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Wen-Lung Shiau

Information Management Department, Ming Chuan University, mac@mail.mcu.edu.tw

Joey F. George

SCIS Department, College of Business, Iowa State University, jfgeorge@iastate.edu

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A Grounded Theory Approach to Information Technology Adoption

Wen-Lung Shiau

Information Management Department, Ming Chuan University

mac@mail.mcu.edu.tw

Joey F. George

SCIS Department, College of Business, Iowa State University

Abstract:

This study explores the nature of information technology adoption based on phenomena found in the real world. We selected the grounded theory method (GTM) for this study, which involved two sites located in the USA, and eight sites located in Taiwan. The results exemplify a multi-year, multi-site grounded theory approach to generating theory that helps explain information technology (IT) adoption in an organizational context. The core categories of the model are developed from, grounded on, and extracted from the data, and are casually linked into four adoption processes: motivation, solutions fit, values, and decision stage. The nature of the information technology adoption model could help researchers and practitioners understand that managers have one or more motivations, seek IT solutions to fulfill their motivations, evaluate IT solutions, and make decision after judging IT value. We also present an assessment of the theory, and discuss its relevance and directions for future research.

Keywords: Information Technology, Adoption Model, Motivation, Solution, Value, Decision.

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I. INTRODUCTION

During the last two decades, there has been an increasing interest in the use of grounded theory in the information system (IS) field (Howcroft & Hughes, 1999; Lings & Lundell, 2005; Lundell & Lings, 2003; Urquhart, 2001, 2007; Urquhart & Fernandez, 2013). Grounded theory is a qualitative research method that offers a systematic way to generate theory from data, and suggests a continuous interplay between data collection and analysis. It is good not only for data analysis, but also for the emergence of rich and original findings that come from the data (Orlikowski, 1993). Grounded theory is useful for explaining information system phenomena (Goulielmos, 2004). However, grounded theory studies in information systems have been criticized for resulting in few theory developments. Many grounded theory studies in information systems rarely use the full potential method but instead use only the coding methods of grounded theory to assist data analysis. As a result, grounded theory is sometimes viewed as a way of coding data rather than a method to generate theory (Elliott & Lazenbatt, 2005; Urquhart, Lehmann, & Myers, 2010; Urquhart & Fernandez, 2013).

One of the best ways to master grounded theory is to go through a real case and explain important information system phenomena. We must seek frameworks, classification schema, or taxonomies to theorize organizational adoption of IT. In other words, a natural theory is needed to understand IT adoption in organizations. Theories used in IS are diversified. Gregor (2006) proposes a taxonomy to classify different types of information system theories and demonstrates the applicability by classifying articles in *MIS Quarterly* and *Information Systems Research*. She distinguishes five interrelated types of theory: (1) theory for analyzing, (2) theory for explaining, (3) theory for predicting, (4) theory for explaining and predicting, and (5) theory for design and action. Theory for analyzing is the most basic type of theory and focuses on "What is" and is useful when we know nothing or little about the phenomenon in question. The second type of theory is for explaining. It clarifies phenomenon about what is, how, why, when, and where, but does not provide predictions. The third type of theory is for predicting. It makes clear what is and what will be. The prediction has testable propositions, but it does not have well-developed casual relationships. The fourth type of theory is for explaining and predicting. It is the combination of the second and third types with well-developed casual relationships. The last type of theory is for design and action. Its purpose is to tell how to do something. Thus, it gives details of all prescriptions (Gregor, 2006). In this paper, rather than develop an alternative theory conceptually from scratch or find theories from other academic disciplines that could be borrowed and adopted, we generate theory from data (i.e., employ a grounded theory approach). As such, this paper is a tutorial example of a multi-year, multi-site grounded theory approach for generating theory that helps explain IT adoption in an organizational context. The resulting theory should be useful from both a research and a practical perspective. This study contributes to the IS literature by developing an IT adoption model based on the phenomenon found in the real world to understand why organizations adopt IT. The rest of this paper is organized as follows. In Section 2, we cover the basics of the grounded theory approach. In Sections 3, 4, and 5, we look at the 10 sites used for data collection, and we provide details of the data collection and data analysis efforts. In Section 6, we then briefly cover ways to assess grounded theory, from the work of Urquhart, Lehmann, and Myers (2010). In Sections 7 through 10, we present the grounded theory of IT adoption that emerged from this study. We introduce and illustrate each of 18 constructs and 36 relationships with data collected during the study. In the interest of space, we present only limited data and commentary. In Sections 11, 12, and 13, we end with our concluding comments.

II. GROUNDED THEORY

Barney Glaser and Anselm Strauss developed and systematized the grounded theory approach in the 1960s. *The discovery of grounded theory* emphasizes a systematic approach to collecting and analyzing data in order to allow a theory to emerge (Glaser & Strauss, 1967). The constant comparative method has been a key concept in the development and understanding of grounded theory (Glaser, 2001) because it can be used to produce either conceptualization or descriptive accounts. Strauss and Corbin (1990) emphasize that every grounded theory should include three basic elements: theoretically sensitive coding, theoretical sampling, and a comparative method between phenomena and contexts to strengthen the theory. Figure 1 depicts the relationships among the constant comparative method, theoretical sampling, and the theoretically sensitive coding.

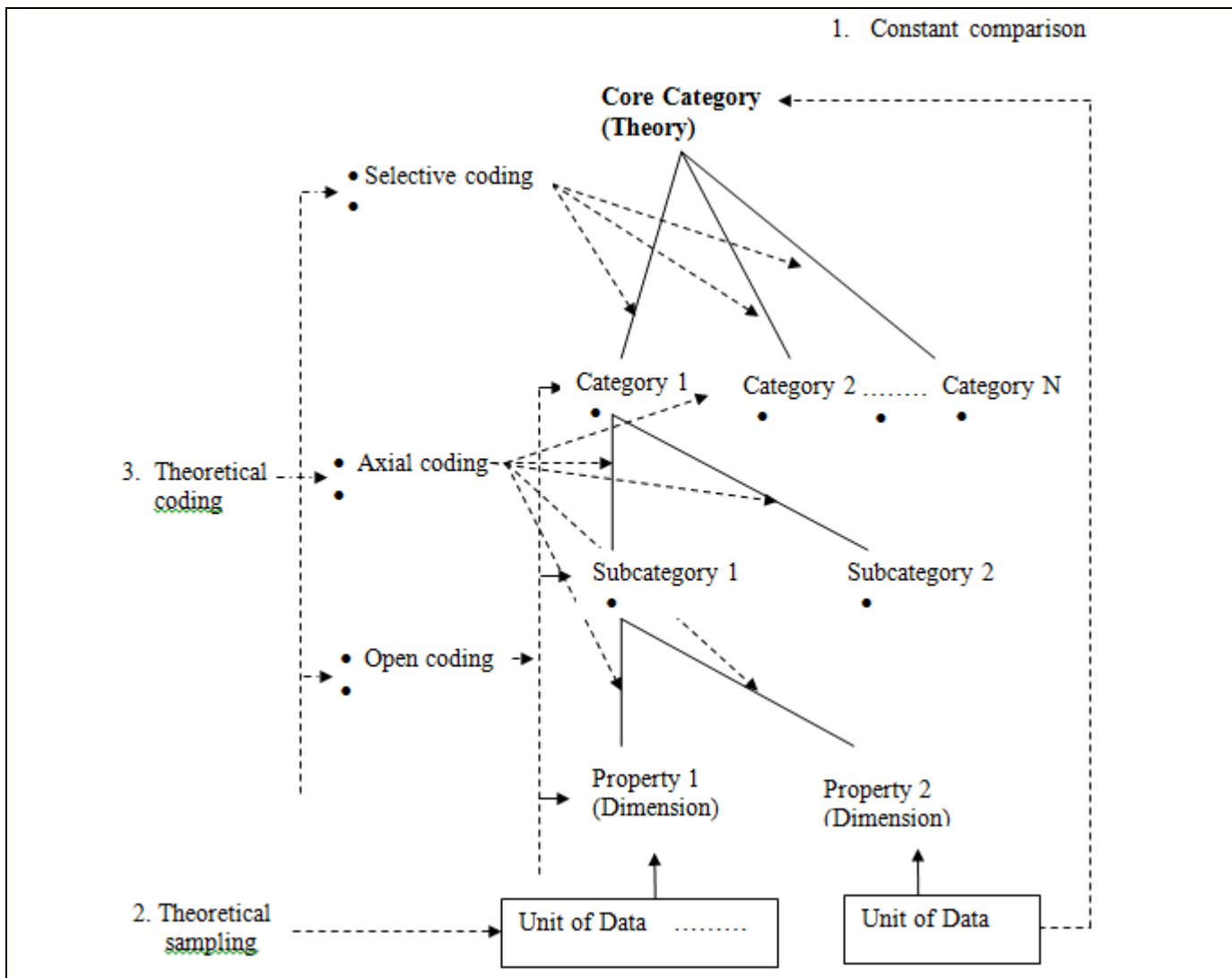


Figure 1. Grounded Theory Method

The first step in starting a grounded theory process is to understand and employ constant comparison. The constant comparative method between phenomena and contexts is the core to strengthen the theory. Constant comparison proceeds throughout a grounded theory research project. Any rich data with components and conceptual labels, such as events, action, variation, interaction, property, dimension, subcategory, category, and core category, need to be compared. Only through rigorous comparisons can a strong theory with one or more core categories emerge.

The second step is theoretical sampling. Theoretical sampling is used to decide what to observe and whom to interview next. Theoretical sampling focuses on data collection. Theoretical sampling helps delineate category properties, causal relationships between categories, and saturating categories (Charmaz, 2006). Glaser and Strauss (1967) show that theoretical sampling is the process of data collection for generating theory whereby the analyst jointly collects, codes, and analyzes their data and decides what data to collect next and where to find them in order to develop theory as it emerges (Glaser & Strauss, 1967, p. 45). We can view theoretical sampling as a technique of data triangulation. The process of selecting a case, data collection, and an analyst (jointly collects, codes, and analyzes) is used to verify, enhance, and/or change the embryo findings until theoretical saturation. After choosing new research sites or cases, independent pieces of information are used to get a better fix on category properties, causal relationships between categories, and saturating categories that were only partially known or understood. All in all, theoretical sampling is used to generate further data to confirm and refute original categories until theoretical saturation.

