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Enterprise information technology organizational flexibility : managing uncertainty and change

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ABSTRACT

ENTERPRISE INFORMATION TECHNOLOGY ORGANIZATIONAL FLEXIBILITY: MANAGING UNCERTAINTY AND CHANGE

by
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Chief Information Officers (CIOs) lead enterprise information technology organizations (EITOs) in today's dynamic competitive business environment. CIOs deal with external and internal environmental changes, changing internal customer needs, and rapidly changing technology. New models for the organization include flexibility and suggest that CIOs should create and manage an enterprise IT organization that is more flexible in order to manage change and prepare for uncertainty, but they do not define what is meant by flexibility.

The first objective of this exploratory and ethnographic research study was to understand how uncertainty and unexpected change are currently managed by CIOs. The second was to develop a systematic definition of enterprise IT organizational flexibility. The third was to explore the potential value of a proposed 'enterprise IT organizational flexibility framework' to be used by CIOs to better manage uncertainty and unexpected change. Rich research data was collected in an exploratory ethnographic study from in-depth interviews with twenty CIOs. These participants included a diverse representation from large to small enterprises, different industries, and with a variety of IT education and functional enterprise experiences.

The conclusions from this study included a clearer understanding of the CIO's leadership role when managing uncertainty and unexpected change, a definition of enterprise IT organizational flexibility with three aspects: anticipation, agility, and adaptability, and a framework for enterprise IT organizational flexibility assessment and development.

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by
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To my family and colleagues

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CHAPTER 1

INTRODUCTION

> *"As economic and organizational changes occur, CIOs must change their IT management approach. Therefore, CIOs must have the flexibility to modify IT strategy to meet changes in the business environment,"* (Leidner, Beatty, and Mackay 2003, p. 13.)

1.1 Objectives and Scope

The goal of this research was to evaluate the potential systematic integration of flexibility into the enterprise IT organization by chief information systems (CIOs) to be used to better manage uncertainty and unexpected change. The enterprise IT organization has evolved from a backroom support function to a strategic business partner in information-intensive enterprises that use information technology to add value to the enterprise and to provide competitive advantages. While the enterprise IT organizations support enterprises, some are market leaders in their industries while others are struggling to survive, they also operate within dynamic business environments. Both competitive and struggling types of enterprises require evolving and innovative IT services, products, and applications to remain or become competitive (Shin 2007, Zhuang 2005, Santos and Fjermestad 2002, Luftman 1996, Malhorta 1993, Tushman and Nadler 1978). This increasing reliance on information technology is changing the way enterprises do business leading to economic and social change. Global organizations require intense sharing of information to allow cooperation, coordination, and teamwork in partnerships and strategic alliances (Biehl 2007, Santos and Fjermestad 2002, Benamati and Lederer 2000, Dhillon and Hackney 2000, Chakrabarti 1993).

According to Purser and Passmore (1992), technological, economic, and social change create turbulent business environments, which result in a high degree of unpredictability, which then leads to environmental 'uncertainty' (Scott 1992, Burns and Stalker 1961). A key aspect of highly competitive, rapidly changing, dynamic environments is 'environmental uncertainty' (Scott 1992, Burns and Stalker 1961). The environment significantly influences the structure of an organization through both externally business-driven and internally technology-driven business influences (Purser and Passmore 1992). Research studies in business management, engineering, and social sciences have identified different approaches to managing uncertainty and interacting with the environment, including waiting for uncertain events to happen and then reacting to the events, or being more proactive by anticipating and preparing for the uncertainty before it occurs (Sambamurthy, Wei, Lim, and Lee 2007, Benamati and Lederer 2001,2000). Benamati and Lederer (2000) described these two approaches as 'environmental determinism,' where the environment dominates the organization, requiring the organization to react to problems caused by environmental changes or 'strategic choice,' where the organization interacts with its environment and takes proactive action to minimize negative impact and create opportunities from environmental changes.

Dynamic business environments will continue to impact the use of information technology as information technology becomes even more critical to the success of the global competitive organization. Leidner, Beatty, and Mackay (2003) concluded that, since uncertainty and change are continuous, even in declining economies, CIOs must both manage a cost-effective enterprise IT operation organization and support the

changing technology needs of their functional business customers by integrating multiple IT solutions into the enterprise.

CIOs are the functional leaders of the enterprise IT organizations, which provide IT services, products, and applications to enterprises in an uncertain and changing competitive environment. Some have speculated that one way to better manage change and prepare for uncertainty is for CIOs to create an enterprise IT organization that is more flexible (Leidner et al. 2003, Kanter 1994). But, what is meant by 'flexibility?' A search of organizations, management, and information systems literature found that the terms 'flexibility' and 'IT flexibility' are both ambiguous and complex (Sushil 2001, Volberda 1998, Upton 1994, Knoll and Jarvenpaa 1994). There is no commonly understood definition for 'IT flexibility.' A flexible IT network (scalable, services-based architecture) has a different definition than flexible software (mass-customizable). Is a flexible IT employee one who ignores the organization's operational procedures and is considered a maverick or one who recognizes opportunities when customers change their business needs? Business literature includes articles on organizational change and how to design and manage the 'new flexible firm' (Volberda 1998, Kanter 1994, Peters 1992, Senge 1990, Peters and Waterman 1982), but there is little theory on 'enterprise IT organizational flexibility.'

Flexibility has been successfully used within the manufacturing industry and with software development for over the past fifteen years (Sushil 2001, Sethi and Sethi 1990, Goldman, Nagel, and Preiss 1995). Could flexibility theories and knowledge from manufacturing and software development be adaptable to the enterprise IT organization? The first objective of this research study was to determine how CIOs currently manage

uncertainty and unexpected change in dynamic business environments. The second objective was to develop a systematic definition of enterprise IT organizational flexibility. The third objective was to determine if the use of the proposed framework for enterprise IT organizational flexibility would help CIOs to lead the enterprise IT organizations to do three things better:

- plan for expected changing business needs as well as prepare for unexpected changes
- leverage opportunities and minimize threats when unexpected changes do occur
- learn from dealing with unexpected experiences and identify ways to adapt the enterprise IT organization as necessary to meet new challenges.

1.2 Motivation

Enterprise IT organizations operate within dynamic business environments where managing uncertainty and change are critical enterprise IT management skills. CIOs must deal with impacts from external business environmental changes, the changing needs of the internal and external customers, and the rapidly changing technologies. Research studies that recommend the enterprise IT organization be more flexible do not define what is meant by 'being more flexible' or 'how to introduce flexibility' into the organization (Leidner et al. 2003, Kanter 1994). Among existing studies, there has been little theoretical advancement regarding aspects of enterprise IT organizational flexibility including: specific definitions, impacts of environmental uncertainties on the enterprise IT organization, specific factors that enable or inhibit enterprise IT organizational flexibility, and competitive aspects of enterprise IT organizational flexibility.

A motivation for this research was to study how a flexible enterprise IT organization – one that has the ability to transform itself, rapidly respond to opportunities, and make adjustments as necessary –manages change and copes with uncertainty as compared to a more traditional enterprise IT organization? One goal of this research was to demonstrate that enterprise IT organizational flexibility can be analyzed and introduced systematically into the enterprise IT organization.

The conceptual flexible enterprise IT organization requires three major characteristics, including 'environmental awareness' of uncertainties and change, increasing 'speed of response' (agility), and increasing 'innovation.' Innovation involves taking advantage of potential opportunities by developing new enterprise IT services, products, and applications from existing technologies, implementing new emerging technologies, reengineering processes and procedures, and educating enterprise IT employees (Lyytinen and Rose 2006, Hatum 2000, Roepke, Agarwal, and Ferratt 2000, Pennings and Harianto 1992). A measure of success for a flexible enterprise IT organization is its ability to focus on the needs of its customers to be competitive by adding IT value (Davern and Kauffman 2000, Brown and Eisenhardt 1997, Hitt and Brynjolfsson 1996). Therefore, a common understanding of flexibility would be useful for developing a flexible enterprise IT organization. Also, a framework, defined as a set of assumptions, concepts, values, and practices that constitute a way of viewing reality (Whitman, Liles, Huff, and Rogers 2001), would also be useful for developing a flexible enterprise IT organization.

The proposed framework for an enterprise IT organizational flexibility, developed and evaluated during this research study, provided a means of explanation, focus for

discussion, basis for analysis and design, and a baseline for process improvement (Whitman et al. 2001). This proposed enterprise IT organizational flexibility framework is one approach to providing a common understanding of enterprise IT organizational flexibility and determining how to achieve future enterprise IT organizational flexibility benefits.

The research problem and proposed solutions are summarized as follows:

- *Problem domain*: Managing and dealing with uncertainty and unexpected change within the enterprise IT organization.
- *Proposed solution*: Introducing organizational flexibility in a systematic manner into the enterprise IT organization. Developing a framework for enterprise IT organizational flexibility based on organizational flexibility theories and the knowledge gained from manufacturing and software development flexibility experience that can be adapted within the enterprise IT organization.
- *Purpose of research*: Understanding how CIOs think about and use flexibility within the enterprise IT organization when managing in dynamic business environments and evaluating a proposed framework for enterprise IT organizational flexibility that is based on CIOs' actual and perceived needs to better manage change and prepare for uncertainty.
- *Research method*: Conducting an ethnographical field study using in-depth interviewing with CIOs.

1.3 Research Question

The following research question, assuming that flexibility can be introduced systematically into an enterprise IT organization, is the focus of this research study:

How do CIOs think about and use flexibility within the enterprise IT organization when dealing with uncertainty and unexpected change?

Flexibility and several closely-related terms – *anticipation, agility, and adaptability* – have characteristics and attributes that would be useful for CIOs to improve the management of uncertainty and unexpected change. Birkinshaw and Gibson (2004) called organizations ambidextrous that have both the separate but complementary capabilities of *alignment* and *adaptability.* Patten, Whitworth, Fjermestad, and Mahinda (2005) expanded the concept of an ambidextrous organization by combining three distinct organizational capabilities — *anticipation, agility, and adaptability* — into a conceptual enterprise IT organizational flexibility framework. Anticipation balances planning for expected change with preparing for the unexpected. When something unexpected occurs, agility is recognition of the change, an analysis of immediate alternatives, and rapid response to the unexpected. Then, based on the experiences and acquired knowledge from dealing with the unexpected changes over time, adaptability is the capacity to self-learn and self-organize to improve performance. The cycle starts again with anticipation and becomes a continuous process. Lee, DeLone, and Espinosa (2006) also recommended that three aspects of flexibility – *agility, adaptability, and alignment* – be applied to supply chains to allow them to adapt to market changes. Patten et al. (2005) considered *alignment* to be a critical element of *anticipation.*

1.4 Conclusions and Contributions

This research study used an exploratory qualitative inquiry process recommended for understanding organizational, social, or human issues (Patton 2002, Creswell 1994). In-depth qualitative interviews were conducted with chief information officers (CIOs), who are experienced and knowledgeable about the problem domain. This method was selected as the best way to determine how unexpected and expected changes influence the enterprise IT organization.

We believe that the findings from this exploratory qualitative research study and the written narrative make a substantial contribution to our understanding of how CIOs currently deal with uncertainty and unexpected change as compared to managing expected change. This study:

- Identified CIO recommendations to manage uncertainty and unexpected change in dynamic business environments.
- Developed a clearer understanding of the role and impact of different activities within the enterprise IT organization affecting each of the three aspects of flexibility - anticipation, agility, and adaptability.
- Determined how each aspect of enterprise IT organizational flexibility improves the enterprise IT organization's ability to deal with uncertainty and expected change as well as expected change thus potentially improving the performance of the enterprise IT organization.
- Collected CIO reactions and feedback about the specific components of the 'enterprise IT organizational flexibility framework' resulting in a more useful framework as a result.

This study concluded that 'enterprise IT organizational flexibility' does have benefits. Therefore, a common understanding of flexibility is useful for developing a flexible enterprise IT organization. Also, the enterprise IT organizational flexibility framework, modified through the CIO feedback and defined as a specific set of assumptions, concepts, values, and practices that constitute a way of viewing reality also would be useful. Dynamic business environments will continue as information technology becomes more critical to the success of the global competitive organization. And, as Leidner et al. (2003) concluded, that since uncertainty and unexpected change are continuous, CIOs in this study agreed that they do need to consider the potential benefits of a flexibility organization.

CHAPTER 2

REVIEW OF THE LITERATURE

> *"Complex problems involve uncertainty, incomplete diverse sources of information, multiple logical and situational factors, and competing demands from numerous stakeholders. When solving complex problems, one must consider exploring the problems because no fixed path or single right solution exists. The unpredictable and the predetermined unfold together... Each [action] sets up the conditions for the next, [and] the smallest variation blows prediction apart."* (Stoppard, Tom, 1993, p. 47-48.)

2.1 Problem Domain: Managing Uncertainty within the Enterprise IT Organization

As enterprises operating in today's dynamic and turbulent business environments struggle to increase their business and achieve a sustainable competitive advantage, they also have increased the use of information technology (IT) (Santos and Fjermestad 2002, Luftman 2000, Malhotra 1993, Tushman and Nadler 1978). This increasing reliance on information technology is changing the way companies do business leading to economic and social change. According to Purser and Passmore (1992), technological, economic, and social change create turbulent business environments, which result in a high degree of unpredictability, which then leads to environmental 'uncertainty' (Scott 1992, Burns and Stalker 1961). Malhotra (1993) further describes a form of IT paradox where IT solutions lead to increased 'complexity' and 'uncertainty' in the environment, thus raising the demand for more advanced IT. Businesses then use more advanced IT in increasingly more sophisticated ways to be more competitive. As a result, the enterprise Information Technology (IT) organization is becoming a key strategic business partner

within the enterprise and CIOs must face the problem of managing in turbulent business environments. One solution, to the problem of managing in turbulent business environments, is to align the enterprise IT strategy and operations with the enterprise business strategy to better support the business strategy (Luftman, Bullen, Liao, Nash, and Newmann, 2004, Luftman 2000, Brown and Magill 1994, Knoll and Jarvenpaa 1994, Broadbent and Weill 1993, Chan and Huff 1993, Henderson, Thomas and Venkatraman 1992). However, this alignment of the enterprise IT strategy with the enterprise business strategy is just the first critical step to success because the business is constantly changing and the enterprise IT services, products, and applications must be kept up to date in a changing and uncertain competitive environment. This leads to the problem domain of preparing for uncertainty and unexpected change and managing expected change by the CIO. Another possible solution is to create an organization that is more flexible. But, what is meant by "flexibility?" The purpose of this chapter is to report on a search of the academic literature to learn how CIOs currently manage uncertainty and unexpected change as well as expected change and in what ways the CIOs could better support the enterprise in turbulent business environments. Specifically, this literature review focused on the following areas:

- Considering the enterprise IT organization as a socio-technical system, how is this organization defined and what are its main components?
- Which theories about managing the impacts of environmental uncertainty on the enterprise can be applied to the enterprise IT organization? What are the current enterprise IT organizational management practices for dealing with uncertainty and unexpected change as well as expected change?

- How do organizational flexibility theories apply to the management of uncertainty and unexpected change as well as expected change? Do they apply to the enterprise IT organization?
- Is there a perceived need for enterprise IT organizational flexibility? Does a gap exist between the perceived and the actual need for enterprise IT organizational flexibility? How is flexibility currently being used by the enterprise IT organization? What specific factors enable or inhibit enterprise IT organizational flexibility?

The analysis section of this chapter discusses gaps in the research literature concerning the problem domain and potential solutions to the problems. Based on the analysis of the problem domain, the following section describes theories concerning an IT organization as a social-technical system and describes the components necessary to make up the enterprise IT organization. The next section describes theories and models related to organizational uncertainty and unexpected change resulting from dynamic business environments. The literature review then describes flexibility and related aspects of anticipation, agility, and adaptability theories and models. Section 5 discusses the various gaps and implications within the academic literature. It discusses a systematic definition of flexibility, referred to as the 'Enterprise IT Organizational (EITO) Flexibility Cycle,' including three aspects of flexibility – anticipation, agility, and adaptability, which are evaluated in this study. A proposed framework for 'Enterprise IT Organizational (EITO) Flexibility' was also developed for this research study, which mapped the flexibility aspects of anticipation, agility, and adaptability to the key components of the enterprise IT organization. The last section of this chapter proposes a

research model and a series of exploratory research questions to study the potential contributions of a systematic definition of enterprise IT organizational flexibility. It also discusses the potential benefits of integrating enterprise IT organizational flexibility into the enterprise IT organization using the EITO flexibility framework.

2.2 The Enterprise IT Organization as a Socio-Technical System

This section describes theories and models that relate to the enterprise IT organization, systems theory affecting the organization, and one type of system's approach, called the 'Web of System Performance (WOSP)' model.

2.2.1 Description of the Enterprise IT Organization

Organizations, such as the enterprise IT organization, should be studied as a socio-technical system (Whitworth, Fjermestad, and Mahinda 2004, Whitworth 2003, Whitworth and Zaic 2003, Alter 1999). Socio-technical organizational systems include operational processes and people, as well as organizational policies and rules. Additionally, these systems are affected by the external environment (Sommerville 2004). System-wide emergent properties are an essential characteristic of socio-technical systems. These emergent properties are dependent on the system components and the relationships among the system components. Since the performance of these properties must be evaluated as a whole entire system, the organizational objectives of a socio-technical system depend on the system as a whole and must consider all aspects and relationships among the components of the system. Therefore, the enterprise IT

organization as a socio-technical system was initially described to include three major components:

- *IT governance* – includes a description of how the organization is structured based on specific decision rights and accountability framework for IT-related behaviors (Luftman and Kempaiah 2007, Luftman, Kempaiah, and Nash 2006, Weill and Ross 2005, Kohli and Devaraj 2004, Sledgianowski, Luftman, and Reilly 2004, Reich and Nelson 2003, Agarwal and Sambamurthy 2002, Luftman 2000).
- *IT personnel* – includes the knowledge, capabilities, and skills of enterprise IT personnel and their relationships with peers, customers, vendors, and partners (Lyytinen and Rose 2006, Byrd, Lewis, and Turner 2004, Reich and Nelson 2003, Lee, Trauth, and Farwell 1995).
- *IT infrastructure* – includes the technology architecture, networks, hardware and software (Chanopas, Krairit, and Khang 2006, Lindstrom, Johnson, Johansson, Ekstedt, and Simonsson 2006, Ross 2003, Weill, Subramani, and Broadbent 2002, Byrd and Turner 2001, Broadbent, Weill, and St. Clair 1999), as well as the technology services, products, and applications provided within the enterprise and externally to the enterprises customers (Hirschheim, Schwarz, and Todd 2006).

Table 2.1 describes the attributes of these enterprise IT organizational components including related theories and models.

Table 2.1 Enterprise IT Organizational Components

Enterprise IT Organization		
Organizational Component	**Description / Attributes**	**Enterprise IT Organization Theories and Models**
Governance	Leadership, organizational, and decision-making processes Organizational structures Strategic and tactical planning; alignment of the IT strategy with the business strategy Executive management processes: • Financial management • Risk management • Change management.	(1) Organizing principles for the IT function (Agarwal and Sambamurthy 2002) (2) CIO leadership (Reich and Nelson 2003) (3) Strategic business / IT alignment model (Luftman and Kempaiah 2007, Luftman et al. 2006, Sledgianowski et al. 2004, Luftman 2000) (4) IT investment business value (AIAC) framework (Kohli and Devaraj 2004)
Personnel	Employee: • Knowledge • Capabilities • Skills. Employee relationships with: • Customers • Vendors • Partners.	(1) Informational system development agility for innovation and organizational learning (Lyytinen and Rose 2006) (2) Critical enterprise IT personnel skills and knowledge (Reich and Nelson 2003; Lee et al. 1995) (3) Enterprise IT personnel skills and IT infrastructure (Byrd et al. 2004)
Technology	**Technical architecture:** • Infrastructure design and implementation • Networks • Hardware • Software • Operations management processes • Day-to-day operations and maintenance • Infrastructure sourcing contracts. **Enterprise IT services, products, and applications:** • Customer account management • Services sourcing contracts • Design and development • Implementation and project management • Ongoing support and troubleshooting	Architecture / Infrastructure: **(1)** Enterprise IT architectural competencies (Ross 2003) **(2)** Enterprise architecture frameworks (Lindstrom et al. 2006) **(3)** Information technology infrastructure framework (Chanopas et al. 2006) **(4)** Information technology infrastructure and process redesign and flexibility / agility (Weill et al. 2002, Byrd, and Turner 2001, Broadbent et al. 1999) Services, products, and applications: **(1)** IT marketing maturity model (Hirschheim et al. 2006)

2.2.2 System Focus of the Enterprise IT Organization

Forty years ago, von Bertalanffy (1968) noted that certain mathematical formulas, repeated across many disciplines such as chemistry, physics, and biology, were often used to describe completely different things. This led to the concept that a 'system' could be studied generically without describing specifics of a particular entity. Another system approach by Gharajedaghi and Ackoff (1985, p.23) defined a system as:

> *"A whole that cannot be divided into independent parts - the effects of the behavior of certain parts on the whole depend on the behavior of the other parts."*

In other words, a system must be studied in its entirety to fully understand it. Treating an organization as a system means that if the parts of the systems are studied independently, they lose their essential properties. Therefore, it is important to consider 'synthetic thinking' to explain system behavior (Allio 2003). Explaining why a system works as it does, synthetic thinking reveals the role or function of each of the parts in the whole. Analysis of a system describes the structure of its parts and how they work. Gharajedaghi and Ackoff (1985) explained that analysis of one part or parts of a system lead to knowledge of the parts, which is aggregated into knowledge of the whole, while synthetic thinking leads to understanding of the system as the whole. Both are complementary. As a result of this approach, both the knowledge about the system and its understanding are important to determining the impact of changes or uncertainty on a system. Gharajedaghi and Ackoff (1985, p. 24) concluded that:

> *"The performance of a system is not the sum of the independent effects of its parts. It is the product of their interactions. Therefore, effective*

management of a system requires managing the interactions of its parts, not the actions of its parts taken separately."

Therefore, when considering the impact of uncertainty and unexpected change on the enterprise IT organization, any changes made within one component of the enterprise IT organization must be balanced throughout the entire organization by evaluating the interactions of the component parts. This approach is also supported by considering the organization is a social-technical system (Whitworth et al.2005, Alter 2004, Whitworth and Zaic 2003, Alter 1999).

Computer systems are a good example of systems in a general sense (Churchman 1979), in that a 'hardware' computer system of chips and circuits is also a 'software' system of information exchanges. Today's 'system' is also the 'human-computer combination' (Alter 1999), e.g., a plane is mechanical, its computer controls are informational, but the plane plus pilot is also a system – a human-computer system. Human-computer interaction (HCI) sees computers as more than just technology (hardware and software). The science of computing began as the study of hardware in the 1950s and 1960s, progressed to commercial information processors in the 1970s, to personal computers in the 1980s, and then to computers as social communication tools in the 1990s (Yates and Van Maanen 2001). The 2000s have become the decade of social computing, where software serves not just people but social groups with systems such as email, chat rooms, and bulletin boards (Farnham, MacLaurin, and Counts 2007).

'Social-technical systems' occur when information technology, rather than the natural world, mediates cognitive/social interaction. The socio-technical perspective is based on the creation of 'fit' or balance among the information technology, the human

resources, and the strategic [governance] components of the organization (Sarker and Lee 2002). Whitworth and Zaic (2003) described an enterprise IT organization system that included four levels: mechanical, informational, cognitive, and social. Table 2.2 compares these four system levels mapped to the traditional concept of an information system (IS) as hardware, software, people, and business processes (Whitworth et al. 2004, Whitworth 2003, Whitworth and Zaic 2003, Alter 1999)

Table 2.2 Information System Organizational Levels (Sub-systems)

Level	Examples	Discipline
Social	Norms, culture, laws, sanctions, roles	Sociology
Cognitive	Semantics, attitudes, beliefs, opinions, ideas, morals	Psychology
Informational	Software programs, data, bandwidth, memory, processing	Computing
Mechanical	Hardware, computer, telephone, FAX, physical space	Engineering

Alter (2004) described how to use the concept of a 'work system' to understand, analyze, and improve systems within organizations. A work system approach could be used to define 'big picture issues' such as how environmental changes may or may not affect proposed organizational changes. Alter (2004) developed an initial set of 21 'work system principles' that could be used to assess whether proposed or potential changes in the information system / enterprise IT organization would be positive or negative. Several of Alter's principles relate to the concept of enterprise IT organizational flexibility:

- *Principle #3* - Match process flexibility with product variability. Alter (2004) refers to this principle as the 'product and work practices element.' This is a

socio-technical principle that technological flexibility should match product variability.

- *Principle #18* - Support the firm's strategy. Alter (2004) refers to this principle as the 'strategy element,' which is consistent with business and enterprise IT alignment theories.
- *Principle #21* - Maintain the ability to adapt, change, and grow (the system as a whole). Alter (2004) concludes that the environment will change over time, therefore, the enterprise IT organization, a system as a whole, should have the capability to adapt, change, and grow. Sometimes IT services, products, and applications support adaptability, but other times they constrain adaptability.

Markus and Robey (1988) described the socio-technical 'theory-in-use' perspective where technologically-oriented views and socially-oriented views must be balanced by considering any interactional assumptions between the two views relating to an organizational outcome. Mumford (1995) also is a proponent of socio-technical thinking. He described how business process reengineering is similar to socio-technical thinking. Socio-technical design experiments are a classic example of 'process re-engineering' even though the objectives are different. For example, socio-technical perspective focuses on improving working conditions while process re-engineering focuses on increasing production.

