersen, HBR case, (1992)				"Benefits from improving cross-departmental communication, networking and access to data" *(Dynamic network capability)*

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