The third step is theoretical coding. A category and other subcategories with properties and dimensions are identified through open coding. The category and subcategories with properties and dimensions become the basis for sampling on theoretical grounds because they stimulate generative and comparative questions to guide the researcher's return to the field to collect related data. Theoretically sensitive coding is used to generate strong

concepts from rich data to explain the real phenomenon that the researcher observes and depicts. Theoretically sensitive coding consists of open coding, axial coding, and selective coding.

Open coding involves identifying categories, subcategories, and properties in the data. The coding is often done line by line to conceptualize all incidents in the data, which yields many categories, subcategories, and properties. A category with subcategories is an abstract representation of something the researcher identifies as being significant in the data (Glaser & Strauss, 1967, p. 36). A property is a conceptual feature or attribute of a category (Glaser & Strauss, 1967; Strauss & Corbin, 1990).

Axial coding involves "conditions, context, action/ interactional strategies and consequences" (Strauss & Corbin, 1990, p. 96). Axial coding is a set of procedures to make connections among categories and subcategories by putting data back together in new ways after open coding. During axial coding, all hypothetical relationships must be considered temporary until verified repeatedly against incoming data. One supported incident is not sufficient base to verify or discard a hypothesis. To increase validity, a hypothesis must be verified by data over and over again. A variation of the hypothesis (in different conditions) must be critically evaluated. The best way is to consider the full range of variation in the phenomena.

Selective coding is the process designed to unify all categories as core categories. The core categories represent the central phenomenon in the context of the study and need further explication. The core categories explain participants' behavior in resolving their main concerns. All core categories must be established as the best fit with the data. Selective coding could be done by going over data already coded once at an earlier stage or by coding newly gathered data (Glaser & Strauss, 1967; Strauss & Corbin, 1990). All core categories emerge under the judgment of theoretical saturation. Theoretical saturation is reached when "no new core categories emerge" (Glaser & Strauss, 1967; Strauss & Corbin, 1990).

III. SITE SELECTION

To select our site, we followed Glaser and Strauss' (1967) theoretical sampling technique. We selected two organizations located in the USA. and eight organizations located in Taiwan for their similarities and differences. All sites had one thing in common—the adoption of IT—but the particular type of IS being adopted varied by firm. To have more explanatory power, different IS were considered. Table 1 describes the ten sites.

Table 1. The Ten Sites Visited in This Study

Site	System type	Description
Sport A	ERP	Sports business. In 2006, it had 7 branches, 40 employees, and earned US\$3 million in revenue. Sport A acquired its ERP system from an outside vendor.
Semiconductor B	ERP	International company with branches in the US, China, Japan, and Korea. It is an IC design house and focuses on video and communication ICs, including on-screen displays (OSD), micro-control units (MCU), analog-to-digital converters (ADC), low voltage differential signaling (LVDS) and transmission minimized differential signaling (TMDS) transmitters and receivers, TFT source drivers, and TFT gate drivers. Publicly traded. In 2006, it earned US\$57.4 million and employed over 250 people worldwide. Semiconductor B developed its ERP system in-house.
Bank C	CRM	International Bank, with Head office, Trust Department, International Department, Offshore Banking Unit, and 101 branches, for a total of 105 units. It had US\$1.14 billion in capital and 7268 employees in 2007. Bank C developed its CRM system in-house.
Agent D	ERP	IS agent and solution provider company. The representative product lines include Cisco, CA, Oracle, and IBM. It also provides a value added service including network planning and implementation, network security mechanism, and enterprise application software. In 2007, it had 3 branches, US\$81.33 million in revenue and 157 employees. Agent D acquired its ERP system from an outside vendor.
Telecom E	CRM	Wimax business unit. It is one of the pioneer Wimax companies in the world. When it started in 2008, it had US\$66.67 million in capital and 180 employees. The telecom services it provides include voice, multimedia, mobile commerce, broadband network, electronic commerce, and online transactions. Telecom E acquired its CRM system from an outside vendor.



Table 1. The Ten Sites Visited in This Study (cont.)

Site	System type	Description
Electronics F (USA)	ERP	Global enterprise in electronics and electrical engineering, and operates in the industrial, energy, and healthcare sectors. Founded in 1847 as an electronics and electrical company in the USA. Offers quality products, services and solutions. With 428,000 employees in 190 countries, Electronics F reported worldwide sales of US\$116.6 billion in the 2008 fiscal year. In the USA, Electronics F reported sales of \$21 billion and employs approximately 60,000 people throughout all 50 states and Puerto Rico.
Maintained G	BI	Maintenance service provider company. The maintenance products include personal computers, printers, digital cameras, monitors, scanners, notebooks, LCD TVs, and projectors. The professional maintenance service lines include products of EPSON, SamSung, LEXMARK, FUJITSU, Lenovo, ASUS, Hannspree, HiPlus, and ACER. In 2009, Maintenance G had 20 service centers and 160 employees. Maintenance G acquired its BI system from an outside vendor.
Delivery H (USA)	ERP	Leading global provider of specialized transportation, logistics services, capital, and e-commerce services. Founded in 1907 as a messenger company in USA. Today, as the world's largest package delivery company, Delivery H has grown into a multi-billion-dollar corporation and manages the flow of goods, funds, and information in more than 200 countries. Delivery H acquired its ERP system from an outside vendor.
Food I	BI	Well-known traditional pickled vegetables and healthy food company. The product lines include traditional foods, Chinese condiments, recreational snacks, health drinks, and dairy products. In 2009, Food I's capitalization was US\$149 million with over 800 employees. Food I acquired its BI system by from an outside vendor.
CAR J	SCM	Car part manufacturer. A small car has more than 3000 different components, each of which is separately designed to work in perfect coherence with each other. The main products of CAR J include steering high pressure hoses, steering oil reservoir tanks, ink trail assays, filler pipe, pedal assays, cross members, power steering low pressure hose assays, and oil strainers. In 2009, CAR J's capitalization was US\$1.73 million with over 120 employees. CAR J acquired its SCM system from an outside vendor.

IV. DATA COLLECTION

We designed the study to identify the factors that affect how managers make the IT adoption decision. We selected companies that had already adopted enterprise information systems. We started with a small organization (Sport A) that adopted an enterprise resource planning (ERP) system. Sport A had seven branches, 40 employees, and acquired its ERP system from an outside vendor. We contacted Sport A's Chief Executive Officer (CEO). The secretary of the CEO of Sport A asked us to provide our purpose and main questions. We stated that our purpose was to understand critical factors influencing ERP adoption. Our main questions were: "1. Why did you adopt the ERP?" and "2. What factors did you consider for the ERP adoption?". We also asked Sport A to provide any information about adoption of ERP, such as memos, records, or training.

The proposed methodological steps in Figure 1 guided our work generating embryonic finding categories. The results of the first case included categories such as competitor pressure, customer satisfaction, electronic business value, information quality, IT support management, problem desire, decision making, expectation fit, top management attitude, competitive advantage, risk, and intent to adopt ERP. However, the relationships among categories were weak and not sufficient. The results from the study of this small organization provided direction for the interviews and observation in the second case. After completing the study of the second case, we repeated the methodology in Figure 1 until the data reached theoretical saturation. The final case we selected was a car parts manufacturer, named here as CAR J, which had 120 employees and acquired its SCM system from an outside vendor. Categories resulting from the study of CAR J (10th case) included external competition, supplier's educational level, customer, cost, timely information, and information quality. All of the categories that emerged from the 10th case fit into the major categories identified in the analysis of the previous nine cases (motivation, solution fit, values, and decision), so, after we analyzed it, we reached theoretical saturation. Core categories emerged through theoretical saturation. Theoretical saturation is reached when "no new core categories emerge" (Glaser & Strauss,

1967; Strauss & Corbin, 1990). We stopped at this final case. Figure 2 shows a final model of constructs, variables, and relationships.

Before we invited potential informants to participate in the study, we asked “Who makes the decision to adopt an enterprise information system (EIS)?” to make sure we interviewed the right person. Some EIS adoption decisions are made by CEOs and CIOs themselves. Others are made by managers authorized by CEOs. We used many different methods to collect data, which included semi-structured and unstructured interviewing, field notes, meeting notes, documentation reviews, and observations. We used semi-structured interviewing to investigate the main questions, such as “Why did you adopt the IT?” and “What factors did you consider for the IT (enterprise information system) adoption?”. We also used unstructured in-depth interviews to collect data to allow decision makers to tell their stories in their own way.

We always followed up on information they provided to probe in-depth factors influencing IT (enterprise information system) adoption. We recorded all the interviews with digital voice recorders with the informants' permission. Later, we transcribed the interviews to provide accurate data for analysis. We collected other data with the organization's permission. We also collected public information if the organization was listed on the stock market. The triangulation from multiple data sources is particularly beneficial in generating theories because it yields a stronger substantiation of constructs (Eisenhardt, 1989; Glaser & Strauss, 1967) and could be the most rigorous explanation of the phenomenon. When collecting data, we focused on the topics of context, technology, and the key decision making and adoption processes engaged in by managers in the adopting firms.

V. DATA ANALYSIS

We followed Strauss and Corbin's (1990) technique of theoretical sampling, open coding, axial coding, and selective coding. Open coding aims to obtain one or more conceptual labels, such as a category or subcategories with properties and dimensions. Axial coding follows open coding and aims to obtain one or more solid categories. Selective coding follows axial coding and aims to obtain one or more core categories. Each core category represents one of the main phenomena of the research. Table 2 shows the primary categories and concepts that emerged during the ground theory process.

We discovered four categories: motivation, solution, value, and decision. We define motivation as a decision maker who is energized or activated to do something. We define solutions as human motivations that are met or fitted by IT support with almost subconscious, easy, natural, correct, and adjust to events in their organization. We define value as the worth of all benefits enjoyed by the business entity. And we define decision as the mental processes (cognitive process) that results in the selection of an action.

For each concept, we provide an operational definition and illustrative data sources. Selective coding is the process that unifies all categories into a core category. At the same time, variations occur between or among the categories. Researchers should be able to conceptualize the phenomenon in a few sentences and explain the variation between or among the categories when they finish their selective coding. A theory then emerges when all gaps in the theory are filled.