When technology is introduced into a social system such as an organization, then specific outcomes depend on a number of situational factors. These specific outcomes are considered less predictive than either of those based on only the socio-centric or technical-centric perspectives (Markus and Robey 1988). Other research also considers

balancing strategy, human resources, and information technology by changing the technology or the social components either simultaneously or sequentially. If the technology component is changed, then the social component is changed, or vice versa (Grover and Kettinger 2000, Markus and Robey 1995, Davenport and Short 1990, Cherns 1987). Therefore, whenever any changes are made within any of the components of the enterprise IT organization, consideration should also be given to understanding and modifying as necessary both the technical aspects and the business processes within the social context of the organization.

2.2.3 Web of System Performance

Performance is how well a system interacts with its environment to gain value and avoid loss. The 'Web of System Performance (WOSP)' model (Whitworth et al. 2005, Whitworth and Zaic 2003) based on general systems theory where system performance is decomposed into a multi-goal model, as suggested by Chung (1999). The WOSP analysis suggests that any advanced system has four elements: a boundary, a supporting internal structure, output effectors, and input receptors (Whitworth and Zaic 2003). For example, cells have a membrane boundary, internal support (nucleus), flagella to move (effectors), and photo-receptors. People have a skin boundary, internal brain and organs, acting muscles, and sensory input. Computers have a physical case, motherboard architecture, printer/screen effectors, and keyboard/mouse "receptors."Finally, software has a memory boundary, an internal program structure, and specialized input/output modules. By identifying the natural system performance role of each element, and designing each

element to maximize opportunity or minimize risk, a system can be optimized. Whitworth and Zaic (2003) defined eight performance goals for the WOSP model:

1) *Boundary: (defines system entry)*
   a) To enable useful entry (*extendibility*).
   b) To deny harmful entry (*security).*
2) *Internal structure: (controls and sustains)*
   a) To accommodate external change (*flexibility*).
   b) To accommodate internal change (*reliability*).
3) *Effectors: (changes the environment)*
   a) To maximize external effect (*functionality*).
   b) To minimize internal effort (*usability*).
4) *Receptors: (senses the environment)*
   a) To enable meaning exchange (*connectivity).*
   b) To limit meaning exchange *(privacy).*

While the WOSP dimensions are not new, their integration into a common framework is new. Table 2.3 provides a list of similar terms for the eight WOSP dimensions.

The 'WOSP model' is shown in Figure 2.1. The 'Web area' represents system performance in general. The bigger the area, the greater a system's performance potential. The 'Web shape' represents the goal criterion weights, which vary with the environment, e.g., a threat environment may mean security has more weight. The 'Web lines' represent goal tensions, imagined as connecting rubber bands that can pull back one performance dimension as another increases. System dimensions like privacy and

Table 2.3 Similar Web of Systems Performance Dimension Definitions

Dimension	Similar Terms
Extendibility	Openness, interoperability, permeability, compatibility, scalability.
Security	Defense, protection, safety, threat, resistance.
Flexibility	Adaptability, portability, customizability, plasticity, agility, modifiability.
Reliability	Stability, dependability, robustness, ruggedness, durability, availability, maintainability.
Functionality	Capability, effectualness, usefulness, effectiveness, power, utility.
Usability	Ease of use, simplicity, user friendliness, efficiency, accessibility.
Connectivity	Networkability, communicativeness, interactivity, sociability.
Privacy	Confidentiality, secrecy, camouflage, stealth, social rights, ownership.

(Source: Whitworth and Zaic, 2003).

security have been researched in the literature for a long time. However, their integration into a common framework under the general concept of system performance is new. IT personnel usually think of performance as only functionality. For example, if a car is stolen because it has poor locks, how well does it perform? The WOSP model says it does not perform very well. One may have a 'high performance' hot-rod, but if it will not start, does it perform well? Again the WOSP model says no.

Because the WOSP model is derived from a general systems theory Churchman 1979, von Bertalanffy 1968), the WOSP model applies to any type of system, including the enterprise IT organization as a socio-technical system. The socio-technical system, shown in Table 2.4, considers that any information system has four system 'levels,' corresponding to the four different types of sub-systems shown in Table 2.2. The lowest level is the mechanical or hardware system level, which becomes the foundation of any information system. The next level on top of the hardware level is the software, which is quite different from hardware design. The first involves voltages and circuits while the

second involves data flows and entity relationships or objects and method calls. The system's nature and performance are defined by these levels and their relationships.

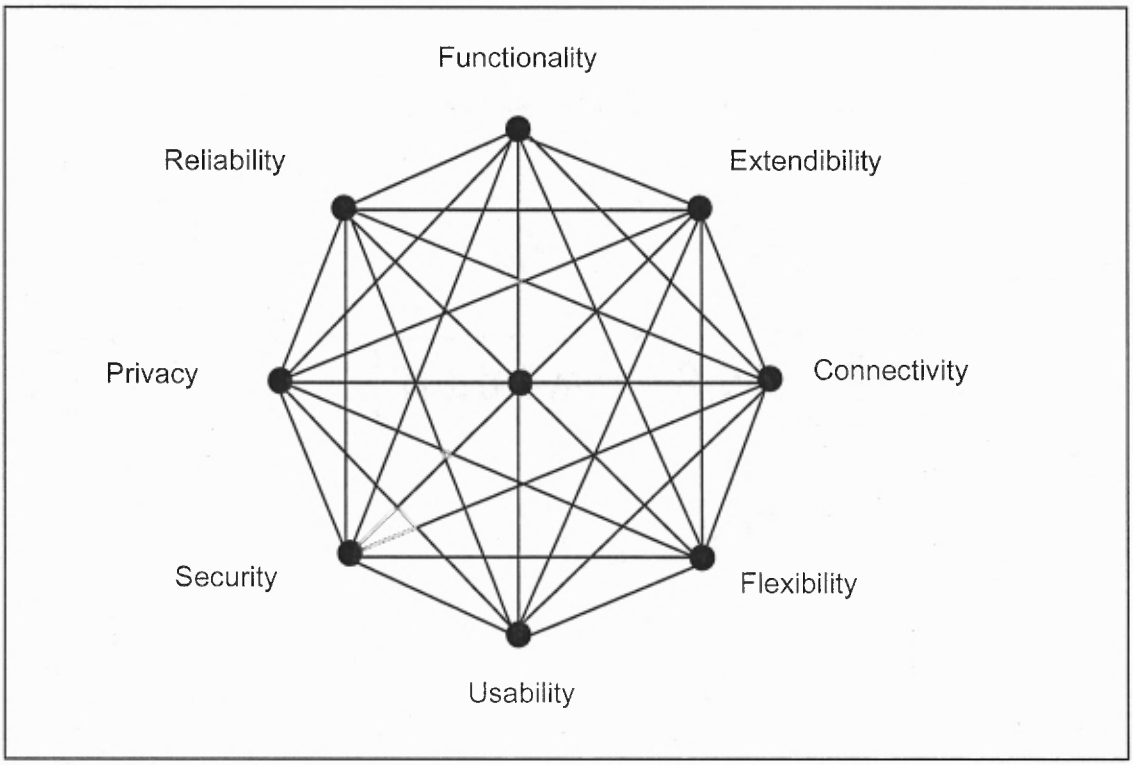


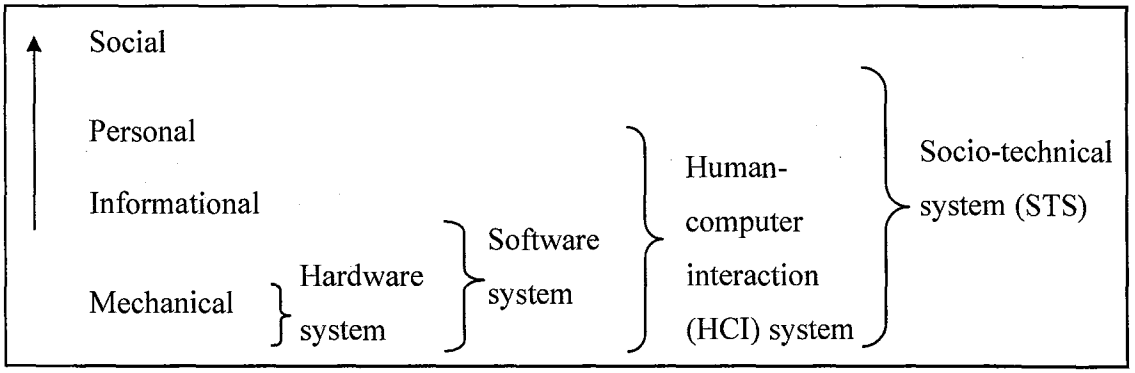
Figure 2.1 The Web of System Performance (Whitworth and Zaic 2003).

When the personal aspects of human cognition are added, the next level, the human-computer interaction level, is created, which addresses cognitive processes. Finally, the fourth level is created by adding social structures, which results in the concept of socio-technical systems, a combination of all four levels together. These levels are not separate systems, but merely different views of the same system. Each level is derived from the lower level, giving the system a new level of causality. Information is derived from mechanics; the personal or cognitions is derived from information; and, finally, social or society is derived from individual cognitions (Whitworth and Zaic

2003). The WOSP model applies to the enterprise IT organization as a socio-technical system in the following ways:

- The strategic focus of enterprise IT governance equates to the 'social level' of the WOSP model.
- The enterprise IT personnel component relates to the 'cognitive level' or human resources focus of a system.
- The services, products, and applications of the enterprise IT technology (infrastructure) component equates to both the 'mechanical' and the 'informational levels.'

Table 2.4 Socio-technical Levels of a 'System'



Byrd and Turner (2000) describe the IT infrastructure as having two parts: the human infrastructure, including the experiences, competencies, commitments, values, and norms of the IT personnel who deliver IT services, products, and applications; and the technical infrastructure, including the data and technology configurations. Again, this maps to the 'informational level' and the 'mechanical level.'

2.3 Organizational Uncertainty and Change Theories and Models

This next section of the literature review describes how turbulent business environments and organizational change theories affect the enterprise IT organization. It also discusses various enterprise IT organizational management practices for dealing with uncertainty and unexpected change as well as expected change.

2.3.1 Turbulent IT Business Environments

Starling (1980) defined the external environment as those forces that drive the behavior of an organization, but come from outside the organization's boundaries. This external environment includes suppliers, customers, enterprise employees outside of the organization, shareholders, and competitors. A key aspect of this dynamic, highly competitive, rapidly changing, turbulent environment is environmental uncertainty (Scott 1992, Burns and Stalker 1961). Changes in the business environment are both expected, requiring strategic and tactical plans, and unexpected, which also increase the level of uncertainty within the enterprise (Malhotra 1993, Tushman and Nadler 1978).

Galbraith (1973) defined uncertainty as the gap between how much information is required to do the work and how much information is known. Daft and Lengel (1986) described uncertainty and unequivocality as two forces that influence organizations and the way decisions are made within organizations. Unequivocality is defined as ambiguity, which is the existence of conflicting interpretations about what is happening (Daft and Macintosh 1981). The impact of business uncertainty occurring in dynamic enterprise IT environments differs by industry and by whether an organization is information-intensive or not. Information intensity refers to the amount of information necessary for the

acquisition, transformation, and delivery of resources to the customer (Kearns and Lederer 1999, Reich and Benbasat 1996). Yoon and McLean (1995) also defined IT intensity as the combination of the reach of IT and the richer range or modes of information generated.

Faucheux and Froger (1995) studied decision-making models affected by environmental uncertainty in three related ways – uncertainty, irreversibility, and complexity. They identified two different methods for describing uncertainty. The first method distinguishes between 'weak' and 'strong' uncertainty. Weak uncertainty can be referred to as 'risk,' which is based on the probability of different classifications of possible events. Strong uncertainty is based on probabilities that cannot be defined because events cannot be classified (Faucheux and Froger 1995). Faucheux and Froger (1995) described an uncertainty typology based on probability and reliability shown in Table 2.5. Certainty is defined as when a situation is unique and expected to happen. The hierarchy moves through weak, which has several options with different levels of probability assigned to each alternative; through strong, which has possible alternatives with little reliability; to ignorance, which is considered the upper limit of strong uncertainty and where none of the alternatives is reliable (Faucheux and Froger 1995).

The external environment significantly influences the structure of an organization. Burns and Stalker (1961) defined two types of organizational structures adapted to meet environment requirements. 'Mechanistic' structures are for businesses operating in unchanging, stable environments, while 'organic' or 'flexible structures' should be adopted by businesses operating in dynamic environments. Pondy and Mitroff (1979) mapped these two types of organizational structures to Boulding's (1956) nine-level scale

of system complexity. Many research studies assume organizations operate in an unchanging, static environment resulting in mechanistic structures, equating to Boulding's levels one to three. However, according to Pondy and Mitroff (1979), organizations are more likely to exist at Boulding's level eight of system complexity, where the organization must interact with its external environment in order to be successful.

Table 2.5 Modalities of Uncertainty

Reliability Probability	Low → Maximum
Imprecise ↓ Well-defined	Ignorance Strong Uncertainty Weak Uncertainty Certainty

(Source: Faucheux and Froger 1995, Table 1, p. 31.)

Benamati and Lederer (2000) defined two ways that organizations interact with their environment. The first is 'environmental determinism,' where the environment dominates the organization, requiring the organization to react to problems caused by environmental changes. The second is 'strategic choice,' where the organization interacts with its environment and takes proactive action to minimize negative impact and create opportunities from environmental changes. Enterprise IT organizations usually fit either of these situations based on their actions or lack of actions. Proactive CIOs seek change, while reactive CIOs avoid change (Benamati and Lederer 2001, 2000).

The environment also affects managers' perceptions of how they interpret the impacts of the environment when making business decisions. Daft and Weick (1984) described an interpretation process that included scanning, monitoring, sense making, interpretation, understanding, and learning. When affected by uncertainty, managers attempted to interpret the impacts based on what they have done in the past, what they have learned, and what they believe they have to do in the future to solve the problems (Daft and Weick 1984).

Traditional enterprise IT organizations use long-term planning and control strategies that have proven efficient and successful in predictable and stable environments (Moon, Hollenbeck, Humphrey, Ilgen, West, Ellis, and Porter 2004). However, Dietrich and Shipley (1999) pointed out that the enterprise IT environment is 'anything but stable' due to the nature of the IT business and the impact of IT on the business. They postulated that enterprise IT organizations should develop a new model of business that is both more responsive and also more proactive. Leidner, Beatty, and Mackay (2003), in their study of managing IT in declining economies, also identified the need to reduce uncertainty and proactively manage changing IT rather than the more traditional, reactive perspective.

Even in stable, predictable environments, CIOs have not been always successful since, according to Moløkken-Østvold and Jørgensen (2005), Jiang, Klein, and Balloun (1996), and Cash and Lawrence (1988), enterprise IT projects and software engineering projects typically have budget overruns and delays. Changing technologies and economic conditions lead to needs for new employee skills, user training, re-allocation of personnel and resources, and the need to merge older embedded technologies with new

technologies, which impacts carefully prepared budgets. But, the enterprise IT infrastructure is also rapidly changing, making it difficult to balance decisions concerning when to deploy new technology including the cost and disruption impact with maintaining the existing IT infrastructure (Reich and Benbasat 1996). Rapidly changing IT and the globalization of information systems also contribute to the turbulence of the business environment (Biehl 2007, Purser and Passmore 1992). And, finally, business turbulence leads to changes in both the enterprise IT strategy and the corporate business strategy impacting their alignment (Reich and Benbasat 1996) and the potential business benefits of the information technology.

Kearns and Lederer (1999) described how enterprise IT executives exhibit 'strategic choice' when dealing with dynamic business environment by seeking an appropriate 'fit' of IT services, products, and applications to business processes. This requires the participation of the enterprise chief executive officer (CEO) and other functional business executives. A number of studies have demonstrated that information-intensive enterprises are better at developing strategic IT plans and using IT-based resources for a competitive advantage than non-information-intensive enterprises (Reich and Benbasat 1996, Bergeron, Buteau, and Raymond 1991, Porter 1980), but what about in turbulent environments? Business declines also contribute to turbulence. Leidner et al. (2003) identified approaches used by CIOs to manage uncertainty when the budgets are reduced. Would these approaches work in turbulent environments? How should CIOs manage uncertainty when the needs for competitive IT investments are increasing? Also, how should CIOs consider the impact of the needs and involvement of external stakeholders when balancing enterprise IT flexibility and reliability?

Enterprise IT executives who follow 'environmental determinism' theory react to uncertainty problems by using coping mechanisms. Benamati and Lederer (2001, 2000) conducted research studies on coping mechanisms for changing IT. One critical finding from these studies was that enterprise IT executives use coping mechanisms that they perceive will alleviate the problems, however, they generally do not use the mechanisms that they perceive will be the most successful. For example, the studies found that two of the most commonly used coping mechanisms were *'pressuring vendors to provide support'* and *'teaching oneself,'* even though both of these were perceived to be ineffective. Benamati and Lederer (2001, 2000) speculated that these enterprise IT executives used coping mechanisms that were less expensive rather than mechanisms they knew would be more successful such as *'maintain your own training staff'* or *'document differences between new and previous IT.'* Little academic research has been conducted in this area to determine why CIOs do not seem to know how to cope, do not spend money to cope, and do not know if certain planning processes, used in the past, were successful or not.

Benamati and Lederer's second major contribution was to suggest how enterprise IT organizations could cope better. These studies showed that enterprise IT organizations tend to ignore problems caused by changing IT and find ways to work around these problems without really addressing the problems. Changing IT requires enterprise IT professionals to develop different or new skills and competencies. Yet, endurance or 'working around the problems' was the second most common coping category. Benamati and Lederer (2001, 2000) concluded that it appears that enterprise IT organizations do not know what works and what does not work.

Carlsson and El Sawy (2008) described five tensions CIOs face when dealing with IT issues in turbulent business environments. These tensions included: (1) the need for quick decisions versus using an analytical decision-making process; (2) the need for innovative and risky action versus safe action; (3) the need to support and empower the enterprise IT middle managers versus the impatience of the enterprise executives; (4) the need for quick-action learning loops versus improvisation; and (5) the need to provide the latest IT services, products, and applications versus deployment of a standardized, heterogeneous infrastructures. A goal for successful IT management in dynamic business environments is for CIOs to better understand and develop strategies to manage these critical tensions.

2.3.2 Environmental Change Theories

Van de Ven and Poole (1995) defined change as differences in form, quality, or the state of an organizational entity change over time. They listed four theories that explain change:

1. *Life-cycle change* – organic growth from initiation to death or termination. For example, life-cycle changes for products are introduction, growth, maturity, and decline.
2. *Teleology change* – purpose or goal guides the change. Development proceeds towards a planned end state. The end state can be continuously modified based on evaluations. External influences also can push for a new path.
3. *Dialectic change* – a win-win or lose-lose form of change. Change occurs from embracing opposing views of constant conflict that work against each other by

exchanging arguments and counter-arguments. These views eventually result in a synthesis or combination of the opposing assertions.

4. *Evolutionary change* – cycles of variation, selection and retention. Change evolves over time based on a variety of circumstances that cannot be predetermined.

The enterprise IT organization generally seems to adopt either the 'life-cycle' or the 'teleology' theory of change to develop and transition to new and emerging information technologies. Occasionally, they also employ 'evolution' theories when specific technology capabilities evolve over time. On the other hand, enterprise IT users may consider some new IT systems as being 'dialectic,' not understanding the business need for the new IT system. The ability to change continuously has become harder in an era dominated by the growing convergence of telecommunications, computing, and consumer electronics with new multimedia applications, deregulation assaults on standards, and the Internet explosion. The enterprise IT organization is in a unique position to help the enterprise maintain a balance between order and chaos and between the past and future (Brown and Eisenhardt 1997). To maintain this balance, the enterprise IT organization needs to acquire a broad set of in-house multidisciplinary capabilities and core technological competencies.

Galy and LeMaster (2001) compared performance differences between organizations that exhibit 'pioneering' changes versus 'strategic' changes. The key difference was how organizations either (1) created continuous incremental effort to adapt to change or (2) radically created revolutionary change. To consider either approach, the enterprise IT organization must first know how and when to change and,

secondly, to be able to identify all the potential impacts of known or expected changes. This study by Galy and LeMaster (2001) on pioneering change demonstrated that technological developments accelerated change, and to be successful, organizations must follow suit. Conflicts occurred as a result of the choices made concerning change. Cyclical change was predictable and comforting. Revolutionary change was unpredictable and brought chaos to any order within the organization (Galy and LeMaster 2001). Khandwalla (1977) concluded that increased uncertainty heightened the need for organizational structure and integration as well as the alignment of the IT strategy with the enterprise business strategy. McFarlan (1971) found that environmental uncertainty resulted in an expanded role for IT planning. Cash and Lawrence (1989) demonstrated that information-intensive industries had more opportunities for IT to provide strategic benefits.

2.3.3 Enterprise IT Organizational Uncertainty and Change

CIOs are responsible for providing IT solutions that can lead to increased complexity and uncertainty in the environment, thus increasing the demand for more advanced IT (Malhotra 1993). This conflict leads to an enterprise IT management dilemma – rather than stabilize IT infrastructures and minimize technology changes, CIOs should be encouraging and embracing the very IT improvements that are contributing to the turbulent business environments. CIOs must leverage IT investments to meet business needs to increase and sustain a competitive advantage, yet balance these business needs with stability and reliability. For the enterprise IT organization to successfully leverage the potential benefits and advantages of IT, CIOs must be able to navigate the turbulence

that occurs, especially in information-intensive industries (Kearns and Lederer 1999, Yoon and McLean 1995).

Just as the executives of the enterprise must be able to develop strategies to exploit opportunities and coping mechanisms to minimize threats when operating in turbulent business environments, CIOs must also be able to do the same. Unfortunately, research has shown that enterprise IT organizations may be more difficult to manage than other organizations, that IT executives are not well adapted to managing successfully in turbulent environments, and that the IT organization may be one of the least flexible organizations within the enterprise (Roepke, Agarwal, and Ferratt 2000, Knoll and Jarvenpaa 1994, Rackoff, Wiseman, and Ulrich 1985, Starling 1980). The turbulent environment is made up of external forces that impact the performance of the organization, such as government regulations, competitors, and suppliers, as well as internal forces within the enterprise including customers and partner divisions (Harrison and John 1996, Donaldson and Preston 1995, Sanchez 1991).

Lee and Krayer (2004) concluded that organizations that drive change are more successful than organizations that only react to change. Instead of reacting to change, CIOs must create and lead a new type of IT organization that acts as a change agent and sets an example for flexibility and adaptability (Gottschalk and Taylor 2000, Rockart, Earl, and Ross 1996, Davis and Olson 1985, and Drucker 1974). In this 'new' enterprise IT model, CIOs must balance innovation with efficiency while dealing with the turbulence and uncertainties in today's competitive world. They must make difficult technology choices based on user needs that are continuously changing and often conflicting with technology budgets that are shrinking and using technologies that are

rapidly changing (Knoll and Jarvenpaa 1994, Davis and Olson 1985). Once the difficult choices are made, CIOs must be able to quickly implement new technologies in shorter timeframes to meet the changing needs of their customers (Gottschalk and Taylor 2000, Rockart et al. 1996). Changing technologies and economic conditions lead to unanticipated needs for new employee skills, user training, the re-allocation of personnel and resources, and the need to merge old technology, all of which impact carefully prepared plans and budgets (Byrd et al. 2004, Reich and Nelson 2003, Lee et al. 1995).

2.4 Flexibility Theories and Models

One way to manage uncertainty is to consider the use of flexibility. This section describes research into flexibility theories and organizational flexibility models.

2.4.1 Definition of Flexibility

Dictionary definitions of flexibility vary by application as shown in Table 2.6. Flexibility is considered a multi-dimensional concept with different connotations, paradigms, foundations, and dimensions (Sushil 2001). A classic definition of manufacturing flexibility is the ability to change or react with little penalty in time, effort, cost, or performance (Upton 1994).

Flexibility is the ability to predict and sense environmental change and to respond appropriately. A flexible system should have ability to effectively adapt or respond to environmental change to take advantage of opportunity and to minimize threats (Whitworth and Zaic 2003). The U. S. Army (Frost 1999) defined flexibility as:

"Being responsive to change and adaptable to the volatility, pressures, and complexities of military operations, while constantly focusing on the objective."

Table 2.6 Definitions of Flexibility

Flexibility \ flex'i'bil'ty\ (from hyperdictionary, Merriam-Webster Online)
n 1. *The property of being flexible; capable of being flexed: pliant.* Synonyms: flexibleness, malleability, inflexibility, bendability, whip.
n 2. *The quality of being adaptable or variable; characterized by a ready capability to adapt to new, different, or changing requirements.* Synonyms: adaptability, inflexibility, wiggle room.
n 3. *The trait of being easily persuaded; yielding to influence: tractable.* Synonyms: tractability, tractableness, trait, intractability, manipulable, intractable, manageability, docility, domestication, amenability, obedience.

Flexibility and its synonyms – hedging, malleability, pliability, resilience, robustness, and versatility – are often used interchangeably as are flexibility and its closely related attributes – anticipation, agility, and adaptability (Evans 1991). When terms are used interchangeably, people become confused from the lack of precision. Shee (2001) recommends that terms should be carefully defined in order to achieve 'conceptual accuracy.'

