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A CONTINGENCY MODEL FOR ORGANIZATIONAL TECHNOLOGY ADOPTION DECISION-MAKING CONCERNING INNOVATIVE TECHNOLOGIES

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Abstract

Decision-making concerning technology adoption within organizations is an arduous task based on a number of contingent factors such as (1) organizational characteristics, (2) attributes of the technology, (3) environmental complexities, (4) and perceptions of the decision-maker(s). This research employs qualitative methods to explore these factors and present a contingency model that depicts the impact of the aforementioned concepts on the type of organizational decision-making orientation selected and its overall relationship to organizational benefit.

Introduction

Decision-making is defined as the process of selecting a particular alternative for implementation (Nutt 1976). Evaluation supplements this selection by assigning value to the options. Thus, Organizational decision-making encompasses selection and evaluation (Nutt 1976). Understanding the decision-making processes that an organization employs affords a fruitful framework for describing and predicting organizational behavior such as adoption of a particular technology. Researchers and managers gain insight and provide prescriptions for improvement by deciphering the factors that attribute to the formulation of these organizational decision-making processes that account for problem or opportunity identification, alternative strategies, and intentions for implementing a particular strategy (Simon 1978). Strategic management and information technology are virtually inseparable in light of advances in technology that facilitate the attainment of organizational goals.

Organizational decision-making concerning information technology (IT) is an arduous but a necessary task for which every organization employs some type of decision-making process to aid in discerning the best satisfactory IT solutions. Researchers have studied organizational decision-making from many perspectives. Economists examine organizational decision-making via applications of transactional costs and markets. Industrial psychologists study the informational and computational bounds of collective thought within an organization and how these organizations deal cognitively with the complexities of the tasks and environments. Management scientists identify heuristics that decision-makers, who act as surrogates for the organization, use for evaluating optimal decisions and computational algorithms for implementing them (Simon 1978).

This intent of this research is to present a contingency model that integrates the impact of individual, organizational, and technical factors on organizational IT adoption decision-making and apply this model to organizational decisions concerning two innovative technologies – Wireless Local Area Network implementations and adoption of XML for data exchange.

This research purports that these decision-making processes are reflections of multiple contingent factors that can be generalized into four main concepts (1) organizational characteristics, (2) attributes of the technology, (3) environmental complexities, (4) and perceptions of the decision-maker(s).

Research Questions

The primary research questions are as follows:

- (1) How will organizational decision-making orientations differ concerning decisions about innovative technologies – WLANs and XML for data exchange?
- (2) How does the organizational decision-making orientation ultimately impact organizational technology adoption?
- (3) How does the organization assess derived benefit from employing the technology?

Theoretical Perspective

The conceptual framework, data collection, and data analysis methods for this research assume the epistemological view of positivism and incorporates qualitative research methods to identify themes and refine constructs in the research model and quantitative methods to test relationships of the constructs within the refined research model. Even though this study is grounded in the positivism epistemology, which assumes a theoretical basis, it does embody some interpretivist undertones because the subject matter is contextually based and there is leniency in this research design for the identification and incorporation of factors, themes, or constructs that are not currently known but that are discerned from the data. This study focuses on decision-making within an organization; therefore, the reality is salient to the environment in which the organization exists. Additionally, field work requires this researcher, to some extent, to interpret the attitudes, intent, and behaviors that *are* articulated and *not* articulated by the organizational decision-makers (surrogates for the organization that act on its behalf) concerning factors impacting IT infrastructure issues, which resembles interpretivism. The unit of analysis is the organizational decision-making orientation.