In the grounded theory approach, analysis begins as soon as the first data is collected. It is necessary to analyze data from the start because the results of the analysis are used to direct the next interview and observation (Strauss & Corbin, 1990). All the interviews were professionally turned into analyzable text using NVivo (formerly NUD*IST). Section 6 provides the results.

Table 2. Categories and Concepts

Categories	Concepts	Operational definition	Sample data sources
Motivation	Need	A psychological feature arouses a person to have action toward purpose and direction to behavior.	We focus on two needs. One is to apply the fee, and the other is monthly reports. (Maintained G) We need to analyze historical data in order to make order. (Agent D)
	Problem	An obstacle, impediment, difficulty, or challenge exists for an organization.	In the semiconductor industry, every company has stock problems. (Semiconductor B) In the past we do not know how much we sold; we only have a rough estimate. (Agent D)
	Desire	A sense of longing for a person who takes actions to achieve goal.	When a customer comes, our salesmen can recommend suitable goods from data analysis. (Sport A) Our customers want to have transparency. They want to know if we could tell them we ship something in time. (Electronics F)
	Expectation	A belief is considered to happen in the future.	In the future, we expect to have KPI (key performance index) managed through BI by department. Using a new BI tool to present, and to do a report monthly. (Food I) The IT has an investment that is there to drive revenue, to increase market share, and to increase to the top of the building. (Delivery H)
	Stimulus	Factors motivate sales to sell more goods.	Salesmen always get rewarded by sales numbers. Salespeople can see and search for related data immediately in the system.(Agent D) IT is used to offer an Email name list to support sellers. (Bank C)
	Customer	A requirement from customer is a functional need that a particular product or service must be able to perform.	You know we serve many enterprises. Our customers want diagnoses of their products. (Maintenance G) At that time our main customer requires the supply chain. Every month we are required to report our progress. (CAR J)
	Government regulation	Legal restrictions are made by a government authority.	For security in the telecom field. If the NCC does not require it, nobody will follow it. (Telecom E) Deloitte wants to check up on our account. This is right and avoids getting out of stock market. (Maintenance G)
Solution	Quality	Aspects of the information are perceived as accuracy or suitability.	Your decision will have problems because of incorrect information.(Semiconductor B) Every single item is calculated. I can use this information (correct) to order goods. (Sport A)
	Timeliness	Information is provided in real time.	IT can speed up the process and save time. We are then more competitive. (Semiconductor B) A BI tool could connect the data and perform real time analysis and send out the new report to the manager. (Food I)
	Flexibility	IT is adapted when external changes occur.	We consider flexibility in the CRM system. (Telecom E) Because we are an agent, we wish to have the source code at the beginning. We can then modify the system as we want. (Agent D) The dimensional functions of Cognos (BI) are flexible. It uses IE to operate and users could drag the reports themselves. (Food I)

Table 2. Categories and Concepts (cont.)

Categories	Concepts	Operational definition	Sample data sources
Solution	Operation	An area of management concerned with overseeing and handling the process of person, production, and service in an IT.	For top managers, the tool has to focus on viewing and ease of operation, such as the good example of Cognos. (Food I) It has to be easy to use so that a large numbers of employees and customers can quickly pick it up and use it. (Delivery H)
	Control	The activity of checking things out is to reach our purposes.	The system should check the fields out. We can then make personal privacy more secure. (Telecom E) Our purpose is to reduce stocks; the BI is good to monitor the status of stocks. (Maintenance G)
	Communication	The activity conveys message across vast distances in time and space and through the exchange of information.	It's easier for them (employees) to work together across the organizational structure by IT. (Electronics F) We want to integrate our communication system with a work flow system (an ERP system). (Agent D)
	System availability	A system will work as required during the period of a mission.	The system must support thousands of people online. The response time must be bearable for one user. (Telecom E) BI consumes computing power in hard disks. Therefore you require an additional hard disk (Maintenance G)
Value	Individual	Impacts people.	We increase the number of goals (customers' transaction numbers) and set it up in the system every year. (Bank C) All the numbers (producing and selling) can be counted out in an MRP (ERP). We still need to refer to it to make decisions. (Semiconductor B)
	Organization	Impacts the entire organization.	IT makes our customers more successful, brings them new services or lowers our costs. (Delivery H) It will cost too much to outsource the IT modification. (Telecom E) ERP certainly increases the performance (Maintenance G)
Decision	Intention	The strength of managers willing to use an IT.	It costs about 8 million NTD to customize the original ERP system. This affects our intention. (Agent D) You just give him/her a simple application. Users are willing to use it more often. (Bank C)
	Adoption	Decision makers choose to use an IT to support operations and management in the business.	I do not know what happened to other companies. In our company computerization is really necessary. (Semiconductor B) Our CEO always wants to know about the IT, and then decides what to do. He knows that it is necessary to have a CRM. (Bank C) We have a large amount of customer data, so CRM is important and necessary to us. (Telecom E)

VI. VERIFICATION AND ASSESSMENTS

A good assessment will help to raise the quality of a grounded theory. Urquhart et al. (2010) provide guidelines for assessing grounded theory studies. These guidelines are: 1) constant comparison, 2) iterative conceptualization, 3) theoretical sampling, 4) scaling up, and 5) theoretical integration. Their first three guidelines concentrate on the degree of conceptualization necessary to build a good theory through analytic processes. Their last two guidelines focus on extending the generalizability of the emerging grounded theory. Scaling up means the process of grouping categories into broader themes, which contributes to the generalizability of the story. Theoretical integration involves integrating the emerging grounded theory with the existing literature (i.e., with other theories in the same or similar domain). Our study meets all of their guidelines: 1) the categories have correlational and causal linkages, and we outline key concepts carefully; 2) emerging concepts directed later data collection, and we overlapped data collection with analysis; 3) we chose sites for similarities and differences in industries; 4) Scaling up is evident, and units of analysis are grouped into themes and each key concept contains a number of categories; 5) the resultant theory is discussed in context and compared with other related theories.

Glaser and Strauss (1967, p.5) originally proposed grounded theory as a method for building theory, not verifying it. Grounded concepts emerge and are suggested, not proven (Glaser & Strauss, 1967, p. 16). The resultant theory grounds its concepts from the data; It does not bring ideas to force the data, which need to be subsequently tested. While never excluding the verification of grounded theory, Glaser and Strauss suggest that, if a theory is grounded in data, in some sense it has already been verified. The result of our study, the ITA model, is grounded in data and was so assumed to be valid.

VII. RESULTS AND DISCUSSIONS

In this study, data analysis followed data collection. Data collection and analysis ceased when no additional data could be found to be adopted into the process stream, which indicated that we reached theoretical saturation. There were 158 categories and 487 subcategories or dimensions. Each category contained one to eight instances. Finally, we classified the core categories that emerged from the data into four adoption processes: motivation, solutions fitness, values, and decision stage, for a total of 18 concepts and 36 relationships (see Figure 2).

The four adoption processes of motivation, solutions fitness, values, and decision stages affect each other as follows: 1) changes in motivation cause changes when seeking IT solution fitness, 2) changes in IT solutions fitness cause changes when evaluating IT values, 3) changes in IT values cause changes when judging decisions. Motivation is an inner drive to behave in a certain way. These inner drives such as wishes, desires and goals, activate to perform actions. As far as managers are concerned, they want their organization to improve. Managers' motivations toward an organization can be classified both intrinsically and extrinsically. Intrinsic motivations are factors that consider motivations within an organization. On the other hand, extrinsic motivations are factors that consider motivations from outside an organization. An organization could be motivated to adopt IT because managers understand its potential utility or value, or because adopting IT will yield a better performance for individuals and organizations. Thus, for an organization, a manager may consider both intrinsic and extrinsic factors when adopting IT.

In the conceptual map in Figure 2, each primary concept box is numbered from 0 on the right to 17 on the left. In Sections 7 through 10, we introduce each concept and provide some data-based evidence for its existence (additional data-based evidence is provided in the appendix). We start with the concepts of intention (1) and adoption (0), and work our way backward to needs (17). We also introduce each of the relationships between concepts. Relationships are indicated with an additional digit in the naming scheme.

For example, a relationship between concept 4 and a downstream concept would be numbered 4.1 or 4.2. While there are 18 concepts, there are 36 relationships. Due to space considerations, limited evidence from the data will be presented to demonstrate each concept and relationship. Appendix A presents additional evidence for the relationships.