The cornerstones of 'enterprise flexibility' are considered to be manufacturing, strategic, planning information systems, financial, and organizational flexibility (Sushil 2001). Sushil cautioned that some consider flexibility as moving to the extreme when, in fact, in a potentially negative situation, flexibility should be more correctly considered as

balancing the extremes. Flexibility within an industry can have complementary or opposite types. For example, enterprise flexibility includes technology-centered flexibility as well as labor-centered flexibility. Proctor and Ackroyd (2000) found that these two types may not be complementary, but in fact may be substitutes. Technology, itself can also be flexible (de Groote 1994):

> *"A particular technology is said to be more flexible than another if an increase in the diversity of the environment yields a more desirable change in performance than the change obtained with the other technology under the same conditions."*

Frost (1999) maintained that people generally understand the need for flexibility and its close cousin adaptability, but understanding the need does not lead to application of the concept. The U.S. Army determined that the degree to which the concept is appreciated or measures up represents an intelligence gap. Adopting flexibility as a principle of war closes the gap. Frost (1999) provided the initial thinking about how flexibility should be considered for the enterprise IT organization based on what is happening in the armed forces. Some enterprise IT managers might agree with Frost's military definition that enterprise IT operations includes a number of volatilities and complexities, although not viewed as a life or death decision as is the case within the U.S. Army. When working in an environment that is characterized as vague, ambiguous, uncertain, and complex, flexibility must be considered a critical operating principle.

Different fields and disciplines also have different definitions of flexibility. Sethi and Sethi (1990) developed eleven different types of flexibility and measurements for use in operations management. A great deal of research has been conducted concerning

manufacturing flexibility with several different types of flexibility (Gerwin 1993, Buzacott 1982). Browne, Dubois, Rathmill, Sethi, and Stecke (1984) developed a manufacturing flexibility classification system, while Upton (1994) conducted empirical flexibility studies in the manufacturing of paper industry. Dixon (1992) defined modification flexibility as changing existing products to better meet customer needs, which is also considered innovative product development.

Flexibility also relates to specific business functions including strategic, manufacturing, human resources, financial, technology, marketing, organizational, and enterprise IT / IS. Because the management of technology is key to competitiveness and wealth creation, a technological perspective is an important criterion when evaluating flexibility and competitiveness (Khalil 2001). Duncan (1995, 1972) found that no common, operational definition of IT infrastructure flexibility existed. He also concluded that the characteristics of infrastructure will vary based on firm resources and industry characteristics such as information intensity. Therefore, flexibility might be encouraged or discouraged based on different perceptions.

2.4.2 Organizational Flexibility Theories

Recommendations for managing 'organizational change' including flatter hierarchies, empowerment of employees, decentralized decision-making, business process reengineering, and self-organizing unit (Kanter 1994, Peters 1992, Senge 1990, Peters and Waterman 1982). However, there is less theory on 'organizational flexibility' (Volberda 1998). 'Organizational flexibility' was defined by Volberda (1998, p. ix) as the "*dynamic relationship within organizations between the necessity of change and targeted planning and control.*" Volberda described how enterprises operating in turbulent

business environments must deal with rapid technological developments, shifting competitive relationships, short product life cycles, and strong fluctuations in product turnover. His research found that strategic planning in turbulent environments is not enough to deal with the uncertainty. This is because strategic planning focused on 'planning and control,' which could lead to 'rigidity and lack of innovation' (Volberda, 1998, p. ix). Therefore, according to Volberda's (1998) research, he found that a 'flexible' enterprise maintained coordination, control, and focus, while, at the same time, focusing on innovation, creativity, and speed. Poole and Van de Ven (1989) described how organizations must mix stability and change as a way of life, since organizations are continuously changing. Stability had been the desired state, so change was viewed as a negative alternative to the preferred stable state. Generally, earlier organizational theories emphasized either stability or, sometimes, change. But, according to Volberda (1998) both should be considered in dynamic business environments. New theories stress change, while older theories stress stability and preservation.

Organizational flexibility, according to Volberda (1998), is built on strategic management theories and innovation and entrepreneurship theories. Strategic management theories include:

- *The Linear Model* (Chafee 1985) – Volberda refers to the 'linear' model as emphasizing the 'rigidities of strategic planning,' focusing on 'what to do' rather than 'what the organization may be capable of doing in the future.' The organization's strategy is based on its goals, resource allocation, and tactical plans. This rational process starts with 'strategy formulation' and then 'strategy implementation.'

- *The Adaptive Model* (Ansoff 1978) – Volberda refers to the 'adaptive' model as an opportunistic behavior emphasizing flexible resources and capabilities. This model focuses on the need for flexibility because uncertainty limits what can be pre-planned in advance. The organization should develop capabilities for strategic thinking and learning by being open and responsive, rather than deliberate and controlling (Mintzberg and Waters 1985). This model uses what Mintzberg (1973) called 'preparedness strategies' and emphasizes flexible resources and management capabilities based on the resource-based theory (Priem and Butler 2001, Bharadwaj 2000, Barney 1991, Penrose 1959).
- *The Interpretive Model* (Hamel and Prahalad 1989, Weick 1979) – According to Volberda (1998), flexible resources and strategic thinking are not enough for adaptation. This also requires people to sense and make sense of their environment. Therefore 'strategic schemas' or frames of reference are necessary for organizational stakeholders to understand the organization and its environment. Hamel and Prahalad (1989) referred to this as 'strategic intent,' where the most successful enterprise develop foresight and can imagine new services and products and even businesses that do not exist as yet.

These three theories (see Table 2.7) demonstrate how flexibility has become a strategic asset for the enterprise including flexible resources, capabilities and broad strategic schemas, while also facilitating entrepreneurial activities and innovations (Volberda 1998). Even though flexibility is important, there are different levels of flexibility to consider. 'Dynamic Contingency Theory' considers the potential of the organization to maintain a 'dynamic fit' between the organization and its environment. On the other

hand, 'Organizational Learning Theory' describes how an organization needs to be reflective and develop an organizational learning system that maintains a dynamic balance between single-loop and double-loop learning. One form of organizational learning results from detecting when something goes wrong, correcting it, and then adapting to prevent future problems (Carlsson and El Sawy 2008, El Sawy, Malhotra, Gosain, and Young 1999, Argyris and Schön 1978).

Table 2.7 Strategic Management Theories

Strategic Management Theories Note: *Generally, in turbulent business environments, the linear model no longer applies; therefore, the flexible strategist must define an organization using either the adaptive model or the interpretive model.*		
Linear model	**Adaptive model**	**Interpretive model**
Planning strategies	Flexible configuration strategies	Strategic schemas such as 'Dynamic Contingency' or 'Organizational Learning'
Changes enterprise's position in the environment	Configures resources for effective responses to unexpected changes.	Develops critical meaning for activities for participants and stakeholders.
Problem Area: • Establishing long-term goals	*Problem Area*: • Enveloping flexible resources and capabilities.	*Problem Area*: • Creating and maintaining broad strategic schemas.
Methods: • Long-term planning, • SWOT analysis, • Determination of sustainable competitive advantages.	*Methods:* • Analyze enterprises' resources and managerial capabilities	*Methods:* • Managing culture by concentrating on o values, o symbols, o language, and o dramas.
Flexibility: • 'management capacity' to quickly develop plans.	*Flexibility:* • 'organizational capability' to facilitate emergent, spontaneous strategies.	*Flexibility:* • 'imaginative capacity' for creating strategic schemas to encourage strategic initiatives.

(Adapted from Volberda 1999, Table 3.1, p. 43)

According to Argyris and Schön (1974), single-loop learning is when something in an organization goes wrong, people will look for another way to prevent the problem, and then will operationalize the new approach. Questioning the alternative solutions and considering the potential impacts may lead to modifications in the goals or processes, prior to developing solutions for the problems. This is considered double-loop learning. The first is an 'if-then' approach, where the second is more of an 'if- modify- then' approach. Figure 2.2 shows this single-loop and double-loop learning differences (Argyris 1990).

Carlsson and El Sawy (2008) described how these organizational learning approaches lead to better executive decisions in dynamic environments. Organizational learning approaches also affect how organizations can become more flexible. Argyris (1990) argued that organizations will make better decisions in rapidly changing and uncertain environments if they do more double-loop learning.

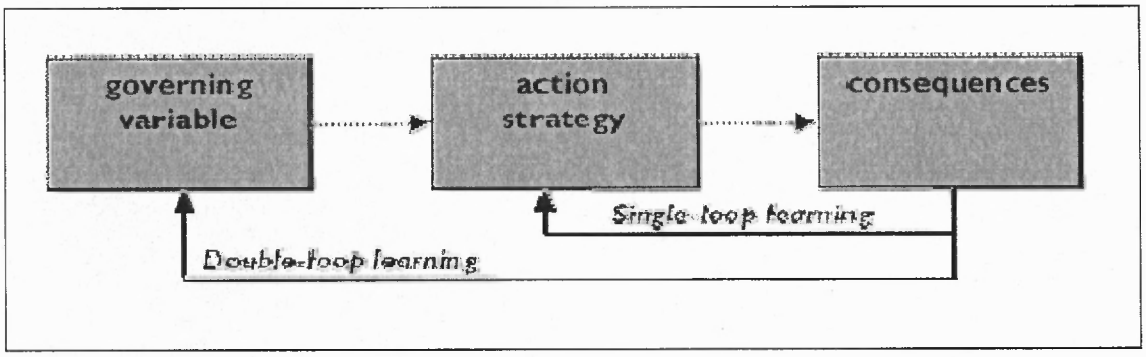


Figure 2.2 Single-loop and Double-loop Organizational Learning (Adapted from Argyris 1990)

Besides increasing the enterprise's capacity for double-loop organizational learning, another approach for handling 'environmental uncertainty' is to develop 'action strategies,' which must be continuously revised, leading to a 'more comprehensive

decision process' (Ansoff 1980). The end effect is that contingency plans are used for situations in which decisions must deviate from the established plan. (Linneman and Chandran 1981) Comprehensive decision processes are effective in stable environments, but, in unstable or dynamic business environments, a non-comprehensive planning model works best according to empirical research on strategic planning (Fredrickson and Mitchell 1984, Fredrickson 1984.) According to Fredrickson and Mitchell (1984, p. 405):

> *"Decision speed and flexibility [will] allow fast, low-cost action that can exploit and overcome a changing list of opportunities and threats."*

Falkowski and Krebs (2004) studied how organizational learning enabled organizations to learn and adapt faster in order to be more successful at transformational change. They developed an 'adaptability quotient' that predicted the success of business transformations driven by environmental change. They used a 'master of change' index that included the degree of difficulty, the level of achievement (objectives achieved), and the speed of change. The organizations that were most successful had personnel who were good at dealing with change and adaptive, while those who were least successful had people who could not deal with change and were not adaptive. Falkowski and Krebs (2004) found that this capability could be measured using the 'adaptability quotient.' organizations could learn to better manage change by being adaptive.

Volberda (1998) described three different types of organizational / environmental relationship theories: 'static contingency theory,' 'population-ecology theories,' and 'dynamic contingency theories.' Table 2.8 shows the organization / environment perspectives and characteristics for each of these three theories. Burns and Stalker (1961)

and Woodward (1965) identified a continuum of organizational forms from static or mechanistic to organic or dynamic where the organic or dynamic is the preferred approach in changing environments. This 'static contingency theory' was also supported by studies by Lawrence and Lorsch (1967) and Duncan 1972. The 'population-ecology

Table 2.8 Organization / Environment Contributions to Organizational Flexibility Theories

Organization / Environment Perspective		
Static contingency theory	*Population-ecology theory*	*Dynamic contingency theory*
Objective / perceived environment	Objective environment	Perceived /enacted environment
Deterministic approach	Deterministic approach	Deterministic and voluntaristic approach
Static fit	Tight fit	Dynamic fit; fit and stretch
Reactive adaptation	Environmental selection	Mutual adaptation
Flexibility is reactive capacity	Anti-flexibility in the form of inertia	Flexibility is proactive and reactive in organizational potential
	Organization inertia (Hannan and Freeman 1984)	Strategic choice (Child 1972) Environmental enactment (Weick 1979)

(Source: Modified and adapted from Volberda, 1998, Table 3.2. p. 53)

theory' (Weick 1979) argued that the ability of the organization to adapt to the environment gives too much credit to the capabilities of the organization and its 'flexibility' and power without truly considering the influences of the environment. Hannan and Freeman (1984) contributed the concept of 'organizational inertia,' which is the relationship between the organizational capabilities and their environments, affecting the speed of response to environmental change. This supports the 'dynamic contingency theory,' which argued that the interaction between the organization and its environment is

less rigid and should really focus on the dynamic interchange between the organization and the environment, referred to as 'strategic choice' (Child 1972). This also supports the argument that the organization actually has the capability to shape and affect the environment rather than simply react to it. This is referred to as 'environmental enactment' (Weick 1979).

Volberda (1998) stated that planning and analysis are still necessary, but not sufficient because the mechanisms of the problem and opportunity identification must still be understood through planning and analysis. As a result, Mintzberg and Waters (1985) argued the focus of the organization should be to develop an 'organizational capacity' for strategic thinking and organizational learning, which is open and responsive, not focused on deliberate planning and control. Some interpret this as 'management being out-of-control,' when, in effect, management is 'open, flexible, and responsive.' Therefore, Volberda (1998) concluded that organizations must develop 'flexibility.'

Key issues for the enterprise IT organizations have been compared and contrasted through a number of IS management studies surveying CIOs and enterprise IT executives over the last twenty-five years (Luftman et al. 2006, Luftman 2005, Luftman and McLean 2004, Watson, Kelly, Galliers, and Brancheau 1997, Brancheau, Janz, and Wetherbe 1996, Niederman, Brancheau, and Wetherbe 1991, Brancheau and Wetherbe 1987, Dickson, Leitheiser, Wetherbe, and Nechis 1984). Differences in the issues identified by CIOs vary because of geographical and national factors, organizational culture influences, environmental factors, and technological changes (Watson et al. 1997). Luftman et al. (2006) evaluated and ranked the importance of these key issues over the

last twenty five years using four main enterprise IT organizational topics: (1) key management concerns; (2) application and technology developments; (3) organizational considerations; and (4) enablers and inhibitors of IT and business alignment. Several of these issues are directly related to influences of the dynamic environment and their resulting uncertainty. The importance ranking of these specific 'dynamic environment' issues has varied greatly over the last twenty-five years as shown in Table 2.9. Business and IT alignment and strategic IT planning have been executive issues since the 1980s. On the other hand, IT governance and speed and agility surfaced as issues only in the last three years and the need to introduce rapid business solutions was first listed in 2004. Clearly, dynamic business environments mean that the enterprise IT organization must be able to respond quickly and effectively.

Table 2.9 Importance of Dynamic Environment-related Enterprise IT Organizational Issues

Ranking Dynamic Environmental Enterprise IT Organization Issues	2005	2004	2003	1994	1990	1986	1983	1980
IT and business alignment	1	1	1	9	7	5	7	-
IT strategic planning	2	4	2	10	3	1	1	1
Introducing rapid business solutions	6	14	-	-	-	-	-	-
IT governance	10	10	10	-	-	-	-	-
Speed and agility	12	5	9	-	-	-	-	-

(Source: Adapted and modified from Luftman et al. 2006, Figure 2, p. 83.)

2.4.3 Enterprise IT Organizational Flexibility

Research on the alignment of IT with business strategy theory often assumed a static environment (Roepke et al. 1999). The alignment of IT with the business strategy in

dynamic environments requires flexibility to deal with business changes and uncertainty (Roepke et al. 1999). For example, Sushil (2001) defined flexible software as:

> *"The ability to change or react with little penalty in time, effort, cost, or performance."*

This is similar to Upton's (1994) definition of 'manufacturing flexibility' described in earlier sections. Knoll and Jarvenpaa (1994) defined software flexibility as its ability to change or fit the changing turbulent environment. Applying the same definition to the enterprise IT organization requires an answer to the question of how the enterprise IT organization should change to fit the evolving environment. Should the structure, the leadership, the employee skill base, etc., be changed? Tushman and Nadler (1980) defined fit as the degree to which the needs, demands, goals, objectives, and/or structure of one component are consistent with those of another component. This then implies that all the components of the enterprise IT organization (governance, people, and technology) should change to fit to the dynamic environment. Terreberry (1968) hypothesized that 'organizational adaptability' is a function of the ability to learn and to perform according to changing environmental contingencies. Knoll and Jarvenpaa (1994) also defined flexibility as the ability to change or fit to the changing turbulent environment by varying the reach of technology and the range of technology features with consideration to time. From a systems perspective, flexibility can be defined as the system's ability to fit different environments and not be rendered ineffective by changing circumstances (Whitworth and Zaic 2003).

Knoll and Jarvenpaa (1994) defined three types of IT infrastructure flexibility:

- *Functionality,* where the system or component remains stable while inputs and conditions change;
- *Use,* which deals with strategic outcomes and proactive opportunities; and
- *Modification,* which refers to the ease and variability of changes to the processes and the technology.

Evans (1991) also identified three flexibility dimension categories including yielding to pressure, capacity for new situations, and susceptibility to modification. Knoll and Jarvenpaa (1994) identified twenty IT flexibility dimensions mapped to Evan's three types of flexibility. They referred to this mapping as the 'IT Dimensions of Flexibility.' Some of these dimensions included robustness, scalability, trialability, connectivity, modularity, reusability, etc. Knoll and Jarvenpaa (1994) defined sample measures for each of these dimensions. Could these 'IT Dimensions of Flexibility' performance measures be used to measure and evaluate the performance of the entire enterprise IT organization rather than just IT infrastructure?

Enterprise IT organizations should be able to (1) precipitate intentional changes, (2) continuously respond to unanticipated changes, and (3) adjust to unexpected consequences of predictable changes (Knoll and Jarvenpaa 1994, Bahrami 1991). Other terms that refer to flexible management characteristics include adaptability, agility, corrigibility, elasticity, hedging, liquidity, malleability, plasticity, pliability, resilience, robustness, and versatility (Evans and Wurster 1999, Evans 1991).

Enterprise IT organizations are difficult to manage because IT complexity and uncertainty as accelerated by technological change, increased outsourcing and IT alliances, and compressed product life cycles (Mahinda and Whitworth 2004).

Information technology has removed the geographical constraints of enterprises, dispersed control and authority within the enterprise, increased the speed of transactions, and changed the way companies do business (Santhanam and Hartono 2003, Patten 2000). In the digital enterprise, enterprise IT customers have changing needs that often conflict requiring new IT solutions that must interoperate with embedded IT services (Agarwal, Ross, and Sambamurthy 2003, Sambamurthy, Bharadwaj, and Grover 2003, Sambamurthy and Zmud 2000). Enterprise IT executives struggle with the conflicting mission of providing a robust and scalable IT infrastructure while, at the same time, lowering costs and being efficient. Certain IT solutions may be beneficial for some functional organizations and detrimental for others. Silver, Markus, and Beath (1995) argued that increased IT investments actually hinder the flexibility of business processes and the effectiveness of the organization. An underlying question then is how should CIOs create and then lead an enterprise IT organization where, for example, the IT infrastructure is flexible, but yet the IT infrastructure is also efficient, effective, and reliable (Whitworth et al. 2005, Patten 2004).

2.5 Discussion of the Literature Review

Volberda's (1998, p. xii) research goal was to develop a "*theoretical framework for managing and understanding the conflicting forces of change and preservation that increasingly characterize the 'flexible firm.*'" The following section discusses the critical issues relating to managing uncertainty and unexpected change as well as expected change by CIOs. It discusses how to apply Volberda's (1998) organizational flexibility research findings to the business needs of the enterprise IT organization operating in

dynamic business environments when the external business environment, the needs of the internal and external enterprise customers, and the technology are rapidly changing (Patten et al. 2005, Patten 2004). One objective of this research study was to demonstrate if the conceptual flexible enterprise IT organization has three major characteristics that include an environmental awareness of uncertainties and change, an increasing speed of response, and the capability to increase innovation. Innovation is defined as taking advantage of potential opportunities by developing new enterprise IT services, products, and applications from existing technologies, by implementing new emerging technologies, by reengineering processes and procedures, and by educating IT employees (Lyytinen and Ross 2006, Hatum 2000, Roepke et al. 2000, Pennings and Harianto 1992). A key measure of success of a flexible enterprise IT organization is its ability to focus on the needs of its internal and external enterprise customers by continuously changing and creating enterprise IT value (Davern and Kauffman 2000, Brown and Eisenhardt 1997, Hitt and Brynjolfsson 1996).

2.5.1 Benefits of Flexibility and Its Aspects

One of the concepts explored in this literature review was to determine if flexibility is a beneficial capability and can it be defined, analyzed, and systematically introduced into the enterprise IT organization. The first task was to systematically define flexibility focusing on flexibility and its relationship with other terms. For example, flexibility / innovation / agility (Hatum 2000) and flexibility / inventory / customer service (Shee 2001). Hatum (2000) analyzed the differences among flexibility, innovativeness, and agility and how to make an enterprise more flexible, innovative, and agile. Shee (2001)

studied flexibility and software competitiveness in the context of software and the service industry in India. He concluded that flexibility is critical to sustaining competitiveness in rapidly changing market dynamics and that flexibility measures are needed to improve and enhance competitiveness.

Flexibility and several closely-related terms (anticipation, agility, and adaptability) have specific characteristics and attributes that CIOs could usefully deploy within the enterprise IT organization to improve the management of uncertainty and unexpected change as well as expected change. We conclude that flexibility is not as simple as one definition fits all, but that three related-attributes - anticipation, agility, and adaptability – should be considered. A combination of these separate, but related, aspects is more clearly understood and can be used to form a framework for managing enterprise IT organization in an uncertain and changing environment. Anticipation balances planning for expected change with preparing for unexpected change. Agility is the capability to respond quickly to environmental changes. And, adaptability is the capability of the organization to self-learn, self-organize, and be self-disciplined based on previous experience.

2.5.1.1 Anticipation's Relationship with Flexibility – The first step to becoming more flexible is to anticipate what might happen by both planning for the known or expected and preparing for the unknown or unexpected. (See Table 2.10 for other anticipation definitions.) Aligning the IT strategy with the business strategy is an example of anticipation (Luftman et al. 2004, Luftman, Papp, and Brier 1999). Sledgianowski et al. (2004) identified factors, which determine an organization's ability to align its

business/IT strategies. Aligning the IT strategy with the business strategy and preparing tactical and operational plans demonstrates that the CIO understands the known business needs. Thus, the first step to becoming more flexible is that CIOs understand the business needs including now the external environment impacts business needs. These plans

Table 2.10 Anticipation Definitions

Anticipation \ an·tic'i·pa'tion \ (from Merriam-Webster Online, hyperdictionary)
n 1a. A prior action that takes into account or forestalls a later action.
1b. The act of looking forward.
Synonyms: expectancy, hope, suspense, fever.
n 2a. Visualization of a future event or state.
2b. The act of predicting (as by reasoning about the future.)
2c. An object or form that anticipates a later type.
Synonyms: prediction, prognostication, foreshadowing, projection, forecast.

should be considered as guidelines since unanticipated changes will require the plans to be changed. Another example of anticipation is understanding how environmental change and uncertainty impact enterprise IT product development processes. Verganti (1999) defined 'planned flexibility' as the capability to clearly identify all critical areas early in a project and to plan for the key reaction measures that may be necessary later. This allows a product development team to link together both anticipation and reaction in order to minimize the problems of anticipating constraints and opportunities too early in the product development process when uncertainty is greater versus delaying product development process decisions to later in the process when uncertainty decreases, but the cost and time to take corrective action increases. Product development teams must be

able to both anticipate and react, a function Verganti (1999) described as 'structural flexibility.' Structured flexibility is impossible unless planned flexibility is built during the early stages of the project.

The ability to anticipate provides the opportunity to plan and then prepare. Forecasting, scanning the Internet, and analyzing trends are management tools used to predict. This helps managers to make decisions about what products to make, where to ship, when to hire, etc. Also, anticipating competitive actions allows managers to take steps to minimize the potential competitive threats.

2.5.1.2 Agility's Relationship with Flexibility – Agility is the ability to both create and respond to change in order to profit in a turbulent business environment (Goldman, Nagel, and Preiss 1995). (See Table 2.11 for agility definitions.) Managers are beginning to focus on business agility to be more competitive in a global economy. Agility is critical to providing high-quality and high-performance products and services to customers in a rapidly-changing global marketplace. Goldman et al. (1995) listed forces that threaten companies including:

- Market fragmentation
- Production to order in arbitrary lot sizes
- Information capacity to treat masses of customers as individuals
- Shrinking product lifetimes
- Convergence of physical products and services
- Global productions networks
- Simultaneous inter-company cooperation and competition

- Distribution infrastructures for mass customization
- Corporate reorganization frenzy
- Pressures to internalize prevailing social values.

Table 2.11 Agility Definitions

Agility \ agil'i'ty \ (from Merriam-Webster Online, hyperdictionary)
n 1. The property of being flexible.
Synonyms: flexibleness, malleability, inflexibility, bendability, whip.
n 2. The quality or state of being agile: nimbleness, dexterity, quickness; quickness of motion.
Synonyms: legerity, lightness, lightsomeness, nimbleness.

CIOs interested in becoming more agile can learn from the experiences of agile manufacturing and agile software development. Critics argue that agility is really the lack of planning or just reacting in an ad hoc manner. On the other hand, agile managers should plan for both the known and the unknown (Schrage 2004). Agility is the ability to both create and respond to change in order to profit in a turbulent business environment. Agile managers must be able to both create and respond to change to provide a competitive advantage (Schrage 2004). Creating change requires innovation that leads to new knowledge that provides business value. Innovation is understanding the context and anticipating when it needs to be changed. Agile managers act (versus react) to respond quickly and effectively to both anticipated and unanticipated business environment

changes. Goldman et al. (1995) described characteristics that define agility as nimbleness and improvisation, balancing flexibility and structure.

It is recommended that the next step to becoming more flexible is to train employees to be able to sense changes when they occur and to selectively use processes and practices that are flexible based on the specific changes occurring.

2.5.1.3 Adaptability's Relationship with Flexibility — An interesting definition of adaptability and adaptation comes from weather forecasting (Adger and Kelly 2000.)