Theoretical Underpinnings and Contingency Model

This research employs tenets from contemporary MIS literature that examine how IS and IT are related in an organizational context (Fichman and Kemerer 1997; Orlikowski 1993; Cooper and Zmud 1990). This researcher also applies perspectives derived from Organizational Behavior and Strategic Management literature that apply the logic of option evaluation based on the utility derived from a fit between organizational goals and technology (Simon 1978). Additionally, Strategic Management literature illuminates the subjectivity of the decision-maker, which impacts the behavior of the decision-maker that acts as a surrogate for the organization (Kahneman and Tversky 2000). This study incorporates premises from Organizational Theory literature that illustrates the contributions of traditional disciplines such as Psychology and Marketing to explain the factors that impact organizational decisions that may be grounded in varying forms of economics, or on the relationship existing between the organization and the external environment, or as a phenomenon of Social and Industrial Psychology (March and Simon 1958; Simon 1978; Perrow 1986; Scott 1998). Recent research in Marketing literature provides a means for classifying organizational decisions concerning marketing strategies for product mix and pricing based either internally or externally oriented knowledge (Smith 2002), which this study draws upon to create a typology for organizational IT decision-making orientations. Each body of literature affords a lens through which researchers use to explain organizational decision-making.

Researchers have historically debated the status of rationality in organizational decision-making research since the 1940s (Shapira 1988). Von Neumann and Morgenstern's (1944) mathematical laden seminal work introduced the parallel between the decision-maker's maximization of expected utility from employing an option with rationality (Shapira 1988). Shortly afterwards, Simon (1947) highlighted the discrepancies between the then accepted modern utility theory and decision-maker's actual behavior when rationality is bound (Shapira 1988). This idea of bounded rationality (i.e., limitations concerning the knowledge that the decision-maker possesses to make the decision) and the idea of satisficing as opposed to maximizing utility bore the Behavioral Theory of the Firm, which has greatly impacted other organizational theories and works of institutional economists such as Williamson (1981) and Friedman (1953) (Nutt 1976; Shapira 1988).

Edwards (1954) introduced psychologists to the aforementioned stream of literature concerning the economic and behavioral aspects of decision-making by the individual and organization (Shapira 1988). The programmatic research concerning decision-making in the Psychology discipline resulted in a field referred to as Behavioral Decision Theory that focuses on the contingencies impacting decision-maker behavior. Behavioral Decision Theory is a multi-disciplinary theory that spans across Economics (Arrow 1982), Philosophy (March and Simon 1958, Simon 1947, 1990; Pfeffer 1981; Weick 1979, 1995, 2001), Psychology,

Marketing (Smith 2002; Nagle and Holden 1995), and Management (Nutt 1976; Tversky and Kahneman 1974; Scott 1998; Kahneman and Tversky 2000), and more recently MIS with the employment of cognitive maps (Kadaras and Karakostas 1999).

The typology for organizational IT decision-making orientations (Table 1) is adapted from Nutt's (1976) comparison of organizational decision-making models and a recent study in Marketing literature by Smith (2002) that provides a means for classifying organizational decision-making orientations concerning marketing strategies for product mix and pricing based on either internally or externally oriented knowledge. This internally or externally oriented focus serves as the basis for conceptualizing the focus of the organization in this research but is adapted to suit specific IT foci, which are Business to Enterprise (B2E), Business to Consumer (B2C), or Business to Business (B2B). Smith (2002) employs two dichotomous organizational decision-making processes that are adapted from the Psychology literature (March and Simon 1958, Simon 1978; Pfeffer 1981; Weick 1979, 1995, 2001) and depicts modes of rationality that are applicable to categorizing organizational decision-making. Management literature incorporates tenets of traditional disciplines to explain the factors that impact organizational decisions that may be grounded in varying forms of economics or based on the relationship existing between the organization and the external environment (Scott 1998). MIS literature examines how IS and IT are most beneficial when there is a fit between the relevant needs or tasks to perform, the characteristics of a particular technology, and quite often characteristics of the social technical environment in which the system will operate (Martin et al., 1999; Goodhue and Thompson 1995). Organizational decision-making processes can facilitate this fit. These processes are also characteristics of the environmental complexities (Segars 2002) and the subjectivity of the decision-maker(s) (Kahneman and Tversky 2000).