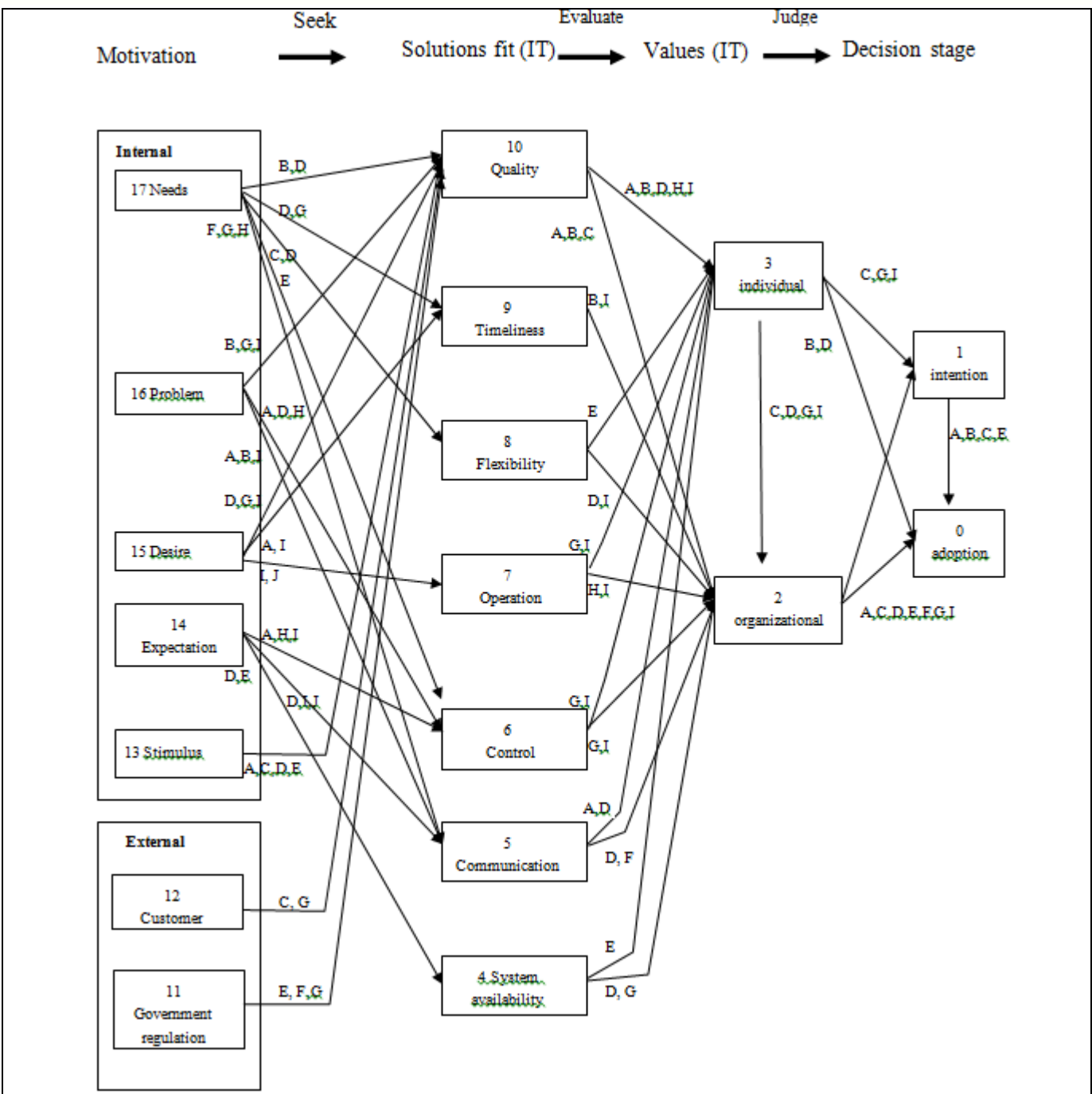


Figure 2. ITA Process Model

VIII. VALUES AND DECISIONS

Intention and Adoption

Intention and adoption are the two constructs that comprise the decision category. Behavioral intention has the robust ability to predict actual behavior, such as adoption. The same was found to be the case here. When intention becomes strong enough, adoption typically follows. In this study, all informants had already adopted the systems in question, and they justified their strong prior intentions. Informant Sport A reported: "Anyway, E-business is a necessary road for our company. The road is tough but it needs to be followed. To confront external competition, integrated information is a necessary and basic tool." Informant Semiconductor B said "I do not know what happens in other companies, but in our company computerization is really necessary."

Organizational Value and Decision

Organizational value and individual value are the two constructs that comprise the value category. Organizational value refers to impacts on an organization. Organizational impacts cover a broad range of factors, such as market share, cost, cost saving, productivity analysis, profitability, efficiency, responsiveness, coordination, flexibility, and performance.

Organizational Value and Intention

The main factor affecting managers' intention to adopt IT is cost. As the informant for Agent D reported: "It costs about 8 million to modify the original ERP system. It affects our intention." Informant Semiconductor B also explained:

In fact, we spend lots of money on IT. If you want to use an IS, you need to know what else costs the rest of time. Except for software and hardware costs, others costs affect our ability to use it. It is unavoidable to have higher employee costs, and maintenance costs.

Organizational Value and Adoption

IT brings both barriers and incentives to an organization. The main barrier for managers to adopt IT is cost. Cost affects not only managers' intention, but also their decisions directly. Informant Telecom E reported: "Every time we talk about the cost of IT, all industries will evaluate 'Is it necessary?' But it is necessary in the Telecom industry." Informant Food I explained more clearly:

In fact, the main reason is that BI [Cognos] costs less. The cost is not high. In our report, it must be said that BI could help management. Every manager could find out about his performance in a timely manner. So Cognos is adopted quickly with no delay time.

IT gives organizations a competitive advantage, which is why they are increasingly adopting IT. Informant Sport A reported:

At that time, we could not do electronic business when we look for mature IT. E-business immediately increases the competitive ability. E-business is a necessary way. It is tough, but needs to happen. In a competitive environment, an integrated information system is a necessary basic tool.

Many of the organizational value factors affecting managers' decisions found in this study have been identified in the IS literature. They include managers using IT to reduce loss and improve profitability (Sheard, 2010) realizing that IT can integrate data, keep data consistent, speed up business processes, offer timely information, and save human capital (Gable, Sedera, & Chan, 2008; Murphy & Simon, 2002; Palaniswamy & Frank, 2000; Sheard, 2010; Vesset, 2005). Managers also use IT to look for more business opportunities (Jacobs, 2006), to communicate among different locations, and to exchange and share data quickly, (Mandal & Gunasekaran, 2002; Palaniswamy & Frank, 2000; Rajagopal, 2002; Stenberg, Viteritti, & Carponcy, 1981), and to support organizational growth (Rajagopal, 2002; Shang & Seddon, 2002; Stenberg et al., 1981; Street & Meister, 2004).

Individual Value and Decision

Individual impacts cover a broad range of factors, such as usage time and frequency on a ERP system, the number of reports, avoidance of cheating and conflict, productivity, decision making effectiveness, and value as perceived by the user.

Individual Value and Intention

Individual values provide an internal reference for managers about what is good, beneficial, important, useful, beautiful, desirable, constructive, and considered as having behavioral intention, especially in the value of personal performance (productivity) and advantage. Informant Maintenance G reported:

Personal performance is related to seasonal reward, not annual. Right now it is a rule, just a certain ratio. It includes the personal finished rate (fix) because the completely fixed rate affects our revenue. Our boss intends to have this kind of KPI value in BI more frequently.

Informant Food I also explained: Our management team perceives the advantage of BI. They use rewards, motivation and reviews to increase their performance. They then have a strong intention to have it."

Individual Value and Adoption

IT's value is that it provides information to managers to help them make decisions. A decision may both benefit or harm an organization. Informant Semiconductor B reported:

We have a booking system and a sale system. We do not discuss the reasons here because both systems are simple. Most companies are the same. There is no big problem. But production and distribution are different in every company. The system we adopted emphasizes products and sales because products and sales require final decisions.

IT speeds up the business process that can increase employees' performance. It is the other main reason to adopt IT. Informant Agent D reported: "Customers need to respond quickly. When there is an emergency order, sales people want products out immediately (performance). Our system could do it. So we have it."

Many factors related to individual value identified in this study have been discussed in the IS literature, such as that IT provides important information for planning and utilizing resources (Palaniswamy & Frank, 2000; Shang & Seddon, 2002); for managing business processes (Gable et al., 2008; Siddiqui, Haleem, & Wadhwa, 2009); for monitoring, controlling, and increasing employees' performance (Boonghee, Schuler, & Sneide, 2003; Buttle, Ang, & Iriana, 2006; Jacobs, 2006; Sundaram, Schwarz, Jones, & Chin, 2007); and for increasing personal productivity (Stone, Good, & Baker-Eveleth, 2007).

Individual and Organizational Value

Individual value directly affects organizational value because organizational value depends the individuals who work to create organizational value. The more talented the employees, the better an organization's performance should be. Informant Bank C explained:

I do not think the external environment changed too much. It is still competitive. We spend more on training our employees to enhance our competition. We have a strategy. If employees have more transactions with customers, they will buy more of our products. It will increase our profit. There is no doubt. When every individual sales person sell more, the whole organization becomes better.

IX. SOLUTIONS

System Availability and Value

The solutions category in Figure 2 includes seven constructs: system availability, communication, control, operation, flexibility, timeliness, and quality. Availability refers to a user's ability to access a system, whether that be to submit new data, update or alter existing data, or collect the results of previous data. If a user cannot access a system, is the system is said to be unavailable. System unavailability may severely impact a business' operations, decrease efficiency, lessen productivity, and even weaken market position. With the emergence of e-commerce, organizations have come to depend on reliable access to computer systems at all times. Since companies and organizations rely heavily on computer systems to conduct their business, system availability's importance has increased dramatically.

System Availability and Individual Value

Individual users generally hate to wait a long time for feedback forms. Thus, a better system must respond to user's request as soon as possible. Informant Telecom E reported:

A main function of CRM could be used by many people. When somebody searches for data in the database, the system may get stuck. A CRM must handle it. Programs were written in a complex way, but the complex function must support thousands of people on line. The response time must be bearable for one user, such as 0.5 seconds. The response time must be within 0.5 seconds when one thousand people go online. The users would then like to use it.

System Availability and Organization Value

In an organization, IT may not only improve personal tasks, but also increase the organization's performance. Thus, an organization may use many techniques to increase system availability in order to support daily operations and/or future growth. Informant Maintained G reported:

We don't suggest that users get to use all the data. A user just makes his requests. If you allow every user to come and use all data, it must fail even in a large company. We run the programs at midnight in order to free resources in the day time [improve efficiencies].

Informant Agent D explained:

In the long run our legacy system could not sustain any more. The database was overloaded. So we needed to change the system and add more systems. As I remember, our system got stuck at about 2.3 billion dollars. We adopted a new system. Our performance increased. This year we expect to achieve three billion.

System availability includes hardware, software, processes and services to perform complex procedures, work flows, and tasks associated with accomplishing business requirements. A good system must be available at all times to all users, and response time must be fast. Better system availability must have the ability to support company growth (Rajagopal, 2002; Street & Meister, 2004).

Communication and Value

Organizations often have many departments that need IT for coordination. Today, increasingly more organizations create new branches as they grow. Each branch may have its own unique applications of information technology. Oftentimes, these applications do not communicate with those located in other branches or at company headquarters. These applications are sometimes referred to as islands of information. Identical data are stored in multiple locations, or straightforward processes are unable to flow efficiently. Poor communication leads to inefficiencies. To deal with these problems, companies have moved to rely more and more on enterprise IS, which integrates systems and applications across the enterprise to increase efficiencies.

Communication and Individual Value

Communications could enhance information flow for individuals. Informant Sport A reported:

We have 7 branch stores, our information goes through the Internet. I give you an example. When a customer comes in and we do not have his/her shoes size. We could look at our computer to see which branch store has. We transfer our goods. Then, shoes are sold out. Salespersons speed up sales and increase his/her performance.