> *"Adaptability is the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes of climate. Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of changes."*

Fink, Kobsa, and Nill (1996) provided a comparison of user-oriented adaptability and adaptivity as part of the Avanti Software Development project. The goal of the Avanti project was to develop online information systems that could be modified manually by the user or automatically by the system. Systems were called adaptable when users were able to individually change system parameters and the system adapted accordingly. Systems were considered adaptive when the system was automatically modified by the system to fit users based on pre-set assumptions (Oppermann 1994). Adaptability has several definitions relating to enterprise IT organizations as shown in Table 2.12 When considering the enterprise IT organization as a socio-technical system, adaptability is the capability to change the organizational system as a whole to accommodate change from its external and internal environment. Other definitions

include the ease of system/component modification, the modification of behavior in response to environmental changes, and the adjustment to changing requirements. Adaptability is also a non-functional (software) requirement (NFR).

Table 2.12 Adaptability Definition

Adaptability \a'dapt'a'bil'i'ty \ (from hyperdictionary, Merriam-Webster Online)
n 1. The ability to change or be changed to fit changed circumstances. Synonym: ability, flexibility, pliability, pliancy, pliantness.

Jaruzelski and Kumar (2004) reported that high-tech enterprises were limited in their ability to respond quickly to changing markets. Trends affecting this analysis include commoditization of hardware, outsourcing of software development, and outsourcing back-offices services. Enterprises do not know how to create organizational structures and cultures that are compatible with adaptability. Also, management processes do not deal well with rapid growth. Since CIOs partner with others to deliver services effectively, then these supplier-partners must also be adaptable if the CIO is going to be adaptable. Thus, CIOs must balance alignment with adaptability. This means the company must be prepared to handle inevitable change.

Jaruzelski and Kumar (2004) defined adaptability as the capacity to anticipate, trigger, and absorb change, whether cyclical or structural, whereas they defined flexibility as the capability to adapt the quantity and the quality of each factor as it re-acts or pro-acts to the changes in the environment. 'Adapt' – also referred to as robustness – emphasized the ability to maintain the status quo despite an internal or external change

(Jaruzelski and Kumar 2004). They defined 'change' as the ability to instigate rather than react to change.

2.5.1.4 The Interaction of Anticipation, Agility, and Adaptability with Flexibility — Bordoloi (1999) studied the relationship among flexibility, adaptability, and efficiency. He found problems with research regarding flexibility because there was no generally accepted definition of flexibility. Bordoloi found that research did not provide a comprehensive and unequivocal understanding of terms and does not recognize related contributions. He found that flexibility was often sometimes confused with complexity and adaptability. Bordoloi defined flexibility as the ability to change 'states' measured in terms of time and cost. For example, a process is more flexible than another if it costs less to increase capacity and/or it increases capacity more quickly. He defined a 'state' as a collection of capabilities plus their changes over time including the conditions that aid or prevent a set of administrative or mechanical processes from occurring. Bordoloi (1999) defined 'adaptability' as the ability to change, for example, to improve performance over a period of time within a given state. 'Efficiency' was defined by Bordoloi as the level of total cost incurred measured as benefits received versus resources expended.

Applying Alter's (2004) work system principles to the enterprise IT organization implies that the enterprise IT organization, as a system, should have the capability to adapt, change, and grow. Alter's research (2004) found that sometimes IT supports adaptability, but other times IT constrains adaptability as stated in his *Principle #21: Maintain the ability to adapt, change, and grow* – recognizing that environments will

change over time. Alter also found that this Principle #21 had the highest acceptability of all 21 principles, but also has the highest gap between applicability and reality. In other words, respondents agreed that adaptability was very important, but they rarely adopted adaptability.

'Organizational learning' enhances the ability to adapt to environmental contingencies (Gavin 1993, Senge 1990). Enterprise IT personnel learn from their experiences before the organization learns, but this does not guarantee organizational learning (Atlas and Vadi 2006, Senge 1990).

Business writers have used the term 'ambidexterity' since the 1970s to refer to organizations that have both the separate but complementary capabilities of 'alignment' and 'adaptability' (Tushman and O'Reilly 1996, Duncan 1995). Gibson and Birkenshaw (2004) provided a complete description of the evolution of business ambidexterity. Birkenshaw and Gibson (2004) described how adaptability is important, but that enterprises also require alignment to be successful in volatile environments. In this case, they defined alignment as the ability to coordinate and streamline processes in the short term in order to create value. The issue is to determine the appropriate balance between adaptability and alignment. They determined a correlation between an enterprise's ambidexterity and business performance. Birkenshaw and Gibson (2004, p. 49) identified four ambidextrous behaviors in individuals that could be adopted by flexible enterprise IT employees:

- Ambidextrous individuals take the initiative and are alert to opportunities beyond the confines of their own jobs.

- Ambidextrous individuals are cooperative and seek out opportunities to combine their efforts with others.
- Ambidextrous individuals are brokers, always looking to build internal linkages.
- Ambidextrous individuals are multi-taskers who are comfortable wearing more than one hat.

Organizational ambidexterity was defined by Jansen, Van den Bosch, and Volberda (2005) as the ability to pursue both exploratory and exploitative innovation at the same time when adapting to environmental changes. Lee, DeLone, and Espinsoa (2006) described how ambidextrous coping strategies could be used to increase flexibility and agility as well as rigor and discipline when dealing with the challenges of global software development. These ambidextrous coping strategies included: common platform, labor organization, education / understanding, technology readiness, doing more, awareness / teamwork, and adaptive use of technology.

Patten (2004) and Patten et al. (2005) expanded the concept of an ambidextrous organization applied to the enterprise IT organization in two ways. First, they recognized that alignment refers to the enterprise IT strategic planning being in-step with the enterprise strategy. However, in dynamic business environments, alignment may become out-of-step when unexpected changes occur. Therefore, the enterprise IT organization also needs to prepare for the unexpected changes, which Patten (2004) and Patten et al. (2005) referred to as anticipation. To quickly respond to the unexpected changes, they also included agility, resulting in a flexible organization. Lee (2004, p. 102) also concluded while studying supply chains in sixty companies over the last ten years that:

> *"The best supply chains aren't just fast and cost-effective. They are also agile and adaptive, and they ensure that all their companies' interests stay aligned."*

Lee (2004) learned that simply being efficient was not enough to be successful. For example, many manufacturing companies were not able to respond quickly to unexpected changes because they use distributive facilities and centralized manufacturing to achieve economies of scale. These companies were also unable to introduce new products in a timely matter. Finally, Lee (2004) observed that efficient supply chains were not competitive because they could not adapt to market changes. Lee's (2004) solution was a 'Triple-A Supply Chain' that consisted of three aspects:

- *Agility* – responding quickly to short-term changes in demand or supply.
- *Adaptability* – adjusting the supply chain to meet the changing needs of the markets from evolving strategies, products, and technologies.
- *Alignment* – creating incentives for better performance by building strong relationships. (Note: This is similar to Patten's (2004, 2005) concept of anticipation.)

Lee (2004) concluded that the best supply chains prepared for the unexpected changes by tracking key patterns and keeping track of all data. This also supports research into flexible and agile supply chains by Whitman, Meade, Rogers, and Huff (1999).

2.5.2 Enterprise IT Organizational Flexibility Cycle

This literature review raises the potential benefits of organizational flexibility during dynamic business environments and questions if it can be analyzed and introduced

systematically within the enterprise IT organization. The literature review has identified specific characteristics and attributes of flexibility and its closely-related aspects (anticipation, agility, adaptability) that CIOs could deploy within the enterprise IT organization to improve the management of uncertainty / unexpected change and expected change. Various combinations of the specific aspects of anticipation, agility, and adaptability have been shown to benefit the enterprise in the form of ambidextrous organizations (Lee et al. 2006, Jansen et al. 2005, Birkenshaw and Gibson 2004, Gibson and Birkenshaw 2004, Tushman and O'Reilly 1996, Duncan 1995) and using the 'Triple-A' form of management (Lee 2004). The above concepts demonstrate how these aspects of flexibility focus on dealing with unexpected and expected change (Whitworth and Zaic 2003). Since external changes are continuous, most CIOs would also agree that some uncertainty will always be present. Therefore, it might be speculated that the enterprise IT organization is systematically flexible when the organization is able:

1. *To anticipate both unexpected and expected changes, allowing time to prepare through forecasting and planning (anticipation).*
2. *To move ahead on implementing plans for expected change and to wait for unexpected changes to occur, then to identify opportunities from the unexpected changes that can be leveraged or to react quickly to potential threats and fix the problems that occur as effectively as possible (agility).*

This is not an either/or choice, as one can do both. However, each is distinct from the other, as an entity can be agile without anticipation, and can anticipate without being agile. In both cases, flexibility increases. There is yet a third option, where an entity can have neither anticipation nor agility, yet still develop flexibility by being adaptable:

3. *To learn from previous experiences and improve the capability to anticipate and be agile in the future.*

As a result of this discussion, we propose that flexibility can be systematically analyzed and introduced within the IT organization. However, combinations of all three distinct aspects (anticipation, agility, and adaptability) should be incorporated into the enterprise IT organization to become more flexible. We propose that these three aspects be combined into an 'Enterprise IT Organizational Flexibility Cycle' as a continuous flexibility cycle shown in Figure 2.3.

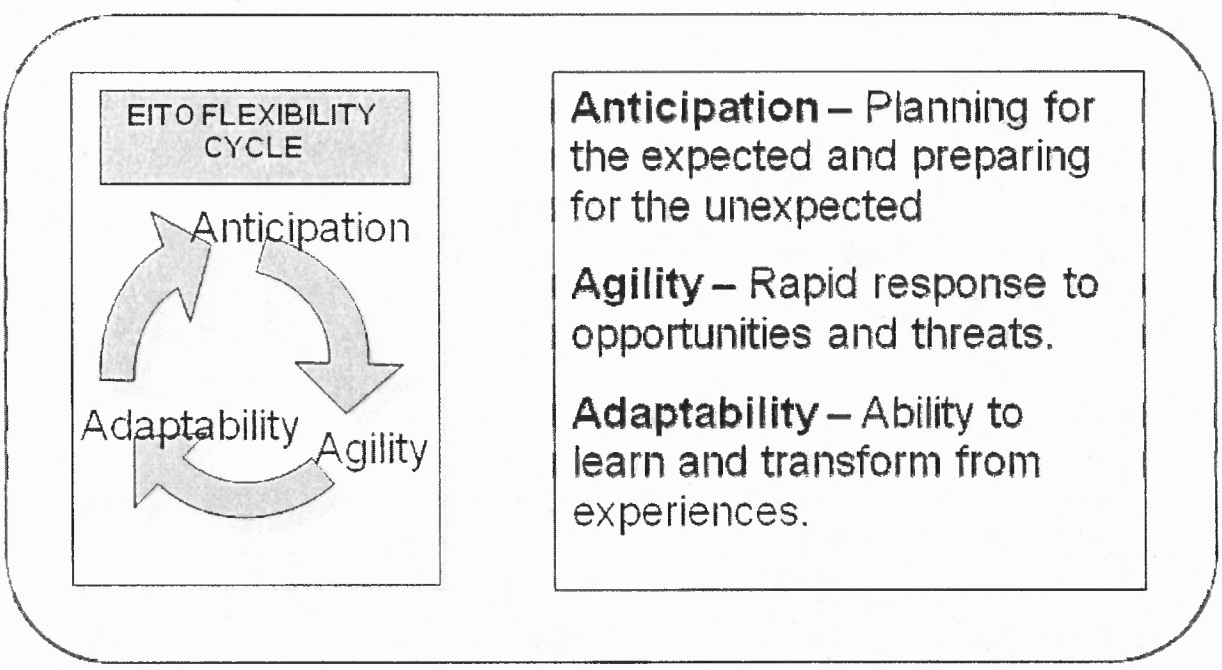


Figure 2.3 Enterprise IT Organizational Flexibility Cycle (Source: Patten et al. (2005)

First, anticipation balances planning for expected change with preparing for unexpected changes within the organization. When the unexpected occurs, agility is the analysis of immediate alternatives (opportunities or threats) and the rapid response to the

environmental changes. Finally, after responding to the changes, adaptability is the capability of the organization to self-learn and self-organize based on its previous experiences. Then the adapted organization starts the cycle over again by planning for the expected change and preparing for unexpected changes, which is anticipation.

One goal of introducing enterprise IT organizational flexibility into the enterprise IT organization should be to leverage opportunities that come from external uncertainty and unexpected change as well as expected change, while at the same time minimizing the possible threats. Leveraging opportunities requires the capability to recognize opportunities and to creatively or innovatively initiate change. Minimizing threats requires the capability to assess risks and develop alternatives. Both require immediate action. Thus, enterprise IT organizational flexibility impacts all components of the enterprise IT organization – its governance including its necessary processes, policies, and practices; its personnel including customers, suppliers, and partners; and its technology infrastructure including hardware, software, products, and services.

2.5.3 Enterprise IT Organizational Flexibility Framework

Building on the concept that enterprise IT organizational flexibility cycle includes anticipation, agility, adaptability, we developed a framework to use to systematically introduce it into the enterprise IT organization. This conceptual 'enterprise IT organizational flexibility framework (EFF)' combines the three distinct organizational characteristics of anticipation, agility, and adaptability with the four major components of the enterprise IT organization including its governance, people, and technology

infrastructure and technology services, products, and applications. This EFF is shown in Table 2.13.

Table 2.13 Enterprise IT Organizational Flexibility Framework

	Governance	People	Technology - Infrastructure	Technology – Services, Products, Applications
Anticipation				
Agility				
Adaptability				

A framework is defined as a set of assumptions, concepts, values, and practices that constitute a way of viewing reality (Whitman, Liles, Huff, and Rogers 2001). The framework is useful to provide a means of explanation, focus for discussion, basis for analysis and design, and a baseline for process improvement (Whitman et al. 2001). The EFF is a similar approach, which can be used to provide a common understanding of enterprise IT organizational flexibility and to determine how to achieve future flexibility benefits.

Meade (1997) and Meade and Rogers (1997) described four key characteristics for agile business processes. These characteristics included:

- Cooperate / enhance competitiveness
- Enrich the customer
- Master change and uncertainty
- Leverage the impacts of people and information.

To demonstrate how the enterprise IT organizational flexibility framework could be used to increase organizational flexibility, we applied Meade and Roger's (1997) agile business process recommendations as shown in Table 2.14.

Table 2.14 Characteristics of a Flexible Enterprise IT Organization

	Governance	People	Technology - Infrastructure	Technology – Services, Products, and Applications
Anticipation	• *Cooperate – Enhance Competiveness* • *Master Change and Uncertainty*	• *Cooperate – Enhance Competiveness* • *Master Change and Uncertainty*	• *Cooperate – Enhance Competiveness* • *Master Change and Uncertainty* •	• *Enrich the Customers* • *Cooperate – Enhance Competiveness* • *Master Change and Uncertainty*
Agility	• *Cooperate – Enhance Competiveness:* • *Master Change and Uncertainty*	• *Leverage Impact of People and Information*		
Adaptability	• *Leverage Impact of People and Information*	• *Leverage Impact of People and Information*	•	• *Enrich the Customers*

(Adapted from Meade 1997, Table 2-1, p. 34.)

2.6 Research Model and Questions

This study proposed that enterprise IT organizational flexibility could be defined, analyzed, and systematically integrated into the enterprise IT organization. Figure 2.4 shows the research model. Turbulent external and internal business environments contribute the uncertainty and unexpected changes, which impact the enterprise IT organization. Although this research did study the impacts of expected change, it was primarily focused on uncertainty and unexpected change. Linking the three flexibility aspects of anticipation, agility, and adaptability forms the 'enterprise IT organizational flexibility cycle,' which is activated by environmental changes. This study evaluated the resulting conceptual 'enterprise IT organizational flexibility framework.

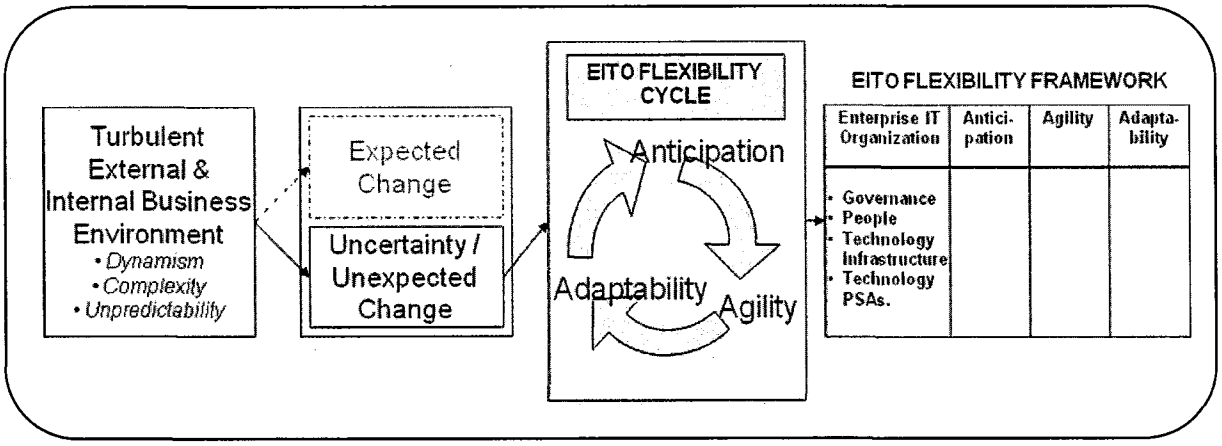


Figure 2.4 Enterprise IT Organizational Flexibility Research Model

Based on the assumption that organizational flexibility is necessary in turbulent business environments and that it can be introduced systematically into an enterprise IT organization, this research focused on the following primary research question:

How do CIOs think about and use flexibility within the enterprise IT organization when dealing with uncertainty and unexpected change?

Because of the exploratory nature of this research, we used an ethnographic qualitative research method. Wolcutt (1990) suggested a list of general questions that should be answered in exploratory research. The following questions are based on Wolcutt's recommendations and were modified for this study:

1. *What is currently going on in the organization under study?*
2. *What is the current situation within the problem domain under study?*
3. *How do the people in the organization work and contribute within the problem domain under study?*
4. *As a potential solution to the problem, would enterprise IT organizational flexibility be useful in managing uncertainty and unexpected change?*

Based on these general exploratory questions, we prepared a list of more specific questions to use to study the problem domain under study described below:

- Understanding the enterprise IT organization as a so socio-technical system
- Operating in a dynamic business environment
- Using flexibility within the enterprise IT organization.

These specific questions are listed in Table 2.15 under each of the four general exploratory questions.

Table 2.15 Exploratory Research Questions

General and Specific Exploratory Questions	Enterprise IT Organization Components / Attributes
1. *WHAT IS **CURRENTLY GOING ON** IN THE **ORGANIZATION** UNDER STUDY?*	
a. How does the CIO lead and manage the enterprise IT organization in dynamic business environments?	CIO Leadership Governance
b. How do CIOs deal with emerging technology and its expected value to the enterprise in order to provide competitive advantages in dynamic business environments?	Technology – Infrastructure
c. How are services, products, and applications delivered within the enterprise in dynamic business requirements?	Technology – Services, Products, and Applications
2. *WHAT IS THE **CURRENT SITUATION** WITHIN THE **PROBLEM DOMAIN** UNDER STUDY?*	
a. What CIO knowledge about the enterprise IT organization environment (individually and collectively) is necessary in order to manage the organization in a dynamic business environment?	CIO Leadership
b. How do CIOs currently manage uncertainty or unexpected change?	Uncertainty and Unexpected Change Governance People Technology – Infrastructure Technology – Services, Products, and Applications
c. Is dealing with uncertainty and unexpected change different than managing with expected change?	Expected Change Governance People Technology – Infrastructure Technology – Services, Products, and Applications
3. *HOW DO THE **PEOPLE** IN THE ORGANIZATION **WORK AND CONTRIBUTE** WITHIN THE **PROBLEM DOMAIN** UNDER STUDY?*	
a. What are the expected roles and responsibilities of the enterprise IT organization people when working in a dynamic business environment?	People
b. How does the CIO create the environment	CIO Leadership

General and Specific Exploratory Questions	Enterprise IT Organization Components / Attributes
where necessary skills and attitudes to work in a dynamic business environment are developed and transmitted to others?	
4. *AS A POTENTIAL **SOLUTION** TO THE PROBLEM, WOULD **ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY** BE USEFUL IN* MANAGING ***UNCERTAINTY AND UNEXPECTED CHANGE?***	
a. How do anticipation, agility, and adaptability affect the enterprise IT organization?	EITO Flexibility Cycle
b. Would the Enterprise IT Organizational Flexibility Framework (EFF) be a useful assessment and development tool when managing uncertainty and change?	EITO Flexibility Framework

CHAPTER 3

RESEARCH METHOD AND DESIGN

"The performance of a system is not the sum of the independent effects of its parts, it is the product of their interactions. Therefore, effective management of a system requires managing the interactions of its parts, not the actions of its parts taken separately." (Gharajedaghi and Ackoff 1985, p. 24)

3.1 Introduction

Traditional academic research uses quantitative research methods such as surveying, experimenting, and statistically analyzing data to study issues in information systems. However, these methods are not as effective when trying to explore more complex questions, such as those occurring in dynamic business environments (Patton 2002, Klein and Myers 1999, Markus 1997). One example of this inefficiency includes studying impacts of dynamic business environments on enterprise IT organizations while viewing the enterprise IT as a socio-technical system. Qualitative methods use an inquiry process to understand organizational, social, or human issues (Patton 2002, Creswell 1994). Earlier studies into enterprise IT organizational flexibility has generally focused on the sub-components of the enterprise IT organization and IT technology: flexible software (Sushil 2001, Goldman, Nagle, and Preiss 1995); flexible infrastructure (Ross 2003, Byrd and Turner 2000, Duncan 1995, Knoll and Jarvenpaa 1994); flexible processes (Meade 1997, Meade and Rogers 1997); and flexible enterprise IT personnel (Byrd, Lewis, and Turner 2004). In this study, all the components of the enterprise IT organization, viewed

as a socio-technical system, were considered integral to the concept of enterprise IT organizational flexibility.

Since one of the objectives of this study was to determine the impact of uncertainty and unexpected change as well as expected change on the complex socio-technical enterprise IT organization, we selected the use of qualitative research methods. LeCompte and Schensul (1999) recommended that an exploratory ethnographic descriptive research should be considered when:

- The research problem is not clear or it is complex and embedded into multiple systems.
- The causes of conflict and issues will be identified.
- Gaps in communications of interested parties increase the complexity of the issues.
- Associated factors associated with the issue will be explored.
- Unexpected or unanticipated outcomes are likely to occur.

The use of in-depth interviews with chief information officers (CIOs) was selected as one method to determine how unexpected and expected changes influence the enterprise IT organization. CIOs were selected as the study participants because they are experienced and knowledgeable about the research domain and problem. This in-depth interviewing technique also identified the importance of enterprise IT organizational flexibility capabilities, the impact of characteristics of various levels of the strategically-aligned IT organization on enterprise IT organizational flexibility, and CIO perceptions of enterprise IT organizational flexibility's impact on enterprise IT organizational performance.

The purpose of this is to chapter is to describe the justification for choosing in-depth qualitative interviewing and the study design, data collection, and analytical techniques used (Hart 2005). The following section discusses qualitative research methods in general and different types of qualitative methods. It then describes in more detail the selection of ethnographic research methods as compared to alternative methods and the advantages and benefits of ethnographic research methods. Details concerning qualitative interviewing techniques are then discussed in the next section including data-collection techniques, potential problems and issues considered, and analysis plans for the collected data. Finally, the last section discussed is the specific research plan including the results of the pilot study and the schedule for the main study.

3.2 Qualitative Research Methods

This section describes the use and benefits of qualitative research methods at a macro level. It then discusses the use of qualitative methods in information systems. It then describes the advantages and benefits of ethnographic research in information systems.

3.2.1 Qualitative Research Method Descriptions

Qualitative research uses a wide variety of available qualitative data collection techniques. It can be descriptive, used as part of quantitative research design in a mixed-method study, or used to develop quantitative measures for future research (LeCompte and Schensul 1999). Qualitative research has been used in Information Systems (IS) research for the last twenty years (Markus and Lee 1999). Different types of qualitative research provide information systems researchers an understanding of human thought and

action within the context of organizational and social perspectives. It has led to 'deep insights' into information systems phenomena such as enterprise information systems management or information systems development (Markus and Lee 1999). Each of these different types of qualitative research have its own appropriate and different criteria for evaluation including philosophical assumptions, research procedures, generalizability arguments, and the written form of the research report. Chua (1986) classified three types of research: positivist, interpretive, and critical. Positivist research is characterized as including propositions, variables with quantifiable measures, hypothesis testing, and inferences to representative samples. Interpretive research makes the assumption that knowledge of reality is only gained through studying social constructions such as language, consciousness, shared meanings, documents, and tools. Interpretive research has no predefined dependent or independent variables and focuses on the complexity of human sense-making. Critical research focuses on the social critique or emancipatory nature of humans (Walsham 1995a, 1995b). Interpretive research is further defined by Walsham (1993, p. 4-5) as:

> *"Aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context."*

Weick (1994) called this type of research 'intensive research.' Different types of interpretive research vary by length of time in the field and the extent of researcher immersion into the social group being studied. Field studies include in-depth case studies, action research, or ethnographies (participant-observer). Yin (1994, pp. 10-11) compared these methods as follows:

"Ethnographies usually require long periods of time in the 'field' and emphasize detailed, observational evidence. In contrast, case studies are a form of inquiry that does not depend solely on ethnographic data."