Table 1. Technology Adoption Decision-Making Orientations

Focus Process		Business to Enterprise (B2E)	Business to Consumer (B2C)	Business to Business (B2B)
Rational ↑ ↓ Natural	Bureaucratic/Normative • Master plan adherence that is analytical and relies on statistical, impersonal sources • Use of established heuristics (ROI calculations, NPV) • Seeks maximizing benefit in subjective expected utility (Weber, Fayo)	<i>Efficiency improvement via Internet</i>	<i>Performance improvement via Internet</i>	<i>Efficiency and Performance improvement via Extranets</i>
	Behavioral • Mix of analytical and impersonal approaches • Seeks satisficing benefit as opposed to maximizing benefit in subjective expected utility (Simon)	• Lower operational costs • Decrease time for employees to access and manipulate corporate data • Decrease time for custom developed applications	• Increase customer volume, due to improvement in quality and ability to transact with the organization • Increasing in revenue	• Just in time access to corporate business applications for transactions • Seamless data exchange • Decrease transaction costs • Increase volume for products and services exchange with other organizations
	Consensual • Sensemaking through group interaction, • Non-analytical • (Guetzkow, Delbeq)			
		Internal	External	

This research builds a contingency model (Figure 1) that draws primarily from the applications of Behavioral Decision Theory in Psychology, Marketing, Management, and MIS and Contingency Theory that assesses how an organization processes information in light of environmental complexities such as organizational structure and uncertainty (Lant and Hurley 1999; Galbraith 1973). This researcher derives the constructs contained in the research model depicted in Figure 2 from the aforementioned bodies of literature.