Informant Agent D reported:

ERP speeds up inter-organizational communication through our work flow system. We always have urgent orders. Salespersons put order into work flow system. Work flow system will automatically send to managers to sign as soon as possible. They do not need to waste time to wait for and go on another project. This could increase their sales number.

Communication and Organizational Value

Information technology has many communication features to improve organizational efficiency, such as the ability to integrate different sites and the ability to increase the speed of communication. The first feature supports multiple geographic locations, integration, maintenance, and modification of information in a centralized organization with good computer and telecommunication technology (Hasselbring, 2000; Mandal & Gunasekaran, 2002; Stenberg et al., 1981). The second feature dramatically increases the speed of communication (Stone et al., 2007).

Good communication also improves organizational efficiency significantly when it is based on the integration of data from different department branches or systems. Informant Telecom E reported:

Integration is complex work. In the beginning, we should have concepts—how much information will exchange information when one system connects to another one. We will not have duplicate data (problems). It helps to operate more smoothly.

Similarly Informant Agent D explained:

We have three branches. In the past, branch offices used paper to communicate to headquarters via Fax. It is ineffective. Thus, we thought to build the whole processes with electronic authentication. We wanted to integrate our communication system with the work flow system.

Control and Value

Human behavior varies considerably. Making employees follow managers' directions is not easy to achieve. Managers always need to monitor and check what employees do in order to achieve organizational goals.

Control and Individual Value

Information systems can be designed to capture information about individual performance. Managers could use those performance numbers to monitor and review individual behavior. Informant Maintenance G reported:

[We have] a great method for management. At least, we show the KPI, the CEO requires more. Every month, the KPI should be updated daily." Later, Informant Maintenance G explained: "All employees need to see it. We put the rank on the first page. For employees, that is the pressure you see it shows everybody. Everybody could see the performance themselves. We also publish the poor performance. We let everybody see it. If the employees themselves do not perform well, they will fear being monitored by the managers.

Control and Organizational Value

Information technology has an information processing ability to monitor and automatically convey information whenever and to whoever needs it (Boonghee et al., 2003; Buttle et al., 2006; Jacobs, 2006; Sundaram et al., 2007). IT reduces the cost of monitoring teamwork because it is easier to track progress when the group members have a common workspace. IT provides management reports in many different forms for monitoring, tracking, and control.

Information systems can set up the rules or the KPI for managers to increase organizational value. Informant Maintenance G explained more details in the BI, which showed a bad rate of stock inventory:

If you don't know the number, you have to stock parts and you need to stock the parts for each company. If their quality is good, they should use fewer parts. Our purpose is to reduce the stock inventory to make it easy to monitor.

Later, Informant Maintenance G explained further:

Our management committee, like yesterday, we had a committee meeting. They mentioned the stock again. In the past we neglected this. Right now, the CEO monitors stock by himself. We monitor stocks since last year. We reduced the cost of the stocks by one quarter (1/4) in 4 months, decreasing from 70 million down to 45 million. The legacy system cannot use data to do that. Right now, BI could do it because it could be analyzed by brands.

Easy Operation and Value

Easy operation refers to how easy a system is to use. Managers typically prefer current, easier-to-use systems rather than legacy ones. The general management of information systems covers the completion of production requirements for reports; data processing; reviewing and analyzing job requests submitted by users; and determining, maintaining, and providing information to support individual and organizational requirements. Human interaction in information systems covers interfaces, such as ease of use and routing to use.

Easier Operation and Individual Value

Easier operation reduces barriers to use and facilitates individual usage behavior. Informant Food I explained the importance of the ease of operation:

For top managers, the interface is a very important factor. The boss does not look at the product. If he does not know how to see the results in a tool, there is no efficacy in a tool. Therefore, the tool has to focus on the view and ease of operation, a good example of which is Cognos.

Easier Operation and Organizational Value

IS researchers have long recognized that an information system's ease of use and interface can greatly influence end users' acceptance and usage of it and their competence and performance with it (Kerimoglu, Basoglu, & Daim, 2008; Schillewaert, Ahearne, Frambach, & Moenaert, 2005; Stone et al., 2007). A good interface can create a comfortable virtual environment where users can easily identify functions and aids (BT Exact, 2004), and where they can freely move around and more efficiently use the system..

For an organization, systems that are easy to use can affect value and performance. Informant Delivery H emphasized:

Ease of use is very important. Right there they report from a good architecture. In here, the system is hard to use, and does not take value of delivery. It has against the balance. It has to be easy to use so that large numbers of employees and customers can quickly pick it up and use it.

Flexibility and Value

Since markets change frequently, adopting information systems is insufficient to meet the individual or organizational requirements for future. Flexibility is the ability to adapt to fulfill the individual or organizational requirements of information systems. Thus, the impact of information system flexibility are an important factor when designing or buying information systems.

Flexibility and Individual Value

Flexibility is good for fitting individual needs, but will sometimes have negative effects. Informant Telecom E reported:

We considered flexibility in the CRM system. But we have to say “any flexibility has limitations” in reality. We wish to be more flexible, but if a system has too much flexibility, the system quality would be worse because there are too many input data and corrected data.

Flexibility and Organizational Value

An organization with flexible IT has a variety of actual and potential procedures, and it can implement these procedures rapidly to increase and improve the management capability over its environment (Satterfield, 2001). Organizations with highly flexible IT will be able to respond quickly to gain a competitive advantage over their competitors (Kerimoglu et al., 2008).

Many managers like to have the source code for their software on hand so that they can change it without waiting for the external software company to do it. Informant Agent D reported: “Because we are an agent, we wish to have the source code at the beginning. We can then modify the system as we want.”. Flexibility is also an important factor when managers consider an IS because flexibility can extend its function(s). With a new, flexible IS, managers could save resources to do more things. Informant Food I reported: “The dimensional functions of Cognos (BI) are flexible. It uses IE to operate and users could drag the reports themselves. Maybe we will write fewer reports.”

Timeliness and Organizational Value

Competitive advantage can come from being the first to respond to a given market with a product or service. Informant Semiconductor B reported:

Every company confronts the same situation. Some products disappear within one or two months. In fact, it is a reality. For example, we see the industry competition in the market. You said to customers, “I need 60 days to produce the goods.”. If other companies can do it in 15 days compared to you, you are not competitive. IT can speed up the process. Then we are more competitive.

For competition, the timeliness of information is an important factor. IT cannot only speed up the process to save time, and also can provide up-to date information to managers.

Information Quality and Value

Information quality may have many dimensions such as accuracy, completeness, and consistency. One dimension could not represent whole information quality—there is no whole measurement of information quality. Thus, in this paper, the quality of the information involves accuracy and clarity. The accuracy of the information is the degree to which information correctly reflects the real world or an event being described. Clarity of information is the degree to which information makes or describes things understandably.

Quality and Individual Value

Managers rely on correct information to make sound decisions, and managers always like to have more and more correct information. Informant Semiconductor B said:

Information, from my point of view, is very simple. Your decision will have problems because of incorrect information. I give you an example: a wafer needs many lots and costs one thousand U.S. dollars. We always order hundreds and thousands more. If the data are wrong, what happens?

Informant Food I also reported:



Some plans are on R3 (SAP R3). That is long term planning and analysis. Long term analysis looks to see whether an annual plan is reasonable or not. We refer to many parameters to do the analysis. It is possible to make wrong decisions. You need to look back to the original time decisions. It is on BI.

With accurate and clear information, managers may make optimal decisions. Informant Delivery H explained: "Now that information comes electronically, I can bring into the system call planning and can decide how many drivers. I can maximize the number of miles driven, and I can do things like safety."

Quality and Organizational Value

Information quality impacts both individuals and organizations. Accurate information may help organizations look for more opportunities and reduce stock problems. Informant Bank C reported:

In the beginning, we wrote many management reports. At first, our target was not clear. We bought a data warehouse, but we did not know what to do. So we just made reports. Our managers made the target clearer. The CRM completely analyzes the customers' behaviors. Later our managers use the CRM to look for business from the data. Wrong information may lead to organizational loss.

Informant Sport A reported: "A pair of Air Jordans costs 4000 more. When you sell such a big brand, you must have the right number and you must know the information quickly. Wrong product numbers will lead to stock inventory problems."

X. MOTIVATION

Government Regulation and IT Solution Fit (Quality)

Motivation is the last category in the model (Figure 2). It contains seven constructs, grouped by whether the motivation is external (government regulation and customers) or internal (stimulus, expectation, desire, problem, needs). Government regulation, the first of the external motivators, may force an organization to adopt IT, such as a government's laws. Governments set rules for organizations to follow, such as with stock market reporting requirements. As Informant Maintenance G reported:

Deloitte wants to check our account. We cannot provide the information because they use the ordinary way to check. They say, according to rules, you need to list a stock loss of about 10 million or more and more million. I am amazed. I say in our industry, you cannot count like this. We need to take the product life cycle into consideration and to be fairer. A machine consisted of so many parts. We have 20 more enterprise customers and thousands of machines. We will build a BOM (bill of materials) table. We could control the BOM table (by ERP+BI). A machine life cycle we know, and enterprise customers we know. According to those parts, we drag what we want from the BOM table. We then know the potential risk. This is the right way and avoids step out of the stock market.

Informant Telecom E explained more clearly: "Let us say it in telecom field. If the NCC (National Communication Committee) does not require it (a personal privacy law), no one will follow it. The security requirement is strict. We use IT to meet the NCC check."

Customers and IT Solution Fit (Quality)

In an uncertain environment, competitive pressure may come from customers. Customers affect organizations' performance. Thus, managers always like to know their target customers and that their needs are satisfied. In this study, Informant Bank C reported: "Originally we want to perform a customer behavior analysis to know our target customers. Our purpose is to increase our performance. Thus, we have CRM." Bank C explained later:

In our bank, sellers do not go out to do business like in the insurance field. They rely on calling out. Recently the customers have changed a lot. They will tell you that they do not want to get a call, but accept email. IT used to offer good Email name lists (target customers) to support sellers.

A truly customer-oriented organization closely monitors its customers' needs and expectations. Fulfilling customers' needs and expectations will lead to customer satisfaction, which is the most important element for a business to survive in a challenging environment (Ryding, 2010). Satisfied customers bring many benefits to organizations (Fornell, 1992), such as being less price sensitive, staying loyal for longer, tending to buy additional products and services, and bringing more profits and market value.