3.2.2 Use of Qualitative Research Methods in Information Systems Research

Walsham (1995b) studied the use of qualitative research methods in information systems research. He classified examples of information systems qualitative research studies as shown in Table 3.1.

Case study methodology is an important strand of information systems research and is accepted as a natural science model of social science (Walsham 1995b). Information systems literature includes a set of case study methodological principles. Generally, the case study is consistent with positivism (Yin 1994, Lee 1989, and Benbasat, Goldstein, and Mead 1987) and is accepted as a valid research strategy.

Table 3.1 Classification of Information Systems Qualitative Research Studies

	Positivist	**Interpretive**	**Critical**
Ethnographic Research	Orlikowski and Baroudi 1991	Boland 1985, 1991 Kaplan and Maxwell 1994 Suchman 1987 Walsham 1993 Wynn 1991 Zuboff 1988	Forester 1992 Ngwenyama and Lee 1997
Case Studies	Yin 1994 Benbasat, Goldstein, and Mead 1987 Lee 1989	Walsham 1995	
Action Research	Clark 1972	Elden and Chisholm 1993	Carr and Kemmis 1986

(Source: Walsham 1995b)

Researchers using qualitative research methods must insure that their research is properly conducted so it may be assessed as quality research (Klein and Myers 1999). They developed a summary of principles as shown in Table 3.2 that should be used for interpretive field research. Also, Markus and Lee (1999) determined that the legitimacy of qualitative or intensive research should not be challenged since so many such researchers are on editorial boards. For example, Allen Lee was a past editor-in-chief of *MIS Quarterly* and qualitative research papers have won best paper awards at information systems conferences and in information systems journals.

Table 3.2 Principles of Interpretive Field Research

Principle Characteristics	Example
The Fundamental Principle of the Hermeneutic Circle Human understanding is achieved by iteration between - interdependent meaning of parts, and - interdependent meaning of the whole. Fundamental to all other principles.	Conboy, Pikkarainen and Wang (2007) study to explore applications of innovative adoption theory in agile research. - Within case analysis of each case study - Cross-case comparison of all the cases. Lee (1994) study on information richness in email communications. - Separate message fragments of individual email (part) - Full meanings separate messages (whole)
The Principle of Contextualization Critical reflection of social and historical background of research setting. Current situation emerges.	Ciborra, Patriotta, and Erlicher (1996) showed how older Ford's production concepts still had significant influence on Fiat's new assembly plant even though they were using radically new changes in work organizations and operations.
The Principle of Interaction between the Researchers and the Subjects Critical reflection on how the interaction affected the "social" construction of the research data.	Trauth's (1997) understanding improved as she started to question her own assumptions.

The Principle of Abstraction and Generalization Idiographic details from the data interpretation (using principles 1 & 2) are related to theoretical and general concepts describing the nature of human understanding and social action.	Monteiro and Hanseth (1996) findings related to Latour's actor network theory.
The Principle of Dialogical Reasoning Sensitivity to possible differences between theoretical preconceptions guiding research design and actual results with subsequent revision cycles.	Nardulli (1978) revised his preconceptions of case load pressure as a central concept in study of criminal courts over time as described by Lee (1991).
The Principle of Multiple Interpretations Sensitivity to possible differences in individual participant interpretations of the same events or situations under study as expressed in multiple narratives.	Levine and Rossmoore (1993) conflicting expectations of the Threshold system in Bremerton Inc. case.
The Principle of Suspicion Sensitivity to possible 'biases' or systematic 'distortions' in participant narratives.	Forester (1992) considered facetious figures of speech used by city planning staff when negotiating problem of data acquisition.

(Adapted from Klein and Myers 1999, Table 1, p. 72)

Wolcott (1990) prepared a visual representation of the variety of qualitative interpretive research methodologies as shown in Figure 3.1. These methods are organized in the figure by research approach. Research studies often use more than one of the methods.

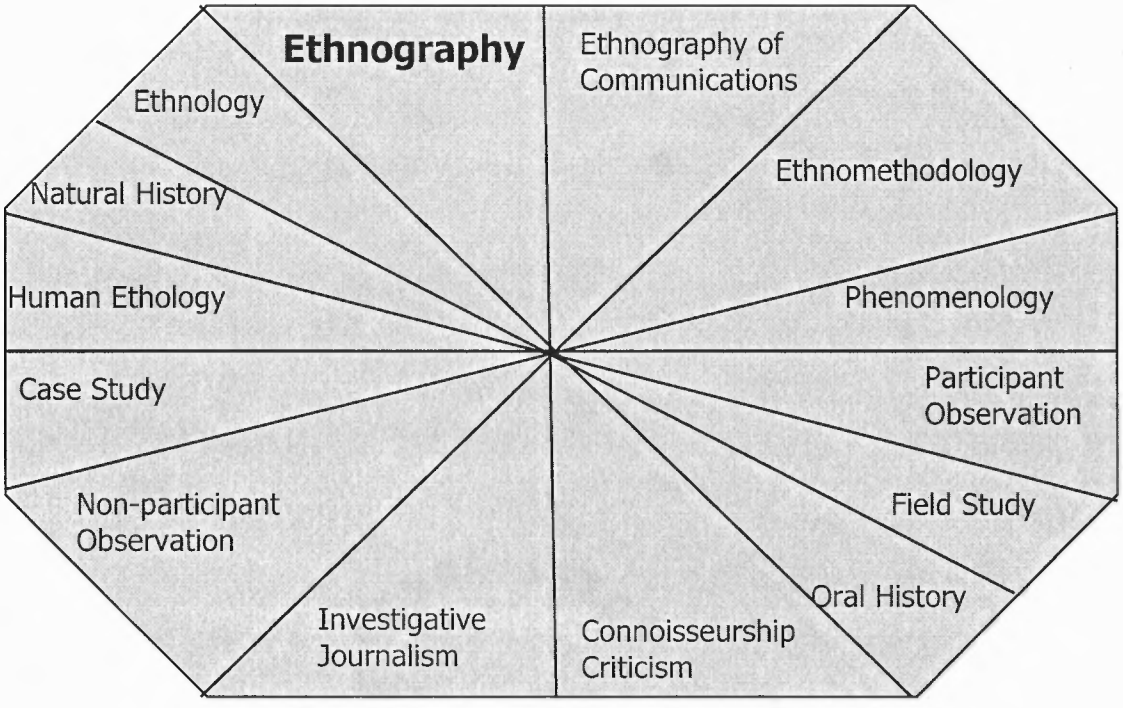


Figure 3.1 Different Qualitative Descriptive Research Methods (Source: Wolcott 1990)

3.2.3 Ethnographic Research Advantages and Benefits

Ethnographic research does not try to prove answers; it emphasizes discovery by using open-ended questions. This method of investigation allows researchers to gather information about sources of problems from the participants, which develop into unique relationships. LeCompte and Schensul (1999) described the difference between basic research and applied research. Basic research answers questions that may not have any direct reference to specific problems. Applied research, on the other hand, focuses on solving human problems. Ethnographic research is, by its nature, applied. Its purpose is to understand socio-cultural problems in various human situations that occur within a community or institution as determined either by the researcher or the involved humans. Its unique approach is intended to solve problems or, at least, bring about positive change

in the problem situations. The problem is first identified, which guides the study. If a problem is perceived to be important by the community, then the community will cooperate with the research (LeCompte and Schensul 1999). As a result, ethnography research leads to theories about the problem culture that explain how people think, believe, and behave in local time and space (LeCompte and Schensul 1999). Rubin and Rubin (2005) explained how ethnography and in-depth interviews overcome limitations of traditional research methods such as surveying, analyzing data, and experimenting with tests and repeated measures. In-depth interviews include careful standards, built-in credibility checks, and a systematic analysis that result in a richness of findings. Statistical summaries are not the same as communicating because numbers do not tell a story that people can understand (Rubin and Rubin 2005).

Ethnographers first ask the study participants the following general questions about the problem situation (LeCompte and Schensul 1999):

- What is happening in this setting?
- Who is engaging in what kind of activities?
- Why are they doing what they are doing?

The ethnographer learns about new situations from the perspective of an 'insider.' Ethnography is considered a science because it is investigative; it collects data through rigorous research methods to avoid bias and ensure data accuracy; and it is inductive since it builds on local theories for testing and then adapts them for use elsewhere (LeCompte and Schensul 1999). It differs from other social sciences because the ethnographer first discovers and strives to understand what people actually do and why they do it before determining interpretations of that action based on the ethnographer's

own personal experience or from other disciplines (LeCompte and Schensul 1999). The second reason ethnography differs form other social sciences is because the researcher cannot control what happens in the field situation of choice, unlike clinic or laboratory-like situations.

Ethnographic researchers are the primary tool of data collection. They learn through systematic observation in the field and by interviewing and carefully recording what they see and hear concerning how things are done. As a result, they learn the meanings that people attribute to what they make and do (LeCompte and Schensul 1999). To do this, ethnographers must gather data carefully and thoroughly in such a way that the data and its interpretation are understandable to others. They also must use procedures that can be replicated by others (LeCompte and Schensul 1999).

The critical methods for collecting ethnographic data include participatory observation, interviews, and content analysis. Table 3.3 describes characteristics of these three critical data collection methods. The rigorous research methods and data collection techniques used by ethnographers are necessary to avoid bias and ensure data accuracy. Ethnographers must adopt or create appropriate data collection instruments that are effective in the local problem domain and lead to a predictive picture or theory of the local business culture. The same instruments should be applicable to similar situations using the same research methods and data collection techniques (LeCompte and Schensul 1999). The instruments should be understood by the local people (study participants) and have meaning in the local setting. The instruments should help the ethnographer to understand the local business culture as a context for research and intervention.

Table 3.3 Ethnographic Data Collection Methods

	Observations	Interviews	Content analysis
Purpose	- Record situations as they happen - Record the meanings of these events at the time from study participants.	- In-depth information on selected topics - Personal histories - Cultural knowledge and beliefs - Description of practices.	- Elicitation of themes or content in a body of written or visual media.
Target	- Activities - Events and sequences - Settings - Behaviors of people and groups - Conversations - Interactions.	- Representative individuals - Key informants or topic experts.	- Documents - Artifacts - Artistic products - Transcripts - Photographic or videotaped records.
Data collection procedures	- Written or taped field notes - Written or taped records of informal interviews and conversations - Video records - Photographs - Maps - Observational checklists.	- In-depth interviews: o Unstructured o Semi-structured - Elicitation techniques (including vignettes or dilemmas).	- Repeated observations - Development of analytic categories - Coding - Enumeration.
Data content	Depiction of: - Physical - Settings - Acts - Activities - Interactions - Patterns - Meanings - Beliefs - Emotions.	- Answers to open-ended questions - Responses to elicitation materials.	- Coded or sorted text or visual media.

(Adapted from LeCompte and Schensul 1999, Table 6.1, p. 128-130.)

The ethnographic process is carried out in a natural setting and involves intimate, face-to-face interactions with participants. As a result, it results in an accurate reflection of participants' perceptions and behaviors. It does this by using inductive, interactive, and recursive data collection and analytic strategies to build local business culture theories. It also frames all human behavior and belief within a socio-technical and historic context.

The business culture acts as a lens through which to interpret results (LeCompte and Schensul 1999).

Ethnographers build theory in two ways (LeCompte and Schensul 1999): (1) they engage in bottom-up inductive thinking by drawing from their data and experience and by generalizing from concrete data to more abstract or general principles; and (2) they think deductively from top-down by applying more general or abstract ideas from relevant theories to the collected concrete data. Theory selection should be based on personal preferences, training of the research team, and what is appropriate to the problems/solutions (LeCompte and Schensul 1999). Examples of theories include:

- Theories of learning, development, social disorganization, perception, or self-efficacy
- Theories of structuralists, linguistic, post-modern or feminist
- Theories based on class, culture, social race, power, resistance, empowerment.

Ethnographers form onsite hunches and working hypotheses for initial explanations for data collection plans as they proceed through the iterative process. Ethnographers examine behavior and belief in the context of economic / political factors, history, people, groups, institutions, and features of physical environment. They also examine the social, cultural, political, and historical ties that connect individuals, institutions and organizations. Thus, the research results in interpretations that are enriched by contextual and historical framing (LeCompte and Schensul 1999).

Ethnographers tell a story from a 'group's' perspective. The written narrative is about the culture of groups of people. In the case of this study, the written narrative (found in Chapter 5) is about the culture of chief information officers (CIOs). It focuses

on patterns and traits that make-up a group's culture. A culture develops when groups adopt a behavior or belief, which persists over time. It is a mental phenomenon that includes what people do in the form of expected norms, what people know, and what people actually do. The group's patterns for behavior are dictated by their culture and their cultural expectations versus the patterns of behavior that are based on observations such as behavioral variations or choices in the group. In the case of this study, the culture is the enterprise IT organization business culture when operating in dynamic business environments.

The final justification for using ethnography is based on the characteristics of the research problem, the conditions of the research setting, what researchers need to know, and who are the research partners (LeCompte and Schensul 1999). Ethnographic research is best used to:

- Define a problem when the problem is not clear.
- Identify causes of conflicts.
- Determine gaps in communications.
- Define the problem when it is complex and embedded in multiple systems or sectors.
- Identify participants when the participants, sectors, or stakeholders are not known or identified.
- Clarify a range of settings where the problem or situation is occurring at times when the settings are not dully identified, known, or understood.
- Explore the factors associated with the problem in order to understand and address them, or identify them when they are not known.

- Document a process.
- Describe unexpected or unanticipated outcomes.
- Design measures that match the characteristics of the target population when existing measures are not a good fit.
- Answer questions that cannot be addressed with other methods or approaches.
- Ease the access of clients to the research process and products.

To summarize, ethnographic research is scientific because it is rigorous, systematic, repeatable, and logical. It seeks to understand what research participant behaviors mean to the research participants themselves rather than others who may impose their own interpretations about the participants' behaviors. Ethnographic research is used to better understand a problem, to illustrate what is happening in a program, to complement quantitative data on program process or outcomes, to complement and better explain survey data, and to identify new trends.

3.3 Qualitative In-depth Interviewing Method

Qualitative methods are better for exploring complex problems because information is gathered by observing and talking with people in the specific enterprise IT settings being studied (Klein and Myers 1999). In-depth qualitative interviewing is an effective method to describe how and why changes occur within the enterprise IT organization (LeCompte and Schensul 1999). This section describes the research design and plan for this study. Chapter 4 describes the actual specifics of the four steps conducted for this study. This section describes the four-step process.

The qualitative interviewing method is a four-step process as shown in Figure 3.2 and listed below:

- *Step 1. Problem Domain* - Define the problem domain and research question.
- *Step 2. Research Design* - Design the research plan and instruments based on the defined problem.

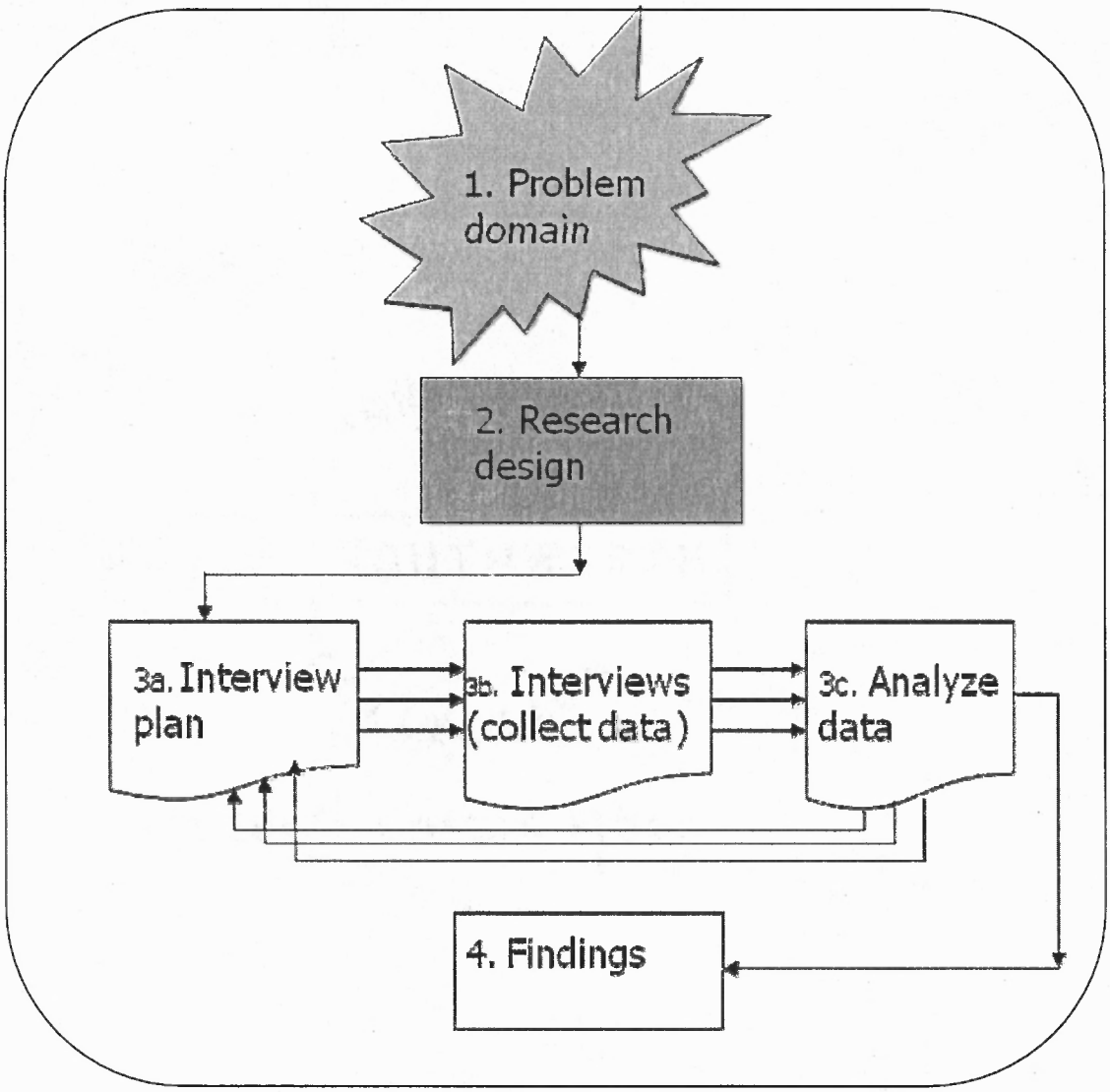


Figure 3.2 Qualitative Interviewing Steps

- *Step 3. Interviews* – Prepare the interview plan, collect the data by conducting the interviews, and then analyze the data. This is done in a series of sets in an iterative manner. Research plan and instruments may be refined after each set.
- *Step 4. Research Findings* – Prepare the written research narrative that describes the emergent themes, findings, and contributions.

3.3.1. Step 1. Problem Domain

The first step of qualitative inquiry using interviewing, exploratory, discovery, descriptive, and naturalistic techniques is to set the 'research focus' within the 'problem domain.' This method is used when it is unclear what will be found in the beginning of the actual data collection. The problems are not well-defined. Wolcutt (1990) suggested a list of general questions that should be answered in exploratory research. The following questions are based on Wolcutt's recommendations:

1. *What is currently going on in the organization under study?*
2. *What is the current situation within the problem domain under study?*
3. *How do the people in the organization work and contribute within the problem domain under study?*
4. *What are the potential solutions to the problems?*

For purposes of this research, the research focus is to answer the following question:

> *How do CIOs think about and use flexibility within the enterprise IT organization when dealing with uncertainty and unexpected change?*

Malinowski (1922, reprinted in 1984) calls this a 'foreshadowed problem.'

Oescher (2001) considered this 'natural discovery' where the goal is to discover different participant meanings of the same or similar processes and events. The anticipated problem is continuously reformatted during data collection. Foreshadowed problems are therefore, a "working knowledge of facts, issues, concepts, and theories" (Malinowski 1922). Theoretical or conceptual frameworks can be used to influence the development of foreshadowed problems. They can either generate research questions used to refine or extend theories or provide conceptual learning or behaviorism theories for phrasing questions. As a result, the problem domain research question may be reformulated during the course of the research study. In the case of this study, the 'Enterprise IT Organizational Flexibility Framework' is used to influence the development of the research question(s). This research 'flexibility' is one of the major advantages of qualitative inquiry, since the research questions are always under constant scrutiny.

The process is started by establishing the 'research focus.' This includes a broadly-defined 'purpose of research.' Since it is not known what will be found in the beginning, key thoughts about 'ethnographic intent' are first developed. Wolcutt (1990; 1982) pointed out that the 'purpose' rather than the 'method' is the heart of ethnographic research. This type of research is "*about 'problem setting' rather than 'problem solving'*" (Wolcott, 1990, p. 26). In the case of this study, the problem domain involved the enterprise IT organization as a socio-technical system operating in a dynamic business environment where uncertainty and unexpected change as well as expected change are continuously affecting the planning, implementation, and support of the enterprise IT services, products, and applications provided to the enterprise. The research focus is

narrowed to focus on the perspective of the CIOs as the knowledgeable leaders of the enterprise IT organization. Therefore, the research focus is:

> *How does one systematically integrate flexibility into the enterprise IT organization to better manage uncertainty and unexpected change?*

3.3.2 Step 2. Research Design

The second step of the research project is the 'selection process' answering who, where, and how questions about doing the research. Who are various groups of people and where is the appropriate place for the field work as determined through the 'eyes of the peer observer.' These people groups include the 'target group,' who will be affected by the results of the findings or change and who will be the 'agents of change.' Finally, any 'interactions' among the various groups must also be identified. These become the 'guiding questions,' which are used to prepare the semi-structured interview scripts. In the case of this study, the 'target group' includes CIOs and enterprise IT employees. The CIOs are also the 'agents of change,' who will lead the systematic integration of organizational flexibility into the enterprise IT organization.

The 'research database' is created during this step. The research database includes two main parts. The first is the nature and extent of the database describing the dates and places when the field work is completed, and the description of the interview part of the database, including the interview script and the research involvement of the narrator. Built into the database are techniques to employ 'triangulation,' which is the technique to double-check or verify the data collected through multiple sources.

This is the point where the first draft of the 'descriptive account' describing the research situation is written (Wolcott 1990). This draft descriptive account should be based on the appropriate body of literature. This should be completed prior to completing the analysis because it provides a check for the analysis and it can include unexplained 'facts' that may be cut later rather than trying to 'fit' them into the interpretation.

3.3.3 Step 3. Interviews

The third step is to begin the iterative interview process, continuously remembering to focus within the research setting. During the first iteration, one key is to identify 'broad categories' of key words concerning the research interest. The first list of these broad categories should be identified from the literature review before the interviewing starts. Additional categories will become obvious as the analysis of the interviews begins. These initial broad categories are built into the semi-structured interview script. Future categories and new sub-categories will are built into the script based on information from subsequent interviews. These broad categories are determined by the following questions (LeCompte and Schensul 1999):

- What is going on here?
- What do the people in this setting have to know?
- What are they supposed to do? Individually? Collectively?
- How are the skills and attitudes of the people acquired? Transmitted?

Analysis of the categories leads to the development of a 'taxonomy' of sub-areas to explore during the interviews (LeCompte and Schensul 1999). Eventually, this taxonomy should result in at least three levels as the research focuses on the:

- Impact of uncertainty and unexpected change on the enterprise IT organization.
- Definitions of flexibility and its related aspects.
- Integration of the enterprise IT organizational flexibility cycle into the enterprise IT organization.

In summary, the 'initial' set of concepts becomes the basis for semi-structure interviews; the research situation answers the above questions. The outputs of each set of interviews (data) are the transcribed interviews and the extensive 'field notes.' Each set of interview data is coded and then compared to each interview within the set and then to previous interviews. This comparison leads to emergent theories, which are then re-compared to the interview data. Also, the comparison leads to new categories and related category properties (sub-categories.)

Selecting the population is an important part of the process (Smith, Evans, and Westerbeck 2005). Based on the analysis, future interview participants are selected through 'theoretical sampling' or 'purposeful sampling' (LeCompte and Schensul 1999). This sampling technique increases the diversity of the participant population by the following process:

- Sample is collected using 'searches' for different properties and characteristics
- 'Core categories' and new 'linked categories' are identified
- All 'categories' are sorted until saturated when the identification of new categories is unlikely.

For this research, the targeted population included CIOs and enterprise IT executives who were members of the Society for Information Management (SIM) in New Jersey, Connecticut, and New York chapters. These CIOs were selected because they are

key decision-makers and have roles of authority and responsibility. The selected participants were also selected using 'case-selection' procedures to determine sampling categories (Minichiello, Aroni, Timewill, and Alexander 1995). The first set of participants was asked about the categories that were prominent and identified during the review of the literature. The second set was asked about categories that were 'discovered' through data collection in the first set. The goal was to seek evidence from research data about 'variables' that mitigate the CIOs' 'perceptions' and 'practices.' These highlighted variables were then included in a 'theoretical sampling frame' or 'purposeful sampling frame.'

In the case of this study, the demographics used for the 'purposeful selection of participants' so that a 'comparative analysis' can be conducted are listed as follows:

1. Formal IT education (E): IT versus non-IT degrees (*BS, MS, PhD*).
2. Years in current and previous CIO positions (Y): *less than 3, 3-6, 6-10, and greater than 10.*
3. Enterprise Location (L): *single U.S. location versus multi U.S. locations (or U.S. only) versus multi-global locations.*
4. Size of the enterprise (S): *less than 20, 20-250, 250-1,000, 1,000-10,000, and larger than 10,000 employees.*

3.3.4 Step 4. Research Findings

The written narrative builds the research 'scene' by adding one actor at a time, eventually identifying enough elements to tell the complete 'story.' It ends by being a reflection of the conscious and unconscious data collection processes and focus. The narrative reports

the interpretation of the findings. It also reports on the iterative or interactive process of constructing the explanatory theory (LeCompte and Schensul 1999).