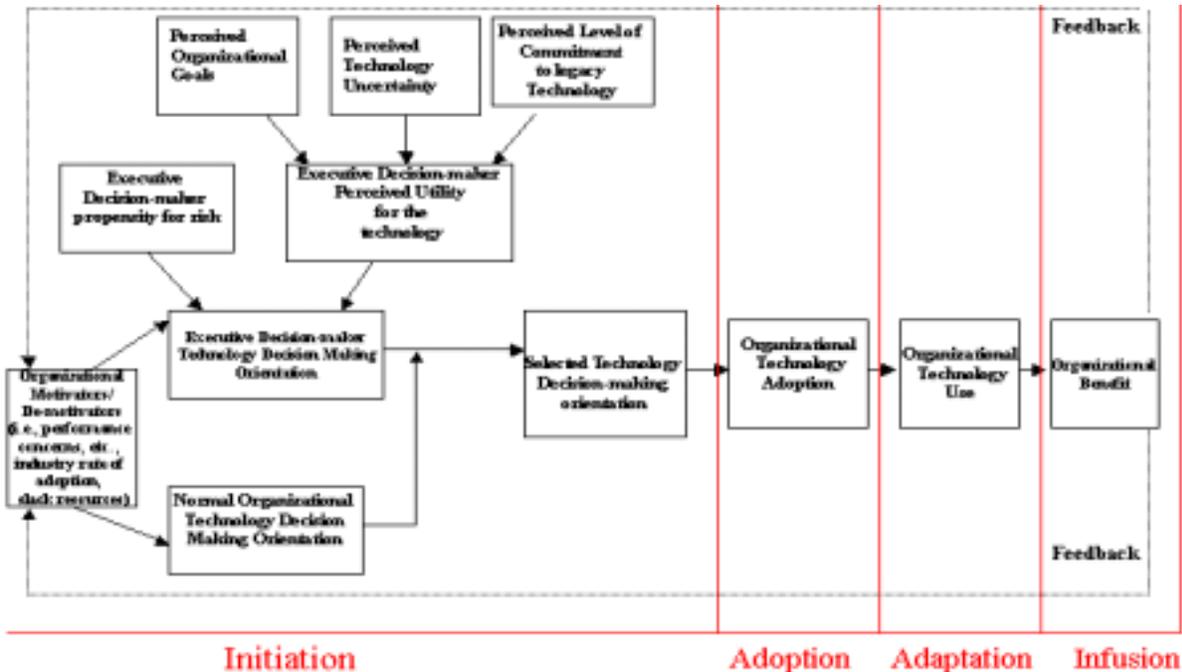


Figure 1. Organizational Technology Adoption Contingency Model

Organizational Motivators/De-Motivators

Organizations vary by the means in which they seek technological solutions to appease problems within the organization. The problems are usually motivators which spur decision-makers to seek suitable alternatives to allay problems such as poor financial performance relative to direct competitors, decrease in market position, or perceptions about the industries rate of adoption for a certain technology (Cyert and March 1963; Levebyre et al. 1991). Additionally, the availability of slack resources can be a motivator or de-motivator that can impact the decision-making process (Cyert and March 1963).

Organizational Goals

“Organizational goals refer to the organization as a whole, as an institutionally defined system whereas decision goals are designed to find solutions to single decision problems in the organization... (Hauschildt 1986).” This analysis concentrates on organizational goals that are strategic or operational and that can be operationalized through the employment of technology. An example of an organizational strategic goal is for an organization to strive to become a market leader by providing differentiated products and/or services such as affording customers the ability to transact with the organization via various telecommunication mediums. An example of an operational goal is for an organization to strive for organizational efficiency by improving internal processes such as improving accessibility to corporate data by ensuring universal usability of the organizations IT assets, ubiquitous connectivity, and the unison of data across the organization (Watson 2000).

Technological Uncertainty

Decisions under uncertain or ambiguous conditions add complexity to the decision-maker's paradox (Nutt 1976). Uncertainty comes in a multitude of flavors none of which are palatable to the decision-maker when faced with a perplexing decision. This

research examines but one type of uncertainty, technological uncertainty. Technological uncertainty incorporates three aspects (1) technological immaturity, (2) lack of realized benefits from employment of the technology, and (3) asset specificity, which assesses if the technology is will be compatible with existing and future resources or assets (i.e., scalability) (Williamson 1981). At this point in time, implementations for wireless networks exhibit high degrees of technological uncertainty based on these three aspects. Empirical research has related the level of technological uncertainty and the organizational decision-making process (Fichman and Kemerer 1993), which adds credence for this incorporation of this construct into the research model in this study.

Perceived Utility

Perceived utility is an adaptation of the Subjective Expected Utility construct in which the decision-maker seeks to maximize expected subjective utility by selecting the alternative that yields the most satisfying expected value (Nutt 1976). Since this research is not exploring multiple alternatives for one technology implementation but rather examining the decision orientations of organizational decision-makers concerning two different types of decisions, subjective expected utility will be referred to as perceived utility that the decision-maker(s) expects from employing an innovative technology. This adaptation of the construct is consistent with Simon's application of it in Behavioral Decision Theory (Simon 1967). This research asserts that perceived utility entails how the decision-maker employs heuristics to (1) attribute information that is salient to them to assess the technology (i.e., the attribution heuristic), (2) identify organizations that have had successful implementations of the technology and realized benefit (i.e., the representativeness heuristic), and (3) anchor their expectations of employing the new technology based on their current technology (i.e., the anchoring heuristic) (Tversky and Kahneman 1979).

Perceived Level of Commitment to Legacy Technology

The human tendency to stay a course of course even in light of negative feedback because of the level of resources committed to the current course of action is the basic premise of the Escalation of Commitment to a Failing Course of Action (Hambrick and Mason 1984; Brockner and Rubin 1985; Brockner 1992). Researchers in both the trade press and academia note that IT projects have slow returns or no longer truly *fit* the business needs of the organization but for which decision-makers have invested an exorbitant amount of resources (i.e., in terms of money and effort) are prime targets Escalation of Commitment to a Failing Course of Action (Hambrick and Mason 1984; Keil and Mixon 1984; Orli 1989; Keil 1993).