Stimulus and IT Solution Fit (Quality)

Sales people are the front line and the bottom line in a company's success. Salespeople always represent an organization when encountering customers. Stimulating or inspiring salespeople is critical for managers in an enterprise. Informant Sport A reported:

Our main competitors sell more youth and fashion products. Therefore the product cost is different. Our competitors' salesmen are more general. Their service is not as good as ours. Our sales people stay longer and are more familiar with the overall product. Our products have different sizes. Even with the same style, there are different colors. Each kind of product has one item, and one code. We can use the system to calculate every single item. Then we know clearly that our customers' sport sizes are more on there.

Information technologies not only calculate numbers, but also inspire sales people to sell more. Informant Telecom E said:

In the whole sales process you sell every product and you are responsible for every promotion. For salesmen, the only reward is a bonus. His bonus must have a record in the CRM. Your customers choose which promotion, which product, which area, or which customer group. Their achievements count in the CRM. Therefore the CRM stimulates them to do more.

Expectation and IT Solution Fit

An expectation may or may not be realistic, although it is what is considered the most likely to happen. In an organization, a managers' expectation is expressed to have an act or thing looked forward to. In the case of uncertainty, the managers' expectation is that they look forward to the future, such as how their IT will support the their organization's management.

Expectation and Control

Managers in different industries may have different prospects, but many would like to use IT to control and monitor their organizations to shield their organization against uncertainty. Informant Food I reported: "In the future, we expect to have KPI managed through BI by the department. Using a new BI tool is to direct employees, to the present, and to perform a monthly report." In the case of uncertainty, risk may be another important factor. Informant Sport A expected and controlled IT's risks. To explain, he said:

There are too many viruses. If we can't deal with them well, our system will be down because of the web system. I could not open too many functions (IT) to employees because of the computer virus. We have limited human resources. Small problem are dealt with ourselves. With more technical problems, we outsource. In the field of logistics, expecting a timely delivery of all cargo and products is a fundamental but not easy thing.

Expectation and Communication

Organizations that have many branches or stores generally want to improve communication to enhance competitive advantage. Informant Agent D said:

Our competitive advantage comes from value added services, such as doing plans for them, updating the Oracle database . . . and so on. We have many service teams. In the past we managed customers by an individual team. It is a messy situation. Data will be integrated in the system in order to enhance our competition and sell more products.

Lowering costs is one way of creating a competitive advantage, and sharing resources through communication is another. Informant Food I explained: "This is my thought, and my opinion; I feel that an enterprise group should share resources [through communication], not only human resources but also data should be shared. So we move on this way."

Expectation and System Availability

Any IT has it maximum capability. As an information system reaches its limitation, it will limit its organization's capabilities. Informant Telecom E reported:

A main function of CRM could be used by many...many users. We expect a CRM must support thousands of people online. The system cannot crash." Informant Agent D explained more clearly, "We have revenue

of about 2 billion and expect to reach three billion shortly. Our system was overloaded and could not sustain any more. So we look forward to a better system.

Desire and IT Solution Fit

Desire reflects a strong longing for good things or an eager wish to obtain them. For an organization, the basic desire is to increase profit and reduce cost.

Desire and Quality

To enhance competitive advantage, managers try to increase organizational value. Informant Sport A said: "We desire to reduce stock pressure. We judge what goods need to be promoted from the data analysis (IT). We can then rearrange our goods line to increase the commodities turnover rate."

Desire and Timeliness

Information technology can provide timely information to work with colleagues throughout the organization to solve problems. Informant Food I said: "Like closing an account [in a] timely [manner], your costs show profit when your operation improves, and you find the problems, change your way to confront the problems, and lower your cost.". Informant Sport A explained value with an example: "When a customer comes, our salesmen can recommend suitable goods from data analysis (timely). When customers feel satisfied, customer loyalty increases and they return. Thus, it will increase our revenue."

Desire and Operation

Daily operation is an essential thing for business. Managers try to improve processes to increase organizational efficiency. Informant Food I said:

Our boss thinks: our MIS always do the same things. In fact, MIS should do more meaningful things, such as improving, and having control of the operation process. Regardless of whether the operation process is smooth or not, it can still improve.

Similarly, Informant CAR J said: "We all desire the SCM to have benefits for us. Let each one be reduced in cost. Today the whole task is to save either paper or manpower. I wish that our partners lower their costs without increasing their burden."

Problem and IT Solution Fit

Problems in organizations always need to be solved in suitable ways, especially the difficult ones. Every day, managers encounter problems and make decisions. They can become stressed dealing with so many problems. However, not all problems can be solved and not all decisions can be made easily. The relationships between problem and IT solution fit are analyzed as follows.

Problem and Quality

Informants reported that their organizations have critical problems related to information quality. Informant Agent D said:

In the agent industry, we have so much bonus feedback passed to us by the original company. We sold products but it showed a minus in the accounting system. We need to compensate for it. It will be the right number. In the past we really did not know how much we sold; we only had a rough estimate. Right now we know the exact number in the new system.

Similarly, wrong numbers always confuse managers. Informant Food I said:

Every department has its views, such as an accountant who recognized the account from the financial perspectives. But sales say the goods have already sold out. It should count on performance. Our boss will inquire with the accountant: Have we earned money this month? He also inquires about sales. How much did you sell today? Did you achieve the criteria? Our boss wonders which data are correct. I gave the boss two pieces of data, but the boss could not judge it. So he relies on our department to file a report to him (BI).

Problem and Control

When managers encounter trouble, they may try to bring it under control. Informant Food I said: "In the manufacturing industry, stock inventory is always a big problem. Therefore, in this project, it is one of our goals. One

of our purposes is to control the stock inventory. We focus on stock.”. Sometimes problems occur inside the organization. Informant Sport A said: “We have problems with losing commodities. Some commodities were stolen by consumers or employees. We know that IT can help us to control it because we know which goods are correct or not correct from the computers.”. Managers typically like to monitor a situation to prevent problems occurring. Informant Delivery H said:

Because of time sensitivity, we track all packages. Take for example, a part exporter from Taiwan. We communicate information electronically. Our brokers here in the US pull down packages. I live in the wire house with many factions inside, and they are all pulled down, going through and preparing the entries for the US customer.

Problem and Communication

Information is often the lifeblood of an organization: organizations rely on information for effective communication. While communication involves information and data sharing, managers seek information technology to solve the problems of information sharing, especially for organizations with many branches and stores. Informant Semiconductor B said: “We have different stores. Thus, we always need a system to provide information—including multiple data. The most important thing is to deal with things in different places.”. Informant Sport A stated clearly: “We have many branches. In the past, we needed 30 more days to get the entire sales data (information delay problem). We want to get data in as short a time as possible and as correct as possible.”. Legacy systems do not correctly report stock loss, market change, and information delay. Consequently, managers will call for more information to solve problems or to make choices.

Need and IT Solution Fit

Need is what someone or an organization feels is lacking, necessary, or requires some action. In human beings, the famous Maslow’s hierarchy of needs includes self-actualization, esteem, love and belonging, safety, and physiological needs (Maslow, 1943). Similarly, in an organization, managers consider what an organization needs to survive or be more competitive.

Need and Quality

Managers need correct information to manage their organizations. Informants reported that they had two general types of needs: correct and specific information, and avoiding wrong information. For example, the informant from Semiconductor B said:

In recent years, most of our management is concerned with producing and selling products. How much do we want to sell? How many products do we need to make? How many have we sold in the market? The numbers can be counted in the ERP.

Obviously, the ERP can play an important role in offering the right information to managers. The informant from Agent D describes his way of avoiding wrong information as:

In the past, order items needed to be inputted, and sale items also needed to be inputted. You needed to input data everywhere, and if problems existed, you would not know about it. In the new system, you only need to input raw data. The data then flows everywhere it is needed. Therefore, any wrong data will be known (informed) immediately.

Need and Timeliness

Issues of timeliness in organizations have become even more crucial in recent years. The importance of time is critical, not only in decision making, but also in organizational effectiveness. The fast development of information technologies enables the spread of data in an organization. Informant Agent D said:

We have 3 branches. Our previous system could not operate on a web system. They need to call the main office to check stock conditions when they want to sell goods. They also need to submit papers when they want to sell goods. They send a fax to the main office and wait for the owner to sign up. We have many requirements for this part.

In today’s business, every company would like to receive cash earlier and pay cash later. This allows companies to have more cash to do business. Informant Maintenance G emphasized his company had: “Two focus[es]. One is to apply the fee; the other is monthly reports.”.

Need and Flexibility

IT was designed in part to help managers run their businesses. Thus, IT should be flexible enough to meet managers' needs. Informant Agent D reported:

Occasionally, high priority customers can cause difficulties. An emergency order comes in, the salesmen want products out immediately, and the stock managers still need to have it signed off by general manager. A conflict occurs. Our system needs to have a buffer. It will redirect orders to another manager to sign. Therefore, we need it." Informant Bank C explained more clearly, "Basically we set up our requirement in our index. You [sales] need to have certain transaction numbers. We increase the number goals and set it up flexibly in the system every year.

Need and Control

Contemporary organizations often have too much data and information that needs to be monitored. Information technology plays an important role in this aspect. Informant Telecom E reported that:

In the Telecom Industry, we have a large amount of customer data. Security is very important so we need to monitor it and set limitations. For example, a salesman keys in customer data and searches for data. The whole process is recorded. The other example is that a salesman is responsible for an industry; he only can see his customers' data. He can't see any other data.

Informant Telecom E explained:

There is an important part of the Telecom industry, namely deception. In a CRM, we must find out what possibility will lead to deception. For example, we have rewards for channels. One of our channels buys lots of goods accidentally. The system must provide alerts to avoid cheating.

Need and Communication

Communication improves access to people and information through better messages and collaboration. Informant Delivery H said:

For example; you cannot do anything without an interface. You cannot interface if you do not have interface technology. Therefore, it is two way communications. In mobile communication protocol with the ID, the communication is so important to us. Some companies are decentralized organizations. Superior businesses rely on good communications.