3.4 Research Plan

This section summarizes the research plan and details the study schedule (Hart 2005).

3.4.1 Summary of the Research Plan

Twenty (20) semi-structured interviews were conducted with CIOs who are experienced and knowledgeable about the research problem. All information collected from the interviews was kept in strict confidence. The research was planned to be conducted in a systematic, multi-phase manner. The first set of the interviews comprised the pilot and included four interviews conducted in January and February 2006. Each interview lasted approximately one hour and was scheduled at the convenience of each participant. Based on the results of the pilot stage, the semi-structured interview script (see Appendix B) and demographics survey research (see Appendix C) instruments were refined. Since the in-depth interviewing methodology is iterative, three additional sets, each with five CIO interviews were then conducted. After each set, the transcribed interviews, the collected demographic data, and the field interview notes were coded and analyzed. It was expected that after the final analysis key enterprise IT organizational flexibility characteristics and capabilities would be identified. Also how CIOs rated their enterprise IT organizations' anticipation, agility, and adaptability capabilities, providing a measure of the enterprise IT organizational flexibility would be identified. One part of the research

was also to identify the participants' estimate of their enterprise IT organization's strategic alignment maturity level, providing a relationship between enterprise IT organizational flexibility and IT alignment. Finally, the CIOs' estimate of the level of enterprise IT organization performance, providing a relationship between enterprise IT organizational flexibility and enterprise IT performance would also be identified.

3.4.2 Research Schedule

Table 3.4 shows the study schedule for completion of this research study.

Table 3.4 Enterprise IT Organizational Flexibility Research Schedule

Tasks	Target Dates
Administration: - Submit IRB - Defend Proposal (4/20/06) - Schedule CIO interview appointments - Schedule and conduct preliminary review meetings with dissertation committee members to discuss preliminary activities and data as necessary.	***4/1-7/15/06***
Data Collection: - Conduct 'pilot' set of interviews - Conduct remaining interviews in sets of five (P1, S2, S3, S4) - Transcribe interviews (under contract with transcription service) - Code transcribed interviews (two coders).	***4/16-8/15/06***
Preliminary Iterative Analysis: - Conduct pattern analysis of each data set - Revised semi-structured interview script and demographics survey - Update written descriptions.	***4/30-9/25/06***
Detailed Final Analysis: - Determine key concepts, emerging themes, and study findings, - Update literature review concerning pattern findings as necessary - Update written descriptions.	***1/1-7/31/07***
Written Documents: - Complete "*Proposal*" document (including "Introduction," Literature Review," and "Method" chapters) and MS© PowerPoint presentation. - Submit draft[s] of "*Dissertation*" document to NJIT Graduate Services for formatting approval (note: 3 submissions required) - Complete "*Dissertation*" document (by adding "Data Collection and Analysis," and "Findings Discussion and Contributions" chapters) and MS© PowerPoint "*Defense*" presentation.	***4/17/06*** ***Varies:*** ***1/08 – 7/31/08***

3.4.3 Pilot Study

The pilot study was designed to test the proposed method as well as the validity of the research instruments including the draft semi-structured script and demographics form. The research method selected for the pilot study was the 'in-depth semi-structured interview.' It was conducted with four (4) chief information officers (CIOs) in New Jersey and New York during January and February 2006. The semi-structured interview provided face-to-face contact with the participants during the approximately sixty (60) minute interview. These pilot interviews also provided the opportunity to identify other related issues raised by the participants. Although a longer interview was preferred, the subject CIO's were very busy and the shorter one hour interview was the compromise to obtain participation. Although not planned, each agreed to a follow-up telephone conversation if necessary.

A semi-structured script, developed with a fixed set of general questions, was used for each interview. All the interviews were recorded with the participants' agreement. Plus written field notes were also taken during the interviews. A short demographics form was also used in the beginning of the interviews to build rapport with the participant and to collect data about the enterprise and its industry, about the enterprise IT organization, and about the CIO personal characteristics. An analysis of the pilot study resulted in a revision of the research methods and data collection instruments. As part of the interviews, the participating CIOs were assured that all discussions and data collected will be kept confidential and anonymous.

3.4.4 Primary Research Plan

The purpose of the primary phase of research was to develop a clearer understanding of the role and impact of different activities within the enterprise IT organization affecting each of the three aspects of flexibility. The second part was to determine how each aspect of enterprise IT organizational flexibility then improved the enterprise IT organization's ability to deal with uncertainty and unexpected changes thus improving IT performance. This phase included more complex and probing open-ended questions regarding the participants' attitudes and opinions for the need and potential benefits of enterprise IT organizational flexibility. Besides the sets of questions discussed above in the *Pilot Study Description*, several other areas were added to the interview scripts. The first was to identify the CIOs' current experiences dealing with uncertainty and unexpected changes as well as expected changes during the 2003-2005 timeframe by probing for specific examples. Also, the CIOs were asked for their reactions and feedback about the definition of the components of the enterprise IT organization, the enterprise IT organizational flexibility cycle, and the enterprise IT organizational flexibility framework using several discussion scenarios.

Since the in-depth interviewing method is iterative, four additional sets of four each semi-structured interviews with CIOs who were experienced and knowledgeable about the research problem were planned. Each interview was scheduled to last between 45 to 60 minutes and was scheduled at the convenience of each participant.

At the start of each interview, interviewers asked participants to sign an 'NJIT Consent Form' (shown in Appendix A), which was required when people are used as

research participants. This consent form explained the conditions of the interview and verified that the participants volunteered. Also, it stated that the participants could withdraw from the research study at any time for any reason. Participants were asked for permission to record the interviews for future analysis. The interviews began with a series of questions concerning demographic information about the enterprise and its industry, about the enterprise IT organization, and about the CIOs' personal characteristics. A short demographics form (shown in Appendix C) helped the researcher to build rapport with the participant and collect data that was used to analyze the results.

The semi-structured script was used as a guide for the main part of the interview. The script was divided into several sections. The first section established the discussion frame by explaining to the participants the purpose and goals for the research and the reasoning for the use of in-depth interviewing. The purpose of the interview was to try to understand how CIOs deal with uncertainty and unexpected change as well as expected change in today's dynamic global business environment. The in-depth script was used to collect detailed information from the participants about their management style, their interactions with their customers, vendors, and employees, and to identify the context within which the impacts of unexpected and expected changes differed among the participants. The description of the 'Enterprise IT Organizational Flexibility Cycle,' as a common definition of flexibility, and the 'Enterprise IT Organizational Flexibility Framework,' as a potential framework for assessing and systematically introducing organizational flexibility into the enterprise IT organization was also reviewed with the participants.

The second section of the semi-structured interview script discussed the components of the enterprise IT organization from the perspective of the participants. The participants were asked for definitions of and probed for needs to better manage governance of the enterprise IT organization. The participants were also asked how enterprise IT people are trained and what are the critical skills and capabilities needed. The interviewer also probed for the use of any specialized staff functions. Finally, the participants were asked how information technology services, products, and applications were developed, deployed, and maintained within the enterprise.

The third section of the semi-structured interview script determined the participants' definitions of uncertainty and unexpected changes as well as expected changes and identified how different types of changes and uncertainties impacted the enterprise IT organization including its governance, people, enterprise IT infrastructure, and enterprises IT services, products, and applications. The interviewer determined the participants' definition of flexibility, when flexibility is beneficial, and where flexibility is currently used. The participants were also asked if they had applied to the enterprise IT organizations any experiences and lessons from 'manufacturing flexibility' and 'software development flexibility,' the two relatively successful focuses on flexibility to help gain competitive advantages. The interviewer also discussed with the participants definitions and perceptions about anticipation, agility, and adaptability and probed for examples of flexibility impacts on governance, employees, infrastructure, and IT services, products, and applications. Finally, during this portion of the interview, the participants were shown the 'enterprise IT organizational flexibility cycle' and encouraged to discuss implications of the systematic organizational flexibility implementation approach. The

last portion of the interview discussed the 'enterprise IT organizational flexibility framework' and collected the thoughts and perceptions of the participants considering the framework. Participants were thanked for their time and participation at the closing of the interview.

Interviews were conducted on a confidential basis using semi-structured interview formats to maintain consistency among the interviews, raise other issues important to the participants, and allow exploratory discussions with probing and open-ended questions. Confidentiality was important to encourage participants to speak freely about their experiences, about their understanding and potential use of the 'Enterprise IT Organizational Flexibility Framework,' and about recommendations for further research on enterprise IT organizational flexibility.

After each set of interviews, the iterative qualitative analysis was conducted using the transcribed interviews, the collected demographic data, and the field interview notes. The 'NVivo' software system was used during the iterative analysis of the interview data between interview sets and after all the data was collected. Data was also collected about each of the enterprises involved from secondary research of published sources including trade and industry magazines, competitive information, annual reports, press releases, and marketing and industry reports.

After all the data was collected and the iterative data analyzes were completed, the detailed conceptual analysis was conducted. This detailed analysis led to the development of 'emergent themes,' which led to the development of 'research findings.' The research narrative was then prepared, which discussed the implications of the findings. The limitations of the study and an evaluative audit of the research study

processes and findings were also made. Finally, the contributions from this research study and recommendations for future research were made. Future research is expected to study enterprise IT organizational flexibility using the Enterprise IT Organizational Flexibility Framework from the perspective of the enterprise executives as well as enterprise IT partners, service-providers, and vendors. This broader perspective is expected to expand the Enterprise IT Organizational Flexibility Framework into an assessment tool to determine an enterprise IT organization's readiness for managing uncertainty and unexpected changes as well as expected changes while taking necessary steps to improve the enterprise IT organization's change management capabilities.

CHAPTER 4

DATA COLLECTION AND ANALYSIS

> *"Analysts also have an obligation to monitor and report their own analytical procedures and processes as fully and truthfully as possible* (Patton 2003, p. 434).

4.1 Introduction

The purpose of this chapter is to describe in detail how the data for the Enterprise IT Organizational Flexibility study was collected and analyzed. It also describes the evolution of analyzed data to major study findings through different analysis stages.

LeCompte and Schensul (1999) recommended a checklist that should be prepared when beginning an ethnographic study. Table 4.1 shows this checklist as modified for this particular study. The 'purpose' of the study was to gather information about how and why uncertainty and unexpected changes occur within the enterprise IT organization and what CIOs thought about systematically integrating enterprise IT organizational flexibility into the enterprise IT organization. The 'target group' consisted of chief information officers (CIOs), who were considered to be the most experienced and knowledgeable about the research problem of managing uncertainty and unexpected change as well as expected change within the enterprise IT organization. CIOs would also be able to provide evidence about 'variables' that mitigate their own 'perceptions' and 'practices.'

Table 4.1 Ethnographic Study Checklist for the Enterprise IT Organizational Flexibility Study

Study	**Enterprise IT Organizational Flexibility Research**
Purpose	• Identify impact of uncertainty and unexpected change on enterprise IT organization. • Determine use of flexibility aspects within enterprise IT organization. • Elicit comments on perceived usefulness of enterprise IT organizational flexibility aspects.
Target	CIOs
Change Agent	CIOs
Procedures for Data Collection	Transcribed in-depth semi-structured interviews Conversations Written field notes Written records of informal interviews.
Data Content	• Answers to open-ended interviews • Depiction of: - Physical settings - Activities - Interaction patterns - Beliefs - Emotions. • Responses to elicitation materials.

(Adapted from LeCompte and Schensul, 1999, Table 6, p. 128-130.)

An expected outcome of this study was that CIOs act as 'agents of change' and lead the integration of organizational flexibility capabilities into the enterprise IT organization (EITO). another expectation was that 'interactions' between the CIOs and enterprise executives and 'interactions' with the enterprise IT organization employees, vendors, and suppliers would be identified. Procedures for collecting the data included transcribed in-depth semi-structured interviews, conversations, written field notes, and written records of informal interviews. The data content from this study included answers

to the open-ended interviews, a depiction of the physical settings, activities, interaction patterns, beliefs, and emotions, and the responses to elicitation materials.

This study targeted different industries and enterprises from the very largest Fortune 500 to the very smallest under the assumption that most industries and different sized enterprises experience the common problem of managing uncertainty and unexpected change. Twenty chief information officers (CIOs) participated in the semi-structured interviews. Section 4.2 discusses the selection of the participants and describes the participant profiles.

A more complete understanding of the problem domain was developed by conducting the interviews as a series of iterative phases or sets. This was because new information was identified from the preliminary analysis of each set's data, which was incorporated into the next set of interviews. This method to modify the semi-structured script between each set was recommended by Janesick (2005) to better understand a domain problem. Figure 4.1 depicts this process starting with individual sets of CIO interviews and each set's initial coding and analysis. The discussion of the field interviews and iterative data collection process is described in Section 4.3. Once all the data was collected, then key ideas and comments were identified through the iterative data analysis. This part of the data analysis is described in Section 4.4. These comments were then combined during the conceptual analysis into emergent themes, discussed in Section 4.5, which were consolidated and summarized as key findings, described in the last section, Section 4.6. The discussion and implications of the findings are discussed in Chapter 5. The findings led to major contributions from this enterprise IT organizational flexibility study, which are also discussed in Chapter 5.

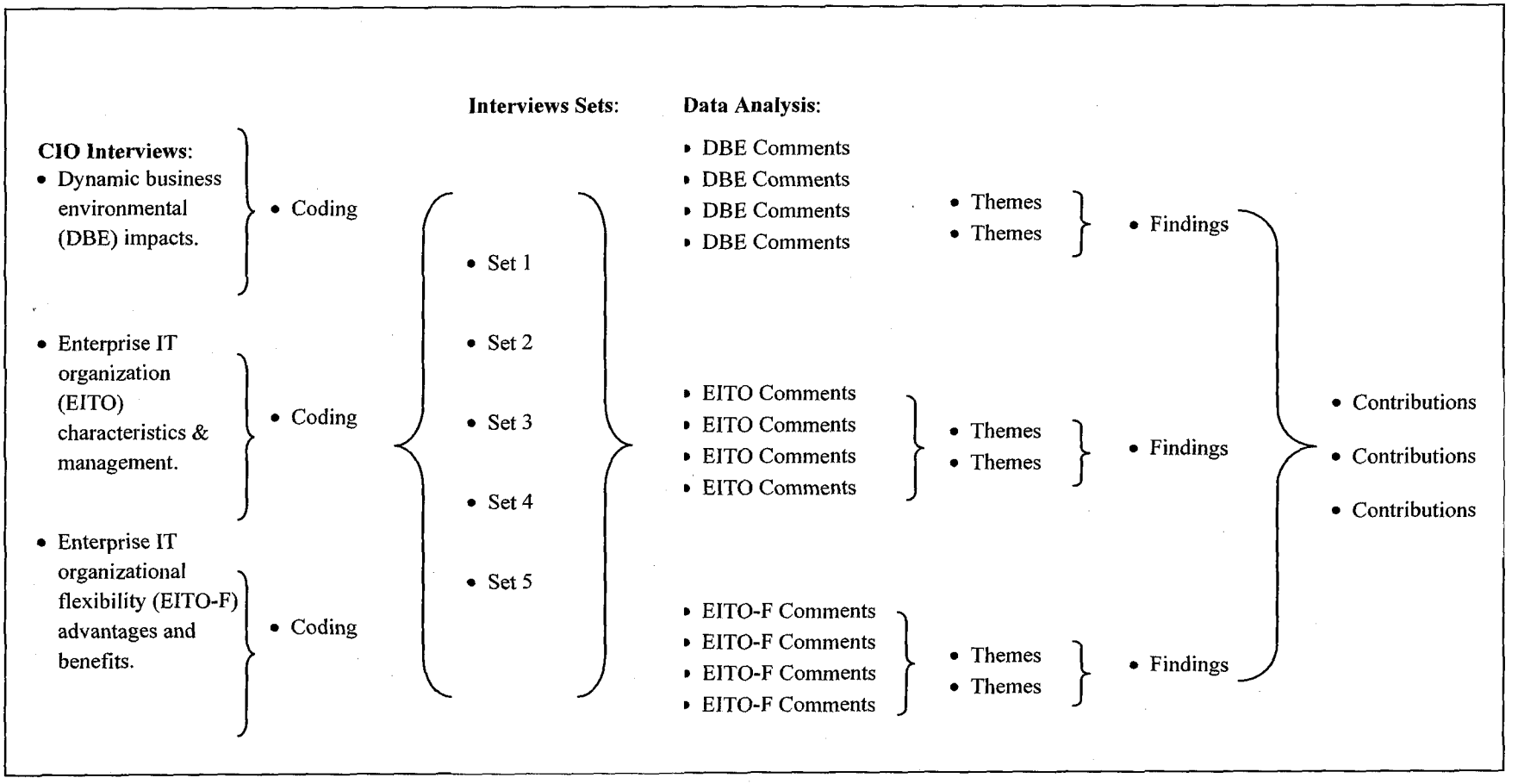


Figure 4.1 Evolution of Enterprise IT Organizational Flexibility Findings and Contributions from Qualitative Ethnographic Research

4.2 Participant Characteristics and Profiles

This section describes how the study participants were selected and includes a descriptive profile of each participant. CIOs who were members of the Society for Information Management (SIM) from the New Jersey, Connecticut, and New York chapters were targeted as potential volunteers for this study. Officers of this professional organization agreed to publicize a request to recruit research participants because of their strong interest in the research question concerning managing uncertainty and unexpected change. CIOs were targeted because they were key decision-makers, had roles of authority and responsibility, and were experienced and knowledgeable about the research problem.

4.2.1 Determining Participant Selection

Volunteers from the NJ-SIM chapter made up the initial group of study participants. Because the sample population is an important part of the research process (Smith, Evans, and Westerbeek 2005), the remaining participants were selected using 'theoretical sampling' or 'purposeful sampling' (LeCompte and Schensul 1999) insuring a broad representation of demographics and 'case-selection' procedures (Minichiello, Aroni, Timewell, and Alexander 1995). Purposeful sampling assumes that once no new categories are discovered from the participants, then no additional useful information would be collected from additional participants. Following the 'case-selection' procedure, participants were grouped into 'sets' for two major reasons. The first reason was to conduct an iterative analysis of the collected data from a small set of in-depth interviews at one time to discover key research categories rather than to analyze

participant data one at a time. The second reason was to specifically select study participants who represented a diverse group of industries, enterprise size, CIO education and experience, and enterprise IT organization characteristics (LeCompte and Schensul 1999). As a result, some CIOs who volunteered were not selected for the study because their demographics and personal characteristics were too similar to earlier participants. Subsequent participants were selected because they represented different demographics and personal characteristics from the earlier participants.

The iterative in-depth interview process was conducted as follows. The first set of participants were asked questions that related to the major research or 'core' categories identified from the literature review. The second set of study participants were then asked about new categories that were 'discovered' during the data collection of the first set as well the initial 'core' categories from the literature review. These 'discovered' categories were then 'linked' to the 'core' categories during each of the iterative analyses between each set of interviews. This iterative process continued until the fifth set of interviews when no new categories were 'discovered.' Data saturation occurs when no new information is being identified.

Participants in this study represented different industries (pharmaceutical, finance, utilities, manufacturing, insurance, and education), both public and private entities, and varying enterprise sizes (Fortune 500 enterprises, small and medium enterprises (SME), and very small business enterprises). This variety of participant characteristics was also used to comparatively determine if the problems of uncertainty and unexpected change remained constant or differed across industries or enterprise size and if CIOs managed uncertainty and unexpected change as well as expected change differently across

industries and enterprise sizes. And, finally, the potential application of enterprise IT organizational flexibility as a technique to improve managing uncertainty and unexpected change across industries and enterprise sizes was also explored. The key characteristics used in this study for the comparative analysis included formal education, number of CIO positions, the enterprise size, industry, and number of locations supported, and the structure and characteristics of the enterprise IT organization. Table 4.2 provides profiles of the individual demographic characteristics for the twenty participants. A more complete description of these profiles follows in the next sub-sections.

4.2.1.1 Formal Education (E) – The formal higher education of some of the CIOs who have an IT education (B.S., M.S.) was compared to the other CIOs with non-IT formal higher education (B.A., B.S., M.A., M.S., MBA, PhD). This second group of CIOs started their IT careers as IT executives. Eight of the CIOs had a bachelor of science (B.S.) degree in IT-related fields such as computer science, electrical engineering, information technology or management information systems, but only one of those had a master of science (M.S.) degree in management information systems. One participant had no formal college degree, while the eleven remaining CIOs had bachelors of science degrees in non-IT functions including math, chemistry, accounting, economics, history, business administration, statistics, management, and finance. Seven of this second group had a master of science or arts (M.S. / M.A.) in non-IT disciplines or a masters of business administration (MBA), while one had a Ph D. in a non-IT discipline. See Table 4.3 for more specifics about the participant education.

4.2.1.2 CIO Career: Number (#) of CIO Positions and Years (Y) – Several of the CIOs had more than one CIO position. Because these earlier CIO positions were in companies or industries other than the participants' current positions, each participant was asked questions that related to his or her current enterprise IT executive position and up to the previous two CIO positions. For purposes of this study, each of these individual CIO positions could be considered as a separate data point for which demographic data could be collected for comparison purposes. Of the twenty participants selected for this study, six were in their first CIO position; three had one previous CIO position; and eleven had two or more previous CIO positions. This represented a total of 46 (6 x 1 and 2 x 2 and 12 x 3 = 46) individual CIO positions used as separate data points for collecting data. Eight of the twenty participants had spent their entire careers in IT-related functions and the twenty had held a total of 46 separate CIO positions for a total of 220 years of CIO experience. The following demographic information is based on 46 separate data points.

The total number of years in each CIO position as well as the total years of each of the previous two or three CIO positions for each participant was sorted into four groups. These categories included: (1) less than three years, (2) three to six years; (3) six to ten years; and (4) greater than ten years. Of the six CIOs who were in their first CIO position, the shortest length of time in that position was three years, while the longest was 25 years. Eighteen of the CIOs had positions or were in their current position for less than three years (one was only three weeks). Six of the CIOs were in at least one position for greater than ten years, while eleven CIOs had CIO careers of greater than ten years, with

four careers of at least greater than twenty years. See Table 4.2 for a more specifics about the number of years in CIO positions.

4.2.1.3 Supported Enterprise: Locations (L), Size (S), and Industry – The scope of different CIO responsibilities depends on a number of different factors. We used the number of locations managed either in the United States or internationally, the size of the enterprise based on the number of employees, and the different types of industries as comparison factors in this study. Three groups of location data were identified: (1) a single U.S. location; (2) multiple U.S. locations; or (3) multi-global or international locations including at least one U. S. location. Four of the executives who were in their first CIO position supported an enterprise or division that had primarily one U.S. location. The rest of the CIOs supported enterprises that were approximately evenly split between either multiple U.S. locations or multiple multi-global locations.

The size in terms of number of employees of the enterprise supported by CIO and his or her enterprise IT organization was also collected. The size categories included: (1) the *very small* business with less than twenty employees; (2) *small* enterprises with twenty to 250 employees; (3) *medium* enterprises with 250 to 1000 employees; (4) *large* enterprises with 1000 to 10,000 employees; and (5) *very large* enterprises with greater than 10,000 employees. One of the CIOs worked for a very small enterprise where she also fulfilled the role of chief financial officer. Seven of the CIO positions were with medium enterprises between 250 and 1000 employees, while four of those CIOs were currently working in medium size enterprises. Twenty-eight of the CIOs positions had been in very large enterprises, greater than 10,000 employees. Ten of the current CIO

positions were for very large enterprises and eight of those CIOs had only worked their entire CIO career in very large enterprises.

Sixteen of the 46 CIO positions supported either financial or insurance-related enterprises. Five of the positions supported pharmaceutical enterprises. The rest of the 45 CIO positions were spread across consumer goods, education, entertainment, IT consulting, legal, manufacturing, services, transportation, and utility industries. See Table 4.2 for a more specifics about the scope of the CIO responsibilities.

4.2.1.4 Enterprise IT Organization Structure – Eleven of CIOs currently led a centralized enterprise IT organization while twelve had led centralized organizations in previous CIO positions. Currently, five CIOs led an enterprise IT division in a federated structure indirectly reporting to either a separate enterprise chief information officer or chief technology officer (CTO) while directly reporting to a business division executive. One of these five has also previously managed in a federated IT division. The remaining three CIOs described their organization structure as decentralized. The organization structure for one CIO was unknown in his current and previous CIO positions. See Table 4.2 for a summary of the types of enterprise IT organization structure.