Organizational Technological Adoption

Much research in MIS literature examines technological adoption on the individual unit of analysis by empirically testing the relationship between constructs such as perceived usefulness, perceived ease of use, and other external moderating variables. This technology adoption and diffusion research converge on traditional theoretical frameworks that seek to explain the individual target adopter attitudes, intentions, and behavior concerning the technology. The traditional frameworks are Diffusion of Innovations (Rogers 1983), the Theory of Reasoned Action (Fishbein 1979), the Technology Acceptance Model (Davis, Bagozzi and Warshaw, 1989), the Theory of Planned Behavior (Ajzen, 1985; Taylor & Todd, 1995), and Social Cognitive Theory (Compeau and Higgins 1995). While useful in discerning the factors that attribute to human intent, one has difficulty in applying these frameworks in an organizational setting. Contemporary studies suggest that these traditional frameworks are not effective in studying the antecedents to implementing technology innovations within organizations, "especially when adoption decisions are made at the organizational, division, or workgroup levels, rather than at the individual level" (Fichman and Kemerer 1997; Orlikowski 1993; Cooper and Zmud 1990). This research asserts that organizational decisions are contingent upon factors that occur at both the individual and organizational levels of analysis and attempts to consolidate these factors in one model. Cooper and Zmud (1990) developed an acclaimed six-stage model for describing technology implementations in organizations. The first two steps (initiation and adoption) of this model are applicable in describing the organizational technological adoption intent. Initiation is occurs when a fit exists between a technology and an organizational goal or when organizational decision-makers deem some application of the technology as beneficial for attaining an organizational goal. Adoption occurs when organizational decision-makers decide to invest resources to accommodate the implementation effort.

Organizational Technology Use

The usage construct is integral to nearly all of the acclaimed MS adoption models (Venkatesh and Davis 2000; Straub et al. 1995; Delone and McLean 1992). Very few empirical studies have linked usage of the technology with the individual performance (Goodhue and Thompson 1995). Academic studies linking organizational performance to technology usage is just as scarce.

This is most likely due to the difficulty in assessing organizational benefit derived from employing an innovative technology that is primarily considered as part of the organization's IT infrastructure. This phenomena plagues practitioner research as well, which attributes to the difficulty in assessing performance from usage because of extended payback periods and other environmental complexities such as asset specificity.

Organizational Benefit

This research proposes that organizational benefit depends on the focus of the organizational decision-maker(s) and is either internally focused on effectiveness and efficiency issues or externally focused on performance issues of the organization, which are operationalized in this study as (1) decreased operating expenses, (2) increased employee productivity, (3) increased market share, or (4) increased competitive advantage that is expected from employment of the innovative technology.

Research Methodology

This study intends to apply qualitative methods to extract rich data and will attempt to conduct at least forty one-hour semi-structured interviews with organizational decision-makers (specifically CIOs or organizational surrogates for IT decision-making) to gain a contextual understanding of organizational decision-making in hopes of validating and testing the relationships amongst the constructs in the contingency model. The researcher has acquired a complimentary invitation to identify potential interviewees from and formulate a convenience sample during a Mobile IT conference (<http://www.mobileinsights.com/conferences/GMS/gms.asp>) for organizational IT decision-makers being held in Naples, Florida on 19-22 May 2002. The qualitative data collection and analysis will apply the Miles and Huberman's (1994) data display technique and use thematic content analysis to discern evidence in the interview related to the model constructs.

Conclusion

This research attempts to integrate contingent factors that reside at the individual decision-maker and organizational levels in light of environmental complexities that impact decision-making to present a view of organizational decision-making concerning innovative technologies. This research should provide organizations with a means of identifying the antecedents and impacts of decision-maker subjectivity on organizational technology adoption decision-making. Decision-making under extremely complex circumstances is a daunting task in any setting and hopefully this research will aid academics and practitioners more in their comprehension of organizational behavior concerning adoption of innovative technologies.

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