Informant Electronics F said:

Before, everything is decentralized. When bill purchasing was decentralized, IT was decentralized. Every division has its own IT department, its own purchasing department and accounting department. Every division has its own processes. They were surprised that there were three divisions. There would be a surprise after a week of negotiation because they didn't talk to each other. I want to mention that our divisions didn't talk to each other. We centralized many functions; we had to centralize the organization by IT.

XI. COMPARISONS WITH OTHER THEORIES RELATED TO IT ADOPTION

The technology acceptance model (TAM) (Davis, Bagozzi, Warshaw, 1989; Venkatesh, Morris, Davis, & Davis, 2003), the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), and the theory of planned behavior (TPB) (Ajzen, 1991) have demonstrated a robust ability to predict actual behavior (such as adoption) at the individual level. There are many other popular theories related to IT adoption at the organizational level, such as innovation diffusion theory, process theory, and cost-benefit. According to innovation diffusion theory, there are five categories of adopters: innovators, early adopters, early majority, late majority, and laggards (Rogers, 1962, p. 150).. Rogers (2013) added a innovation-decision process to this theory: knowledge, persuasion, decision, implementation, and confirmation. Our IT adoption processes emerged from his study: motivation, solution, value and decision. Our IT adoption processes may complement decision processes of innovation diffusion theory to provide insightful details of decision processes. Moreover, process theory allows us to trace adoption decisions at different phases. For example, Rajagopal (2002) provided six stages of ERP implementation projects: initiation, adoption, adaptation, acceptance, routinization, and infusion (Rajagopal, 2002). He describes adoption as one of the six stages, coming after initiation, and consists of choosing and deciding on the system. Despite the proliferation of studies on enterprise IS, the research examining the organizational innovation process of enterprise IS on the adoption stage is scant (Mabert, Soni, & Venkataramanan, 2003). Our IT adoption process may fill this gap with more comprehensive

processes during the various stages of the adoption process. In addition, with cost-benefits theory, some authors (Ram, Corkindale, & Wu, 2013; Shiau, Hsu, & Wang, 2009; Woo, 2007) claim that the perceived benefits of adopting ERP positively influence the adoption decision. Shang and Seddon (2000) and Basoglu, Daim, and Kerimoglu (2007) list some of the benefits, such as operational, managerial, strategic, IT infrastructure, and organizational benefits. These studies do not provide detailed information about decision processes. Our IT adoption model provides more complete processes and insightful meanings about the stages of adoption through motivation, solution, value, and decision processes.

XII. IMPLICATIONS FOR RESEARCH

In this paper, we introduce another theory of information technology adoption, and some may say that it is one theory too many. The primary difference in our emergent ITA theory compared to that of several others is that we identify our proposed constructs and their relationships by carefully following the grounded theory method. As such, when we are asked where these constructs originated, why they were chosen and not others, and why we proposed these relationships and not others, we have an answer: the constructs and their relationships emerged from analysis of the data. The final theoretical model is quite complex, and it has yet to be tested. There are many paths through the model, starting with motivations on the left-hand side, moving to solution fit, then to value, and then to decision. We show in Section 8 how the model can help explain the decision to adopt an enterprise system in the 10 organizations for where we collected data, but testing the entire model at once would be a daunting task. Instead, we suggest researchers start with subsets of the model. For example, one could start with “needs” as the ultimate independent variable and move from that particular motivational construct to the five solution fit constructs with which it has a relationship: quality, timeliness, flexibility, control and communication. Four of these (all but timeliness) are antecedents to individual value. All five are antecedents to organizational value. Individual value is an antecedent to organizational value, intention, and adoption. Organizational value influences intention and adoption, and, finally, intention influences adoption, the ultimate dependent variable. Other motivational constructs could be investigated in a similar manner, either alone or in combination with others. Should additional qualitative studies find support for parts of the model, then follow up studies could be designed for scale development, leading to the ability to test the theory in large-scale survey-based research.

Our emergent ITA theory offers a comprehensive foundation for the study of IT adoption. Our model begins with managers’ business-based motivations, which give rise to their search for solutions to business problems. Managers then evaluate the solutions they find and decide which systems to adopt. We call on other researchers to extend the ITA theory to other types of information systems, beyond BI or ERP systems. Future research could focus on other levels of analysis, from individuals to groups, industries, or nations. In addition, future research could consider different sets of managerial motivations than the ones that emerged here. Further research will be required to generate hypotheses that could be tested under a variety of circumstances. These hypotheses could be used to test the falsifiability of our ITA theory. Researchers could verify that the adoption of IT is consistent or in conflict with the theory presented here to provide an even better theoretical framework for the process of adopting IT.

XIII. CONCLUSION

This study provides a multi-year, multi-site grounded theory approach to generating theory that helps explain IT adoption in an organizational context. We collected data via many methods, including semi-structured and unstructured interviewing, field notes, meeting notes, documentation reviews, and observations. The theory described in this paper provides a relatively comprehensive answer to the research question: “What is the nature of IT adoption?” The resulting theory posits that the IT adoption model of the MSVD process (motivation, solution, value, and decision—top of Figure 2) developed from, is grounded in, and emerged from the data. The results of this grounded theory approach meet all assessment criteria required by Urquhart et al. (2010) and the verification procedure outlined by Glaser and Strauss (1967).

To deal with their needs, problems, desires, and expectations, and to inspire sales people, customers, and government regulation, managers seek IT solutions. IT solutions have many properties, including quality, timeliness, flexibility, ease of operation, control, communication, and system availability. IT solutions impacts both individuals and organizations. The impacts of IT solution fit on individual value include accurate information for decision making, information for resources planning, flexibility of management to help business processes, information for managers to monitor, control, and increase employee performance, communication to integrate, exchange and share resources, high system availability for concurrent use with rapid response, and friendly operations for individual users to increase personal productivity, and for individual managers to view and manage easily. The impacts of IT solution fit on organizational value include providing more business opportunities, rapid access to accurate information for making decisions to reduce losses, managing inventory, and improving profitability. Managerial motivations inspire managers to seek suitable IT solutions, which, in turn, shape IT-related individual and organizational values. These values influence each other, and they jointly influence both the intention to adopt IT

and the adoption decision itself. In the end, If managers perceive that IT has value, they will signify their intent to adopt it and eventually actually adopt it.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:

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APPENDIX A: ADDITIONAL EVIDENCE TO SUPPORT THE THEORY

Intention and Adoption

Informant Bank C explained: “Our CEO always wants to know about IT, and then decide what to do so he knows that it is necessary to have a CRM.”. Informant Telecom E also said: “We have so much customer data, so CRM is important and necessary for us.”.

Organizational Value and Intention

Informant Bank C stated: “Our CEO wants to know more about IT and how to use it. We always develop it by ourselves; such a case is about 200 million. The project is about 2–3 years. We will consider it more.”.

Organizational Value and Adoption

Informant Maintenance G also explained: “Normally, although it could be done wrongly, I also consider problems, such as the management budget, and continuous cost, all of which need to be considered.”. Informant Food I also explained performance further: “Performance! It is the most important thing the boss wants to see. How can we integrate because we have more branches (company) coming?”.

Informant Sport A explained:

About the value of e-business comes from enhancing our competitive advantage. Electronic businesses also get real time information to solve problems, have more chain stores, and integrate purchases, sales and accounting data and customer management. It has so many benefits so why don't I use it?

Informant Electronics F reported:

We are cost saving for the whole productivity game. One thing is very true, and I am convinced that we are in the system, and we have this here with about 3 and half million dollars saved, almost 4 million dollars saved, and try to expect that we have 20 million dollars saved. I'm convinced it will double, and our saving for you is in the future. It is over the head of the company because we have one system.

Later, Informant Electronics F explained more clearly:

And then you decided you have 20 million dollars to invest, and I made a 20 million dollars investment. You want to fit the benefit, and you want a return on all of the investment. We calculated every return over about 3 years for that 20 million dollar investment, in productivity and cost saving.

Informant Maintenance G explains how to persuade management to adopt IT:

In the proposal, you need to say what performance you achieved when you spent that money and when I remember to write the goal. You promise to achieve a certain goal. They will give you support. Let top managers recognize at their feeling is OK. Finally, they still asked me to do a cost benefit analysis. You need to tell them what to achieve at a certain cost.

Informant Food I said a similar thing:

Like the BI, the Cognos always has an updated version. The new virtualization is very good. We consider to update, but how about cost. We will tell our boss, 'The tool is very good, and you will have advantage, you just sit here and monitor it.' We need a budget and wish to provide information in a timely manner. When I have a meeting with top managers, do overall presentations, with more details and an analysis of reports agree?

Informant Bank C also explained:

First, with CRM, our sales promotion has targets. Second it provides to our customers the products that they want. It also motivates our marketing people to think more about what they can do. Third, we always take a look at how much a business unit earned. There is no doubt about it. Right now we want to know how much a customer earned in our company.

Informant Telecom E reported another benefit:

Like what I said before, management IT could increase the revenue and reduce the loss, and then decrease the cost. For example, if your cash flow increased from 50% to 70%, you will know whether it is worth investing in IS or not. We enhance forward management, informing customers to pay in time, to reduce the loss of millions of dollars or more.

Similarly, informant Bank C gave an example to explain more: "Our investment in IT is sales oriented. Sales direct CRM. Sales need IT to store the customers' data. We did data warehouse from a credit card. Our credit card numbers increased from 300 thousand to over one million." As managers consider future benefits, they may cooperate with a partner (company) or get into other market. Informant Agent D reported:

We use their ERP system and they sell our products when they sell ERP products. We think that we will have more cooperation in the ERP project. We are an agent of IBM and they adopt our products. Therefore, we have some cooperation. We also co-work to have some conferences.

Informant Sport A also explained: "Our target is mainland China, the Asian market and other markets. We adopt IT to support out management, and then expand to international markets."

Individual and Organizational Value

Informant Sport A reported: "There are so many competitors in a small area. We need to enhance our competitive ability." As operational processes become computerized, a company may consider reducing employee costs. Informant Maintenance G reported: "The ERP cost us more than 20 million and BI. In fact, we reduced employees in other departments; and we certainly increased performance and have something instead. Some work could then be replaced."

Communication and Organizational Value

For an organization, good communication allows human resources to do other things. Informant Agent D reported:

Our legacy was in a mess. Every department developed for his requirements and had his own database, such as customers' data. Every department had its own. Data was not consistent with each other. Therefore, we decided to use ERP as a common platform. If you want data, go to ERP. If you want to change it, go to ERP. Keep the data consistent. We do not waste human resources in every department. We then have more manpower to do business intelligence (BI).