CIOs were asked if they were familiar with the Luftman's Strategic Alignment Maturity (SAM) Model and the five levels of IT alignment with the business strategy (Luftman and Kempaiah 2007, Sledgianowski, Luftman, and Reilly 2004, Luftman 2000). When asked to rate their own strategic IT alignment with the business strategy on a maturity scale from one to five, five of the CIOs considered their strategic alignment maturity to be at level four, three considered their strategic alignment maturity to be at

Table 4.2 Participant Profiles of the Demographic Characteristics for 20 Participants and 45 Participant Data Points

Set	#	M / F	Formal Higher Education		Experience		CIO Experience		Enterprise			Enterprise IT Organization	
			IT	Non IT	Non IT & Non CIO IT Function	Total IT Years (includes CIO exp)	CIO Positions	Total CIO Years	Industry	Size	Locations	Structure	Business / IT Alignment Level
1	1	F	none	BS: PhD: Chemistry	R & D	6	1 (1A)	<3	Pharmaceutical	VL	Multi – US	Centralized	5
							2 (1B)	<3	Pharmaceutical	VL	Multi – In'l	Centralized	na
							3 (1C)	<3 (6)	Pharmaceutical	S	Multi – US	Centralized	na
	2	M	BS: EE	BS: EE	Manufacturing	19	4 (2A)	3-6	Consumer Goods	M	Single – US	Distributed	Local = 4 Global = 2
							5 (2B)	>10	Consumer Goods	L	Multi – In'l	Centralized	na
							6 (2C)	<3 (19)	Manufacturing	S	Multi – US	Centralized	na
	3	M	BS: IT	none	IT	unk	7 (3A)	<3	Finance	L	Single – US	Centralized	5
							8 (3B)	3-6	Manufacturing	VL	Single – US	Centralized	na
							9 (3C)	<3 (9)	Finance	VL	Single – US	Centralized	na
	4	M	none	BS: Math MBA: Mgmt	Manufacturing Finance	17	10 (4A)	>10	Services	VL	Single – US	Federated	4
							11 (4B)	3-6	Pharmaceutical	VL	Single – US	Distributed	2
							12 (4C)	<3 (17)	unk	L	Multi – In'l	Federated	na
2	5	M	none	none	IT support	20	13 (5A)	<3	Utilities	VL	Multi – US	Centralized	unk
							14 (5B)	<3	Utilities	VL	Multi – US	Centralized	na
							15 (5C)	>10 (20)	Utilities	VL	Multi – US	Centralized	na
	6	F	none	BS: Acctg	Accounting Comptroller	14	16 (6)	>10 (14)	Consumer Health Care Goods	VS	Single – US	Centralized	3

Set	#	M / F	Formal Higher Education		Experience		CIO Experience		Enterprise			Enterprise IT Organization	
			IT	Non IT	Non IT & Non CIO IT Function	Total IT Years (includes CIO exp)	CIO Positions	Total CIO Years	Industry	Size	Locations	Structure	Business / IT Alignment Level
3	7	M	BS: CS MS: MIS	none	IT	unk	17 (7)	6-10 (7)	Insurance (mini-Case Study)	VL	Single – US	Federated	4
	8	M	none	BS: Econ	Finance IT	27	18 (8A)	3-6	Insurance (mini-Case Study)	VL	Multi – In'l	Federated	unk
							19 (8B)	3-6	Insurance	VL	Multi – In'l	Distributed	na
							20 (8C)	<3 (10)	Insurance	VL	Multi – US	Distributed	na
	9	F	none	BA: History MA: Science	Consulting	5	21 (9A)	3-6	Financial	M	Multi – US	Centralized	unk
							22 (9B)	<3	unk	unk	unk	Distributed	na
							23 (9C)	<3 (5)	Legal	VL	Multi – US	Centralized	na
	10	M	none	BA: Econ MBA: Mgmt	Manufacturing IT	20	24 (10A)	3-6	Entertainment	L	Multi – US	Centralized	unk
							25 (10B)	<3	Manufacturing	VL	Multi – In'l	Centralized	na
							26 (10C)	<3 (12)	Entertainment	L	Multi – In'l	Centralized	na
	11	M	none	BS: Bus Admin	Finance	25	27 (11A)	3-6	Insurance (mini-Case Study)	L	Multi – US	Federated	4
							28 (11B)	3-6	Insurance	VL	Multi – US	Distributed	na
							29 (11C)	3-6 (25)	Insurance	VL	Multi – US	Distributed	na
	12	M	none	BS: Bus Admin MBA: Finance	Finance Insurance	5	30 (12)	3-6 (5)	Insurance (mini-Case Study)	VL	Single – US	Federated	unk
4	13	M	none	MBA: Accounting	Accounting Healthcare	14	31 (13A)	<3	Finance	L	Multi – US	unk	4
							32 (13B)	6-10	Finance	L	Multi – US	unk	na
							33 (13C)	3-6 (14)	Finance	M	Multi – In'l	unk	na

Set	#	M / F	Formal Higher Education		Experience		CIO Experience		Enterprise			Enterprise IT Organization	
			IT	Non IT	Non IT & Non CIO IT Function	Total IT Years (includes CIO exp)	CIO Positions	Total CIO Years	Industry	Size	Locations	Structure	Business / IT Alignment Level
	14	M	BS: IT	none	IT	27	34 (14A)	3-6	Transport	VL	Multi – In'l	Centralized	4
							35 (14B)	6-10	Pharmaceutical	VL	Multi – In'l	Centralized	na
							36 (14C)	6-10 (20)	Manufacturing	VL	Multi – US	Centralized	na
	15	M	none	BS: Math / Statistics MS: Mgmt	Education IT	20	37 (15)	>10 (15)	Education	L	Single – US	Centralized	3
	16	M	BS: CS	none	IT	18	38 (16A)	<3	Pharmaceutical	M	Multi – US	Centralized	3-4
							39 (16B)	3-6	Consumer Goods	VL	Multi – In'l	Distributed	na
							40 (16C)	3-6 (10)	IT Consulting	VL	Multi – US	Distributed	na
5	17	M	BS: IT	none	Finance IT	16	41 (17)	3-6 (4)	Finance	VL	Multi – US	Distributed	unk
	18	M	none	BS: Bus Admin MBA - Mgmt	IT Consulting	14	42 (18A)	3-6	IT Consulting	VL	Multi – In'l	Distributed	unk
							43 (18B)	3-6 (14)	IT Consulting	VL	Multi – US	Distributed	unk
	19	F	BS: MIS	none	IT	16	44 (19A)	6-10	Finance	VL	Multi – US	Centralized	unk
							45 (19B)	<3 (10)	Consumer Goods	VL	Multi – In'l	Centralized	na
	20	M	BS: CS	none	IT	30	46 (20)	>10	Education	M	Multi - US	Centralized	unk

Code: Enterprise Size (employees): VL = > 10,000 M = 250 – 1,000 VS = < 20
L = 1, 000 – 10,000 S = 20 - 250

level three, and two considered their strategic alignment maturity to be at level two. Implications of the impact of uncertainty and unexpected change on the IT alignment with the business strategy ratings are discussed in Chapter 5.

4.2.2 Characteristics of the Interview Sets

The interview sets had a different number of participants due to the availability of participants and the time when the iterative analyses were conducted. The number of participants in each set is shown in parentheses in Figure 4.2. Although conducted at different times, the characteristics of the participants in each set were relatively comparable. In Set 1, the four CIOs held twelve different CIO positions for a total of 51 years of CIO experience. Yet, three of the four managers also had non-IT careers before coming to IT. Both CIOs in Set 2 had previous non-IT careers, but had also filled four CIO positions for a total of 21 years of experience. Four of the six CIOs in Set 3 had non-

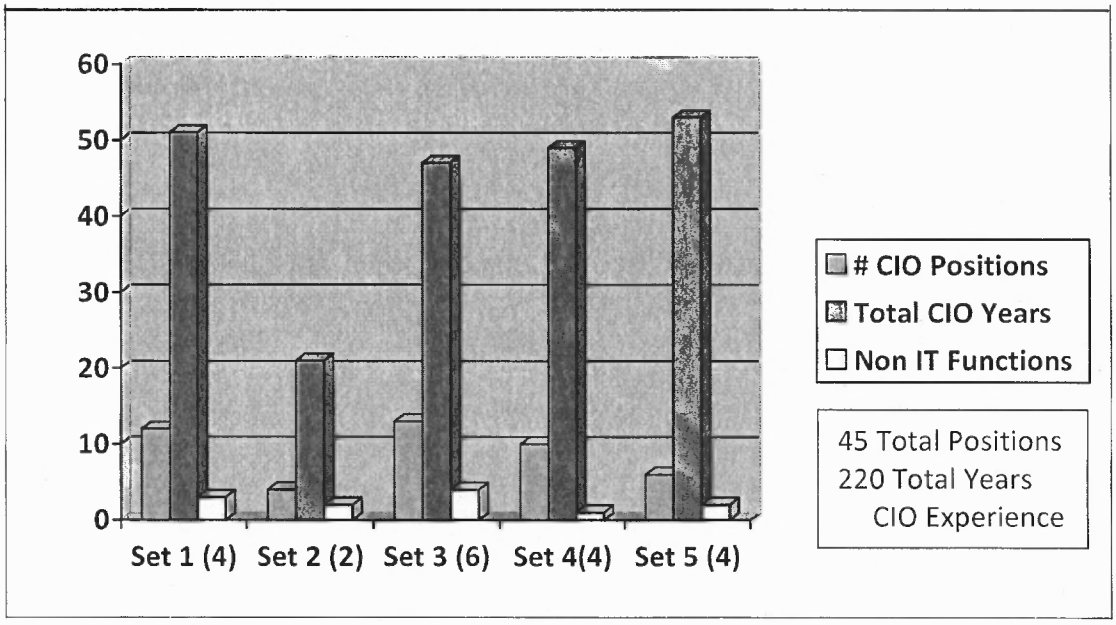


Figure 4.2 Set Comparison of Participant CIO Positions, Years Experience, and Number of Non-IT Functions

IT careers before holding thirteen CIO positions for a total of 47 years. In Set 4, three of the four CIOs had previous non-IT careers, but totaled ten separate CIO positions for a total of 49 years. Finally, as displayed in Set 5, two of the four held previous non-IT positions before holding six CIO positions for a total of 52 years experience.

4.3 Data Collection: Participant Field Interviews

According to Hart (2005). data collection activities should be based on an approved research plan and work schedule. Table 4.3 summarizes the process used to collect data through field interviews with iterative data analysis, analyze the data, and develop the study findings. This section describes the first stage of the study – Data Collection (Steps 1-3). Section 4.4 describes the second stage – Iterative Analysis (Steps 4-9). Section 4.5 describes the last stage – Conceptual Analysis.

4.3.1 Semi-structured Interview Process

As each participant interview began, the researcher explained that the purpose of the interview was to collect information about his or her management style, interactions with his or her customers, vendors, and employees, and how unexpected and expected changes impacted his or her enterprise. Upon completion of the study, the data would be compared among the different CIOs and their enterprises. The researcher also explained another research purpose to understand potential benefits of introducing flexibility systematically into the enterprise IT organization. Based on the data collected, it was expected that the study would result in a common and consistent definition of flexibility and an evaluation of a potential Enterprise IT Organizational (EITO) Flexibility Framework and its use within the enterprise IT organization.

Table 4.3 Data Collection and Analysis Process

Step	Activity	Comments	Document
	DATA COLLECTION		
1	- Prepare initial list of categories.	- Used theories, models, and frameworks from the research model and literature review. - Initially 24 standalone categories.	Dissertation, Table 4.4
2	- Prepare semi-structured script.	- Asked questions relating to the initial categories.	Dissertation, Appendix B
3	- Conduct interviews. - Transcribe audio tapes.		Written transcripts for each participant interview
	ITERATIVE DATA ANALYSIS		
4	- Code transcriptions.	- Two coders. - Inter-coder validity (check-coding) > 70 percent.	NVivo-coded transcript documents
5	- Compare coded transcriptions by sets. - Identify new categories.	- Maintain an audit log of the new categories as developed.	Category audit log
6	- Revised model / interview scripts as necessary based on comment. - Repeat steps 3-5 for all iterations.		Dissertation, Appendix B includes final interview script.
7	- Summarize all coded transcript sections by individual categories.	- First phase of iterative data analysis	Individual NVivo-coded documents for each categories
8	- Identify key concepts by individual categories.	- Second phase of iterative data analysis	Key concept lists for each category
9	- Establish relationships (links) among the categories. - Delete those categories that weren't relevant or did not have any relationships. - Prepare final analyses categories.		Dissertation, Figure 4.3

Step	Activity	Comments	Document
	CONCEPTUAL ANALYSIS		
10	- Map individual participant discussions by categories. - Create data tables by major categories by interview participants (analysis tables).	- First phase of conceptual data analysis	Analysis Tables by Categories (Levels 1, 2, & 3)
11	- Identify key concepts by participants. - Identify key phrases. - Determine frequency counts of the key phrases (key phrase tables and charts).	- Second phase of conceptual data analysis	
12	- Summarize 'level 3' categories	- Key concepts - # CIO cites	
13	- Identify patterns or 'emergent' themes based on comments. - Establish preliminary propositions by major categories. - Identify additional patterns or themes based on the data table analysis and frequency tables.		Emergent Theme Tables, Dissertation, Table 4.9
14	- Compare patterns and emergent themes based on the interview participant (CIO) demographics for additional insights and trends. - Develop and describe findings by major categories.	- Third phase of conceptual data analysis	Emergent Themes, Dissertation, Tables 4.10-14
15	- Prepare written discussions of findings and implications.		Dissertation, Chapter 5.2

Interviews were conducted on a confidential basis using prepared semi-structured interview scripts to maintain consistency among the interviews, identify other important issues raised by the participants, and allow exploratory discussions with probing with open-ended questions. Confidentiality is important to encourage participants to speak freely about their experiences, about their understanding and potential use of the 'Enterprise IT Organizational Flexibility Framework,' and about recommendations for further research on enterprise IT organizational flexibility.

Each interview lasted from 45 to ninety minutes and was scheduled at the convenience of each participant, generally at the participant's office. One interview was also conducted initially in person and was completed by telephone at a later date when an IT emergency occurred interrupting the interview. All participants signed the *NJIT Consent Form* (shown in Appendix A), which was required as part of the Institution Research Board (IRB) review. The consent form explained the conditions of the interview and verified that each of the participants volunteered to be in the study. Also, it allowed the participants to withdraw from the study at any time for any reason. None of the participants withdrew. At the beginning of each interview, the researcher asked a series of demographic questions based on a short survey form (also shown in Appendix A). These questions asked information about the CIO's enterprise and industry, the enterprise IT organization, and the CIO's personal characteristics and experience. The demographic questions also gave the researcher the opportunity to build rapport with each participant while collecting data used to analyze and compare the findings.

Most of the interviews were audio-taped to provide an accurate record of the comments. The researcher also made hand-written field notes during each interview to

record major ideas and concepts as well as making notes on prepared drawings included with the semi-structured script. These notes included paraphrased comments and well as observations made about the subject's office, books, and personal manner. Two of the interviews were not taped. One participant needed prior permission from his legal department to participate in a recorded interview. Field notes provided the data for this participant. As a result of this situation, the researcher notified future participants prior to the interviews to obtain permission to record the interviews. The second interview was not recorded because of an equipment problem. Again the field notes were used to collect data. As a result of this problem, the researcher made sure to have a backup tape recorder and batteries for all future interviews.

Data was also collected during the interview process from a variety of sources. This data included company information such as products and services literature, press releases, and formal documents provided by the participants. It also included information about the participants themselves from press releases, written documents, and resumes collected by the researcher or provided by the participants. Secondary data was collected about each of the companies involved from published sources including trade and industry magazines, competitive information such as annual reports and press releases and marketing / industry reports.

After each interview, the recorded tapes were sent to a professional transcriber for transcription. The researcher also summarized and recorded the field notes. As expected, during the interviews, participants sometimes suggested changes to the presented diagrams and drawings. Participants also raised new ideas or concepts that were explored more fully in subsequent interviews. For example, originally the enterprise IT

organization model included three major components, governance, people, and technology. It became clear that most of the CIOs really considered technology as two separate categories – the technology used in the internal IT architecture and infrastructure and the technology as it related to the actual enterprise IT services, products, and applications offered within the enterprise or for the enterprise's customers. The research model was changed in subsequent interviews to reflect four enterprise IT organization components rather than three. This iterative and ongoing analysis also led to changes in the script and interview discussions, in the selection of subsequent interview subjects, and in the conceptual development of the findings. Several of these changes are described in more detail in the section discussing category development.

4.3.2 Initial Interview Set 1

The initial interview set was designed to test the iterative method as well as the validity of the research instruments including the draft semi-structured script and demographics form. The first set of in-depth semi-structured interviews was conducted with four chief information officers (CIOs) in New Jersey and New York during early 2006. The semi-structured interview provided face-to-face contact with the participants during the approximately sixty (60) minute interview. This initial set of interviews also provided the opportunity to identify other related issues raised by the participants. Although a longer interview was preferred, the participative CIO's were very busy and the shorter interview was the compromise to obtain participation. Although not planned as part of the study, each participant agreed to participate in a follow-up telephone conversation if necessary.

A semi-structured script, developed with a fixed set of general questions, was used for each interview. These research instruments were designed to collect the enterprise IT organizational flexibility capabilities, the change and uncertainty impacts at various levels of the strategically-aligned IT organization, and the perceptions of enterprise IT organizational flexibility's impact on the IT performance. A more detailed description of the semi-structured interview script is given in Section 4.3.4. An analysis of data collected during the first set of interviews led to several revisions of the research methods and data collection instruments.

4.3.3 Subsequent Interview Sets 2 through 5

Since the in-depth interviewing methodology was iterative, the remainder of the study was divided into four additional sets, each with three to six CIO interviews. After each set, a qualitative analysis was conducted of the transcribed interviews, the collected demographic data, and the field interview notes to identify new concepts or experiences that should be explored more fully in later interviews.

These later interviews included more complex and probing open-ended questions regarding the participants' attitudes and opinions concerning the need and potential benefits of enterprise IT organizational flexibility. Besides the sets of questions discussed in the initial set of interviews, several other areas were discussed during the subsequent interview set. The first was to identify the CIOs' experiences dealing with uncertainty and unexpected change as well as expected change during 2004-2006 by probing for specific examples. The second was to collect the CIO reactions and feedback concerning the definition of the components of the enterprise IT organization, the enterprise IT

organizational flexibility cycle, and the 'Enterprise IT Organizational Flexibility Framework.'

4.3.4 Evolution of the Semi-structured Interview Script

The semi-structured interview script included questions concerning the enterprise IT organizational flexibility capabilities, uncertainty and unexpected change as well as expected change characteristics at various levels of a strategically-aligned enterprise IT organization, and the CIO perceptions of the proposed enterprise IT organizational flexibility's impact on the enterprise IT organizational performance. The script was only used as a guide for the interviews, because the actual interview included improvisation and new questions based on the analysis of earlier answers as recommended by Janesick (2005).

The semi-structured script was divided into four sections. The first section established the discussion framework for each interview by first discussing the purpose of the research and an overview of the hour-long interview and by collecting the demographic characteristics from each participant. The second section focused on understanding how CIOs currently defined causes of uncertainty and unexpected change as well as expected change. It also collected how CIOs described the management techniques they used in today's dynamic global business environment. The questions focused on impacts on the enterprise IT organization affecting its governance, people, IT infrastructure, and IT services, products, and applications.

The third section of the interview script focused on the participants' own definitions of the enterprise IT organization and its key components, while also collecting

in-depth information about the participants' management style, interactions with customers, vendors, and employees, and the different situations where impacts of unexpected and expected changes occur. The script probed for the participants' own definitions of governance, including descriptions of the structure of the enterprise IT organization, discussions of key management issues, and ways to better manage governance. the script then focused on questions relating to the management of IT personnel, such as *'how are IT people trained?'* '*what skills and capabilities are necessary for the changing enterprise IT organization in the future?*' and *'are any specialized staff functions used for special purposes?*' Then the script probed for information about how information technology is developed, deployed, and maintained within the enterprise as well as how the IT architecture and infrastructure are upgraded. The definition of the IT infrastructure included the network, hardware, software, and processes involved. This section also asked questions about the IT products, services, and applications provided for the enterprises' internal and external use.

The last section of the script determined the participants' definition of flexibility, if flexibility is beneficial, where flexibility is currently used, and if experiences with 'manufacturing flexibility' or 'software development flexibility' have led to applications within the enterprise IT organization. It also asked about definitions and perceptions concerning anticipation, agility, and adaptability and probed for examples of flexibility impacts on governance, employees, IT infrastructure, and IT services, products, and applications. The participants were shown the diagram of the enterprise IT organizational flexibility cycle and asked to discuss implications of this systematic flexibility approach. The last section of the interview script discussed the 'Enterprise IT Organizational

Flexibility Framework' and collected the thoughts and perceptions of the participants about this framework. This section of the interview script focused on gaining a better understanding of the potential benefits of systematically introducing enterprise IT organizational flexibility into the enterprise IT organization. After each set of interviews, a qualitative analysis was conducted of the transcribed interviews, the collected demographic data, and the field interview notes. The 'N-Vivo' software system was used to do the analysis of the interview data. A discussion of the results of these iterative analyses is given in the next section.

4.4 Iterative Analysis

The purpose of qualitative analysis is to "transform data from interviews, observations, documents, and field notes into findings" (Patton 2002, p.432.) The purpose of findings evolving from the analysis of 'massive amounts of data' is to make sense of the previous experiences of the study participants and their relationships in their unique world. This section describes the iterative analytical process listed in Table 4.3, starting with Step 4 through Step 9, used to analyze and then organize the analyzed data.

4.4.1 Identifying Broad Coding Categories

The first step of analysis is to code the data. The purpose of the coding is to identify data relationships and also to help eliminate irrelevant data. The coding process should start with the broadest categories identified from the literature review according to Wolcutt (1990). The initial list of 24 broad data coding categories is shown in Table 4.4. They were identified from the literature review based on dynamic environmental theories,

Table 4.4 Initial Broad Data Categories from Literature Review

ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY STUDY: FREE-STANDING CODING CATEGORIES (SOURCE: MODELS, THEORIES)	
1. **Agile Software Development** (IT management theories)	13. **IT Flexibility** (EITO flexibility model)
2. **Business-IT Alignment** (IT management theories: Broadbent and Weill 1993, Brown and Magill 1994, Chan and Huff 1993, Henderson, Thomas, and Venkatraman 1992, Knoll and Jarvenpaa 1994, Luftman 1996)	14. **IT Governance** (EITO model)
3. **CIO Leadership** (CIO roles and responsibilities)	15. **IT Operational Planning** (IT management theories)
4. **CIO Roles** (CIO roles and responsibilities – Drucker 1974, Gottschalk and Taylor 2000, Rockart, Earl, and Ross 1996.)	16. **IT Partnerships** (IT management theories)
5. **Change** (dynamic environmental theories – Drucker 1974, Gottschalk and Taylor 2000, Rockart, Earl, and Ross 1996, Van de Ven and Poole 1995.)	17. **IT People** (EITO model)
6. **Changing Customer Needs** (management theories)	18. **IT Strategic Planning** (IT management theories)
7. **Competitive Global Business** (dynamic environmental theories – (Reich and Benbasat 1996, Yoon and McLean 1995), (management theories – Galy and LeMaster 2001.)	19. **IT Organization Structures** (IT management theories)
8. **Complexity** (dynamic environmental theories – Carlsson and el Sawy 2008.)	20. **IT Tactical Planning** (IT management theories)
9. **Environmental Factors** (dynamic environmental theories – Benamati and Lederer 2000, 2001, Burns and Stalker 1961, Scott 1992, Starling 1980.)	21. **IT Technology** (EITO model)
10. **IT Anticipation** (EITO flexibility model)	22. **Operational Flexibility** (management theories – Knoll and Jarvenpaa 1994, Sushil 2001, Upton 1994, Volberda 1998.)
11. **IT Agility** (EITO flexibility model)	23. **Strategic Flexibility** (management theories – Alter 1999, 2004, Whitworth, Fjermestad, and Mahinda 2005, Whitworth and Zaic 2003.)
12. **IT Adaptability** (EITO flexibility model)	24. **Uncertainty** (dynamic environmental theories – Burns and Stalker 1961, Leidner, Beatty, and Mackay 2003, Purser and Passmore 1992, Scott 1992.)
Code: EITO = enterprise IT organization(al)	

management theories, IT management theories, and CIO roles and responsibilities. They also included key concepts from the enterprise IT organizational flexibility model being

studied. The first group of categories was built into the initial semi-structured interview script. The coding category list was continuously changed because as new data documents are coded and analyzed, new concepts and themes are recognized according to the grounded theory coding model (Charmaz 2000, Straus and Corbin 1990). This approach also led to the necessity to recode data as the meanings of different terms change with more input from subsequent interviews. Specifically, the grounded theory method required preparing a list and refining the concepts as the project continues (Rubin and Rubin 2005). The new categories and sub-categories became obvious during the iterative analysis of the interview sets. Using the 'iterative' analysis process (Rubin and Rubin 2005), the initial broad coding categories were modified during the iterative analyses between each set as new categories were identified. Eventually, the interviewer built all the new categories and sub-categories identified in subsequent sets of interviews into the subsequent scripts based on data from previous interviews. By the end of the iterative analysis process, all the research data was coded into a maximum number of categories 'discovered' during the analysis and organized according to category relationships.

Analysis of the categories led to the development of a 'taxonomy' of sub-categories, which were explored during the interviews (LeCompte and Schensul 1999). The taxonomy for this study eventually became three levels, focusing on the:

- Impact of uncertainty and unexpected change as well as expected change on the enterprise IT organization.
- Managerial styles of the CIOs in dynamic business environments.

- Definitions of organizational flexibility and flexibility's related aspects: anticipation, agility, and adaptability.
- Systematic integration of the enterprise IT organizational flexibility cycle into the enterprise IT organization.

In summary, the initial set of categories became the basis for the subsequent semi-structured interviews. The data from each set of interviews comprised the transcribed interviews and the researcher field notes. The researchers coded the sets of interview data, and first compared other data from each interview within the set and then compared previous interview sets. This comparison led to emergent theories and new categories, which were then coded into the previous interview documents.

4.4.2 Data Coding Processes: Organizing the Data Analysis

The first stage of analysis involved preparing the collected data and identifying concepts and themes, labeling them, and determining the relationships among the categories (Miles and Huberman 1994, Rubin and Rubin 2005). Part of the analysis process included comparing "*how ideas are expressed by the participants to refine meanings, elaborate on concepts and themes, and determine what needs to be added*" (Rubin and Rubin 2005, p. 223). This sub-section describes how the coding was conducted; how inter-rater validity was determined and verified between the study coders; how the study data documents were organized; and how the final hierarchy of the coding categories was developed.