Individual and Organizational Value

Informant Agent D reported: "We support sellers to go ahead and then sellers will have a better performance. Salesmen always get rewarded by sales number. You know that we are a profit center. They earn more and we

(company) get more.”. For the IS department, managers always want MIS to have more value in their organization. Informant Food I reported:

Our manager always thinks: our MIS always does the same things. In fact, the MIS should have more meaningful things [value], such as improving the control of the operation process. Regardless of whether the operation process is smooth or not, it can be improved.

Increasing one’s performance could increase the organizational value. From another point of view, decreasing one’s cost also increases the organizational value. Informant Maintenance G gave an example to explain more clearly:

Reporters of CPC [Chinese Production Center] came to interview us. I gave her a number. Before the system makes reports automatically, we have 110 reports to do. These outputs included monthly, weekly, and daily reports. If one took cost 30 minutes, you can count out how much man power we needed. We saved at least 10 persons.

Customers and IT solution fit (quality)

After customers use products or services, their satisfaction is very important due to long term organizational performance. Informant Bank C said: “We have a certain strategy. That is all the CRM said. If users have transactions with you in the long run and are satisfied, he will buy more of your products. It will increase our profits.”. In the same way, Informant Maintenance G reported:

We care about customer satisfaction. According to our maintenance records, we outsource a survey about customer satisfaction. After finishing a survey they will give us the satisfaction number of customer. We build it into our BI. For example, our BI has KPIs. When an employee login, he will see his performances in the core KPIs [for example, the customer satisfaction index]. The top two means 8 -9 points which have 79 percent. You see in the middle 5-7 points about 21 percent.

Stimulus and IT Solution Fit (Quality)

Informant Agent D gave an example to explain more:

Salesmen always get rewarded by sales number. You know that we are a profit center. We count reward at the end of this month. So they always want to achieve clear numbers. For example, if the sales numbers are within his ability, he will do his best to obtain the rewards at the end of this month. If the number exceeds his ability, he will know it is impossible. In the past, we did not know the real numbers. We solved this problem in the new system. We can see it and search for relevant data immediately.

Control and Individual Value

Similarly, Informant Food I reported: “The IT technology [BI] could show sales’ performance, and you could see how many customers he gets. You also can see his target. Does he achieve his target? You could see how many sales he could do.”.

Control and Organizational Value

Informant Food I reported:

We have profit center, but if there is no reviewing reports of IT, it is useless. We look back at why the new team grows more quickly and the old team receded. For example, if the products line is not enough, we will review the RD department.

Easier Operation and Individual Value

Informant Maintenance G reported: “For analysis, they [managers] are used to Excel. They hope data is changed to an Excel file format, which is user friendly, and the Excel files are more easily edited.”.

Easier Operation and Organizational Value

Informant Food I gave an example to explain further:

Our operation team is good at using BI to train and review sales due to its friendly interface. For example, he will decide that a new product needs to be deployed in an area. Why do you only deploy at these

locations, why can't you deploy more and more on a transactional level. Through this system [BI], we could perform review sales weekly, talk to sales team and increase their performance.

Timeliness and Organizational Value

Informant Food I said:

We taught them to use the BI tool, connect the data and do real time analysis. Let a user finish a report quickly, and that report should be sent daily. Through the big tool, it connects more than 20 more Excel tables. You define and store it, and when you update data it will send out the new report immediately to management.

Quality and Individual Value

Informant Sport A reported:

Our single item management is different from others. Because we have saved different style colors, every item has its code. A single item is calculated [by IT]. We then know that our customers' sizes clear more clearly. Which products to focus on? I can then use this information when I decide to order goods.

Informant Agent D explained further:

Like IBM products, we still need to make orders every season. We need to analyze the historical data in order to make an order. When a salesman wants to make decision, he also needs to see the reports in the system to see what products the customers bought and why and when they need them.

Quality and Organizational Value

Informant Semiconductor B explained:

If he wants to rely on a system, he must have lots of experience and be familiar with the flow of the data warehouse. Managers make the decisions without complete information. I believe it will lead to much stock inventory.

Government Regulation and IT Solution Fit (Quality)

Similarly, Informant Electronics F reported:

This affects our company in New York, I think they released in 1999 and for us really to implement the AAA Tax, which is the regulation in our company, and then of course, it may be even more important to have a financial, lecture system, and a financial system that is reliable, traceable, and could be audited.

Customers and IT Solution Fit (Quality)

Informant Maintenance G said:

You know we serve many enterprises. We have so many places to take care. Every manager wants to see our reports. You will work until you die without a system providing reports. Every time we want to apply a fee from our customers [enterprises]. They want the diagnoses of their products. Just like doctor in the hospital needs to record the sickness of patients. You did maintenance. You need to record how to solve the problems, what parts you used and all you have done. Our customers [enterprises] want these.

Stimulus and IT Solution Fit (Quality)

Similarly informant Bank C said:

In the past, we call up customers directly. Right now it is totally different. Two or three years ago, we mailed a DM to customers and invited customers to our branch to get a gift. We also offer name list [by IT] to branch office. Branch channel waited for customers. The out-bound seller will try to contact with customers. The out-bound seller will ask branch sellers to contact valid customers.

Informant Bank C explained more in the later interview: "IT offers better name lists. Sellers feel excited when they have a higher success rate. It will motivate sellers to go ahead. Then seller will have a better performance."



Expectation and Control

Informant Delivery H explained:

For instance, in Europe and Asia, how many packages are shipped, this is for one piece and two piece shipments. It has a tracking number with individually unique pitch labels. And it is therefore unique in the world, allowing them to go into this system and give the supply chain in the building. So we can tie packages to the shipment and the shipment to containers, the containers to trains, planes, and we can track many features all the way to DC, distribution centers, all the way to the end consumer. They will all be built in this building system.

Expectation and Communication

Similarly, in order to get competitive advantage, it is necessary to win customers' favor through competitive prices. Informant CAR J said:

We expect the SCM [improving communication] lowers our cost. For the competitive niche, the first one is price, the lower price [based on cost]—give us a competitive advantage [unless his price wins, or his quantity is larger]. Even though the quality is a little poor, the vendor will try to help to reduce cost. Therefore, cost is the most important factor.

Food I Informant explained: "We brainstorm about where to go in the future. So why do we choose SAP? We expect to integrate all groups [enterprise] in the long run."

Desire and Quality

Informant Maintenance G explains in a high tone:

Our system tells us what number to order. All the money is cash due to the reduction of stock. This is what our boss wants. It is strange that we did not earn more. Why did our cash increase? Our cash increased quickly. Oh, that is our bill. We order less, pay less, and then our cash accumulates. Suddenly we have 20 million more than before in cash.

Desire and Timeliness

Informant Food I explained further: "The profit margin is about cost, lowering cost. In manufacturing, why does the unit cost fluctuate largely? That is profit margin."

Problem and Quality

Informant Maintenance G also said the same thing:

There is only one result, not two results in the world. That is why we have same language in the whole company. You do not talk to me so that you could analyze another result. The purpose is to fit into a table, which is the standard. There is only one standard in the whole company. Everybody files the same reports. Do not let one give him one report, while the other gives him another. In the past, it always happened like this. The CEO wonders what happened. Which one is right? Which one should I look at? So our CEO wants BI to show up above ERP. There is only one set of raw data [source]. You do not all argue with each other anymore. You just look at these reports. Who should be responsible for just looking at the information? It saves time. Therefore everybody is afraid of poor performance.

Concerning performance, Informant Sport A emphasized: "We have problems with moving goods between our stores. In the past, we could not do it. Right now our branches can get which store has stock from the computer (right number). IT can help us to sell more."

Problem and Control

Managers and employees sometimes forget to do something. In this situation, people need to be reminded to do things. Informant Agent D said:

Overdue receivables and lending products are always problems. In the past, we needed to download data and check the legacy system one by one. Now, the new system will automatically send out data on overdue receivables and lending products every Friday to let the salesmen know what they should do. We can then reduce overdue receivables and increase our cash flow.

Problem and Communication

Similarly, Informant Food I said:

The earlier MIS system was developed by us. It was not an open platform. At that time, the internet had just begun, our data was located everywhere, and we had set up in every location to collect data. We used a modem to dial up and send data back, and later, we set up the framework network. Every location was connected to this framework. Many years later, Hinet (ISP) promoted 512 K (peer speed) ADSL. We tried it and found the quality to be OK. Therefore, we set up at 32 locations. All data was sent back to one server [central location management].

Need and Quality

Informant Telecom E explained further: Basically a system must have a mechanism to avoid errors to ensure information quality. It must be involved in system design. For example: an ID is filed digitally. You cannot type characters. The system should verify it.”.

Need and Communication

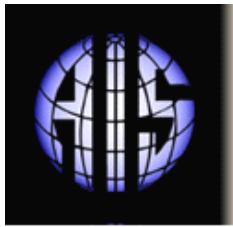
Informant Maintenance G said: “Traditionally, we did fax and remote operation for our business.. Now we do most business processes on the web, even in the internal processes. For example, when you are in Japan or you travel on official business to Japan or mainland China. The only thing is going on the internet. You could apply to sign in and check out the fee.”.

ABOUT THE AUTHORS

Wen-Lung Shiau is an associate professor in the Information Management department of Ming Chuan University, Taiwan. He received the MS in Computer Science from Polytechnic University, New York, U.S. in 1995 and the PH.D. from the Department of Business Administration, National Central University, Taiwan in 2006. His current research interests include Cloud Computing Services, Information Technology adoption and diffusion, Networking, and E-Business. His papers have been published or accepted in *Computer Communications*, *Industrial Management & Data Systems (IMDS)*, *Behaviour & Information Technology*, *Computers in Human Behavior*, *Scientometrics*, among others.

Joey F. George is Professor of Information Systems and the John D. DeVries Endowed Chair in Business in the College of Business at Iowa State University. His research interests focus on the use of information systems in the workplace, including deceptive computer-mediated communication, computer-based monitoring, and group support systems. He is a past president of the Association for Information Systems (AIS), and in 2008, he was selected as a Fellow of AIS.

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