4.4.2.1 Inter-rater Validity - Since the primary researcher and the assistant researcher both initially coded the interview transcripts and other data documents, they first had to establish a reliable coding process to insure that both coders would be able to separately code data documents consistently and reliably. 'Check-coding' allows two or more researchers to review and discuss any differences leading to a common vision and understanding of what each of the coding categories mean and when each coding category should be used. Check-coding becomes a reliability check by using the following formula from Miles and Huberman (1994):

$$\text{Acceptable Inter-rater Reliability} = \frac{\text{number of agreements}}{\text{total number of agreements + disagreements}} \geq 70\%$$

Ideally, the inter-rater reliability should be at least 70 percent. Inter-rater reliability is defined as the assurance that the two raters or coders would be able to code the data documents in a consistent manner (Miles and Huberman 1994). To insure this, the two coders first practiced by coding the first transcript together using the initial coding categories (referred to as 'nodes' in the NVivo software system). They discussed each of the coding decisions and agreed on the decisions. This discussion also resulted in the addition of new categories. Next, the assistant coder coded the second participant transcript alone. Both coders reviewed the coding of the second transcript and discussed if any changes were needed. Again, the coders agreed that several additional categories needed to be added to the coding categories.

The coders then coded for the 'inter-rater reliability check.' The assistant coder coded a third participant transcript. The principal researcher then separately coded the

same document. The two coded documents were then compared in two ways. The first was the comparison of sections of the document considered important and needing to be marked and coded. The second was the consistency of the categories selected for the particular sections of the document. Since the reliability inter-rater percentage was less than seventy percent, the two coders again reviewed each coded section, the definitions of the codes, and the need for overlapping categories. Again, the principle and assistant coders separately coded the fourth transcription. The two comparisons of the coded data were made again. After the fourth transcription, the inter-rater reliability percentage was greater than seventy percent. After this point, the two coders separately coded different transcripts and field notes.

4.4.2.2 Document Coding - Once the coding categories with appropriate definitions were determined, each of the data documents, including the eighteen interview transcripts and field notes from the twenty interviews, were searched for pertinent data units that matched any of the categories listed in the coding categories. These data documents were filed in the NVivo research database using the following data file scheme:

- Transcripts (subx.tr)
- Field notes (subx.fn)
- Memos (subx.mm).

The NVivo document browser showed all files saved in the document browser including observation notes, memo files, transcribed interviews, and field notes. These document files were modified as the data was analyzed. The categories were used to retrieve text segments for future analysis. Categories were linked and structured, which

supported the emergence and construction of theory and developed a category hierarchy based on a critical review.

Coding involved continuous decision-making to identify significant data units and determine how the data units should be coded. As a result, it was important to also keep track of the evolution of the coding categories from the initial broad categories until data saturation was reached and no new codes were necessary. This process acted as an audit trail and was important for validation (Miles and Huberman 1994; Patton 2002). Once a document was completely coded, it was printed in two ways. The first printing was as a text document with coding stripes matching selected sections in the margins. The second printing was as a 'coding document' repeating all the categories selected shown in numerical order. Figure 4.3 shows an example of a portion of a text document with multiple coding stripes.

Data documents were coded by first identifying each target category term and then running a search on the data document for all occurrences of that term. The researchers chose to read the entire data document and code each of the selected areas containing the targeted terms as they occurred. Certain areas in the data documents were be coded with more than one category resulting in overlapping areas. After each set of interviews were coded, new categories were identified during the iteration analysis and then were added to the coding of data documents from subsequent sets. To be thorough, earlier sets of data documents were re-coded using these new categories. The coders used the NVivo search capability for this follow-up coding.

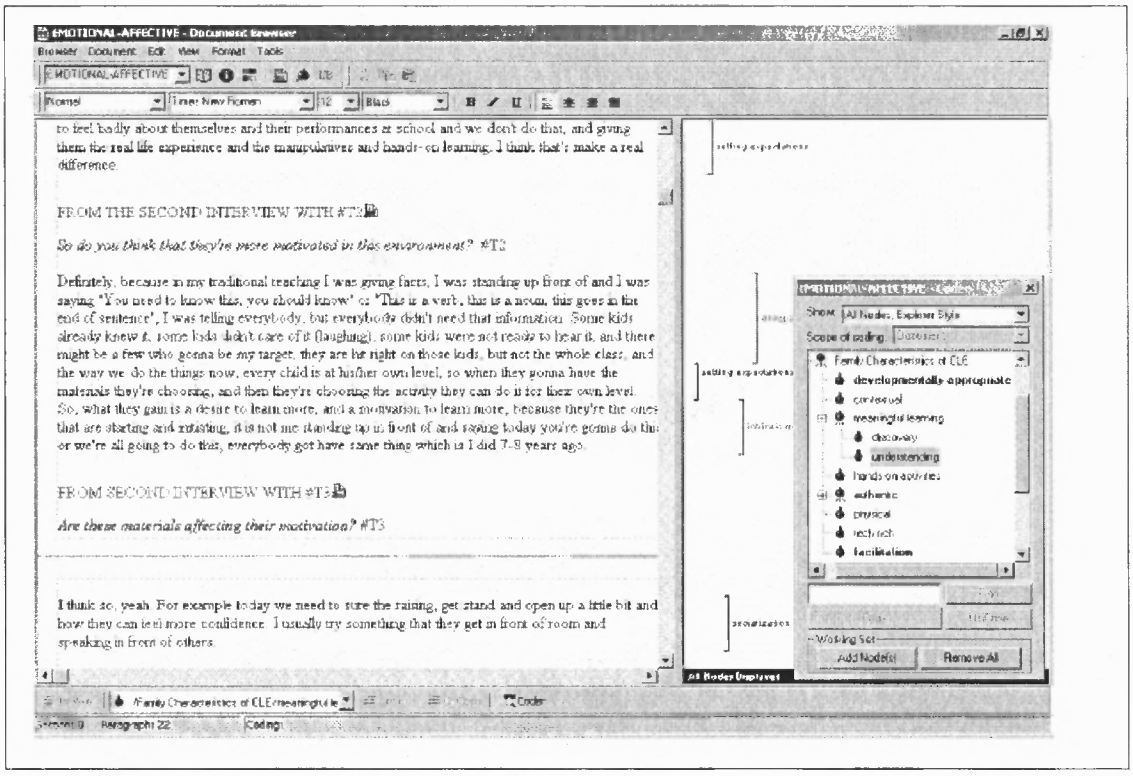


Figure 4.3 Text Coding with NVivo (Source: Ozakan, B.C., Figure 7, 2004, pp. 601)

Once coded, the data documents were then grouped for analysis purposes into sets and cases and compared with the 'free categories' ('stand-alone' categories that have no clear logical connection and have not yet been linked to other categories) and 'tree categories' (categories that have been linked to other categories and catalogued into the hierarchical structure: level 1, level 2, and level 3.) A list of all the coded data units for all data documents for each coding category was printed and used for analysis purposes.

4.4.2.3 Coding Hierarchy – The initital 24 categories (See Table 4.4) were identified based on the literature review and the exploratory research questions. All of the categories were initially standalone and considered 'free categories' using NVivo terminology. During the coding of the first set of research data, 35 more categories were identified and roughly organized into five separate topic strings with up to as many as six

levels in any one topic string. This was very complex and difficult to deal with. Eventually, natural relationships among the categories formed and became clearer during the iterative analysis process. These natural relationships also represented patterns and themes emerging during the iteration analysis. The organization of the categories, demonstrating relationships, was refined after each set of data was analyzed.

Over the course of the iterative analysis, it was determined that all the categories could be traced or connected through relationships to one KEY concept, the CIO. The CIO category was then linked to five major Level 1 categories in the final coding hierarchy: Enterprise IT Organization, Dynamic Business Environment, Enterprise IT Organizational Flexibility, CIO Attributes, and CIO Demographics. These five Level 1 categories were then linked to an additional twenty Level 2 categories. The relationships between the key category, CIO, and the 23 Level 1 and Level 2 categories are shown in Figure 4.4. The identification of the relationships also helps to eliminate irrelevant data. At the conclusion of the iterative analyses, all the research data was coded into the three levels of the categories using the original 24 organized categories plus an additional 64 categories as shown in Table 4.5. All the Level 1 categories also related directly to the study Research Model shown in Figure 2.4 except for the Demographics category. This category was used for data comparison and was not a part of the research model.

As the analysis continued, one area did not seem to initially fit into the research model. This problem area was logically showing how 'uncertainty' and 'change' related to the CIO and to the enterprise IT organization. The solution emerged during the iterations by first defining 'change' as only those changes that are 'expected' and 'uncertainty' as those changes that are 'unexpected.' The complex, dynamic environment

that impacted the CIO and the enterprise IT organization was also divided into three different areas based on where the business drivers causing expected or unexpected changes originated: the environment external to the enterprise IT organization, the environment within the enterprise, but not including the enterprise IT organization, and the environment internal to the enterprise IT organization. Thus, 'uncertainty' became 'unexpected change' and 'change' became 'expected change' impacting the CIO and the enterprise IT organization occurring both in the external and in the internal environment as shown in Table 4.6. This relationship of environment sources of expected and unexpected change was then added to the Revised Research Model shown in Figure 4.3.

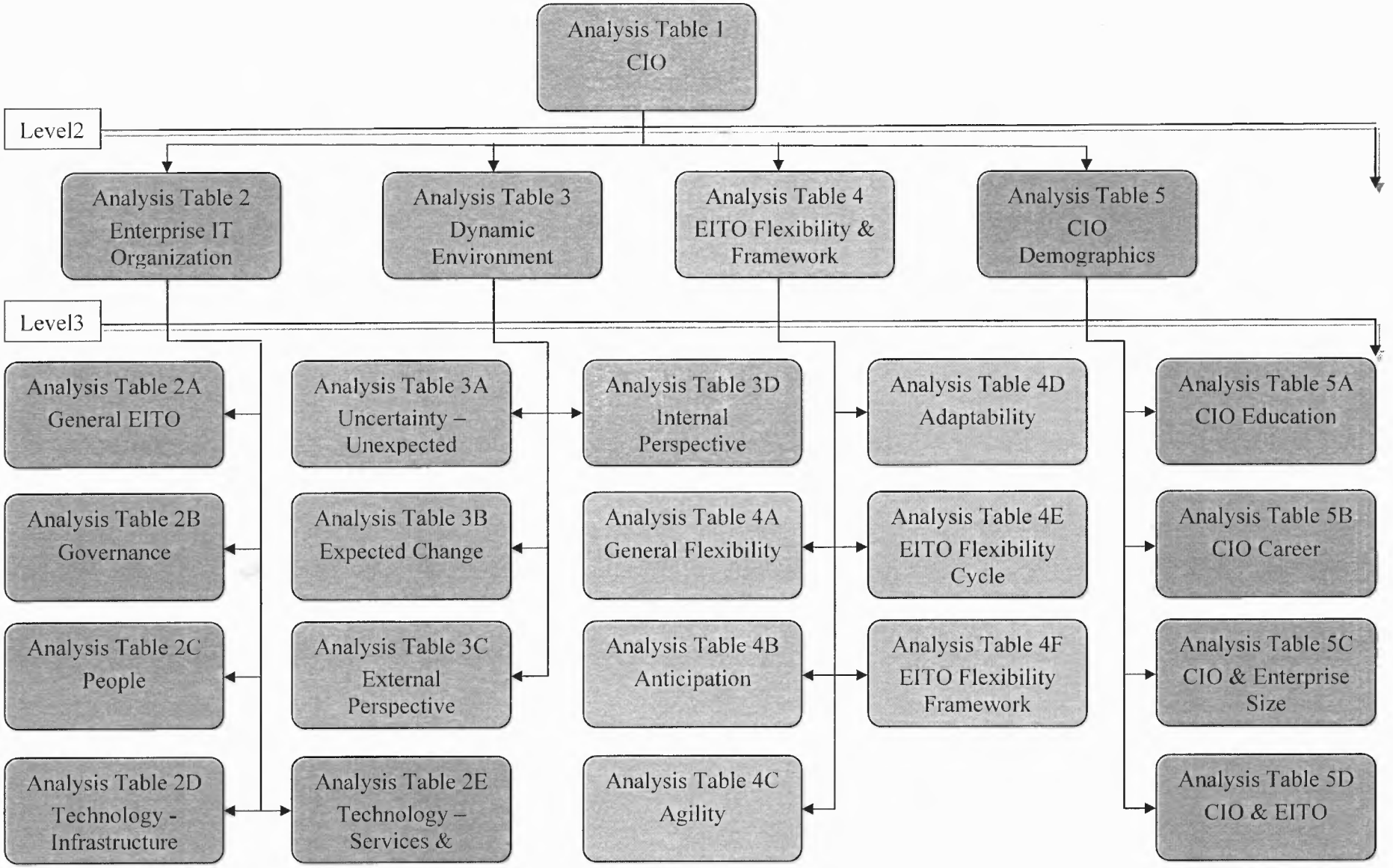


Figure 4.4 Key Data Category Analysis Tables

Table 4.5 Three Levels of Data Categories

KEY	Chief Information Officer (CIO)				
Level 1	**Enterprise IT Organization (EITO)**	**Dynamic Business Environment**	**EITO Flexibility**	**CIO Attributes**	**CIO Demographics**
Level 2 • Level 3	*Governance* • CIO Definition • EITO Structure • Governance Processes *People* • Knowledge • Capabilities • Skills • Relationships *Technology Infrastructure* • Architecture • Networks • Hardware • Software • Management processes • Infrastructure design and implementation • Day-to-day operations and maintenance • Infrastructure sourcing contracts. *Technology Services, Products & Applications* • Customer account management • Servicing sourcing contracts • Design and development • Implementation and project management • Ongoing support and troubleshooting.	*Uncertainty & Unexpected Change* • CIO Definitions • CIO Examples • Causes • Impacts on the EITO *Expected Change* • CIO Definitions • CIO Examples • Causes • Impacts on the EITO *External Perspective* • CIO Definitions • External change drivers to the enterprise • Internal enterprise change drivers *Internal Perspective EITO* • CIO Definitions • Organizational • People • Processes • Technology - Infrastructure • Technology - Services, Products & Applications.	*General* • CIO Definitions • Examples • Theories. *Anticipation* • CIO Definitions • Examples • Process *Agility* • CIO Definitions • Examples • Process *Adaptability* • CIO Definitions • Examples • Process - Organizational Learning *EITO Flexibility Cycle (EFC)* *EITO Flexibility Framework (EFF)* • CIO Definitions • Examples • Funding • Measurements.	*Leadership* *Roles* *Characteristics.*	*Career* • # CIO positions • Years in each CIO position • Total CIO Years • Non-IT positions. *Education* • IT degree • Non-IT degree. *Enterprise Description* • Industry • Size (# employees) • Geographical locations *EITO Description* • Structure • Services, Products & Applications • Size (# employees).

Table 4.6 Environmental Business Drivers Causing Uncertainty / Unexpected Change and Expected Change Impacting the Enterprise IT Organization

ENVIRONMENTAL SOURCES OF CHANGE	BUSINESS DRIVERS EXTERNAL TO THE ENTERPRISE IT ORGANIZATION ENVIRONMENT		BUSINESS DRIVERS INTERNAL TO THE ENTERPRISE IT ORGANIZATION ENVIRONMENT
TYPES OF CHANGE	*External to the Enterprise*	*Within the Enterprise*	*Within the EITO*
UNCERTAINTY AND/ UNEXPECTED CHANGE	Globalization impacts Government regulations Customer business strategy changes	Proactive business strategy changes Mergers & acquisitions	IT personnel changes Technology compatibility issues Technology supplier mergers & acquisitions
EXPECTED CHANGE	Customer forecasts	Internal customer forecasts for IT services, products, and applications	Technology infrastructure changes

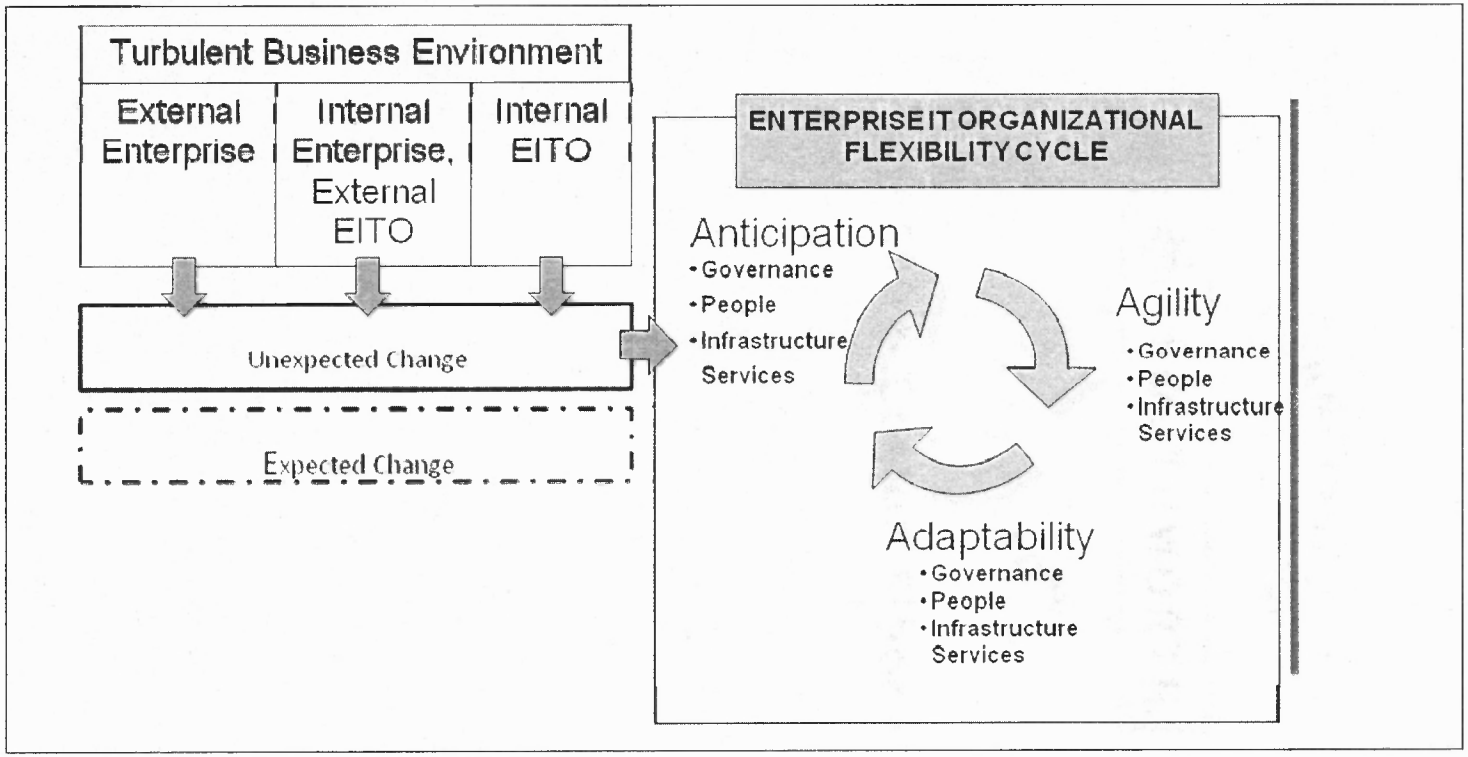


Figure 4.5 Revised Research Model

4.5 Conceptual Analysis: Key Comments to Emergent Themes

A key part of the research method used for this study was to conduct interviews and iteratively analyze the data in order to develop a complete set of inter-related key categories affected by the problem area – managing uncertainty within the enterprise IT organization. This point was reached when, after twenty interviews, the iterative analysis linked the CIO category to five major Level 1 categories, which were in turn linked to twenty Level 2 categories, which were in turn linked to 39 additional Level 3 categories for a total of 88 categories (See Figure 4.4). Then, the conceptual analysis of the data, shown as Steps 10-14, in Table 4.3, prepared a preliminary set of key concepts. This section describes these steps in more detail.

4.5.1 Cross Analysis of Key Categories with Individual Participants

Once the final sets of categories were determined from the iterative analysis, the final conceptual analysis began. Analysis tables by each of the categories were prepared as listed in Step 9 of Table 4.3. Then the NVivo coded sections for each set of categories from the coded transcripts of each participant were transferred to the analysis tables. The participant comments were analyzed again looking for key concepts or common thoughts among the comments. These were highlighted and then combined and summarized under a "comments or observations" area in each analysis table, which allowed similar thoughts or comments to be counted (Steps 10 and 11, Table 4.3). Table 4.7 shows a sample of the Steps 9-11 analysis of the 'Dynamic Business Environment - level 1 category' / 'External Perspective of Managing Change – level 2 category' for one participant.

Table 4.7 Dynamic Business Environment Cross Analysis of Key Level 2 Category – External Perspective / Managing Change Example

Key	CIO			
Level 1	Dynamic Business Environment			
Level 2	**External Perspective – MANAGING CHANGE**			
Level 3 o Level 4 (Category Description)	**CIO Definitions** (Descriptions of CIO definitions.)	**External to the Enterprise** o Government rules and regulations o Technology o Medical requirements (Business drivers that come from the external environment to the enterprise.)	**Internal Enterprise / External to the EITO** o Client-driven o Competitor-driven (Business drivers that come from within the enterprise, but external to the EITO.)	**Observation / Comments - Managing External Change** (*Comments, nuggets, and proposed propositions from analysis.*)
CIO # xx	External pressures [to the EITO] are both client-driven and environmentally driven and include medical, government, and technological changes. There is a view of the world that is very conservative. If there is a chance that you will break the environment, you do not move or, if you do move, you only do it with a calculated set of contingency plans and risk assessment. This will give you some latitude in the future so that there are alternate paths if you run into trouble.	You have external change and internal change that are coming and pressures that are going to cause change. If it is client-driven, it is internal [yet external to the EITO]. If it is environmental, it is external. We use the SWOT (strength, weakness, opportunity, threat) analysis to analyze both external and internal pressures to change. In the pharmaceutical business, you also have FDA drivers from the external environment. This results in uncertainty. You can't always predict what it going to happen. Just like you can't always predict the way your clinical trials are going to come out. Because of the FDA, however, you have to be more conservative. So we deal with lots of uncertainty.	You have external change and internal change that are coming and pressures that are going to cause change. If it is client-driven, it is internal [yet external to the EITO.] If it is environmental, it is external. Projects and sponsorship come from the business and they understand why we want to do it. We may want to do it for either internal efficiency or effectiveness improvements or external projects that are customer facing.	*[Proposed PROPOSITION]: Uncertainty causes both internal and external (predictable and unpredictable) changes, however, government regulations cause uncertainty, which leads to a conservative management approach.* *Conservative IT perspective : Change comes with calculated risk assessment & contingency plans.* *External pressures : Environmental-driven include medical, governmental, and technological.* *Internal enterprise pressures: Enterprise driven changes are client-facing.* *Action for IT : Evaluate proposed changes using SWOT analysis.*

The comments from every participant for every category were analyzed using this method. Key observations or comments about the "external perspective of managing change" were summarized in the last column and carried forward for the next evaluation. By combining the same or similar comments relating to the key concepts that emerged from the analysis, a count could be made of the number of participants who had the same or similar thoughts. These CIO participant counts were then used to prioritize the key concepts emerging from the analysis. In the case of the one participant sample shown in Table 4.7, four comments were summarized under emerging key concepts:

- *Conservative IT perspective :*
  - *Change comes with calculated risk assessment & contingency plans.*
- *External pressures :*
  - *Environmental-driven [external pressures] include medical, governmental, and technological factors.*
- *Internal enterprise pressures:*
  - *Enterprise driven changes are client-facing.*
- *Action for IT :*
  - *Evaluate proposed changes using SWOT analysis.*

Also, one proposed proposition was identified and carried forward through the analysis:

- *[Proposed PROPOSITION]: Uncertainty causes both internal and external (predictable and unpredictable) changes, however, government regulations cause uncertainty, which leads to a conservative management approach.*

Once all the categories were cross analyzed with all the participant comments, all the emerging key concepts were prioritized and then analyzed to develop "emergent

themes" as described in Steps 12 - 13, Table 4.3. Again, using examples of the analysis relating to the Dynamic Business Environment – level 1 category, ten 'Emergent Themes,' which came from the analysis of 'key concepts' from the analysis of the level 2 category: Uncertainty or Unexpected Change, are shown in Table 4.8.

These key concepts came from the analysis tables similar to the example shown in Table 4.7, which analyzed the definition, examples, causes, impacts, and issues relating to 'causes of uncertainty.' For example, there were five 'key concepts' with 14 CIO citations:

- Enterprise customers drive internal business changes (4 cites)
- Business marketplace changes (4 cites)
- Government regulations (1 cite)
- Conscious decisions lead to uncertainty (5 cites)
- Natural or manmade disasters (1 cite).

These 14 CIO citations led to three emerging themes:

- *Theme 3: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations.*
- *Theme 4: Needs of the internal customers also change because of conscious decisions to proactively change to stay ahead of market changes.*
- *Theme 5: Business continuity plans should be made and continuously updated to prepare for natural or manmade disasters that might never happen (risk management).*

Table 4.8 Dynamic Business Environment Emergent Themes with CIO Counts for Uncertainty and Unexpected Change

Dynamic Business Environment (from Analysis Table 3 – Level 1)			
I. Uncertainty & Unexpected Change (level 2)	Concept list with total # cites and resulting 'emerging themes'		
Level 3 categories	Key concepts (# cites)	Total cites	Emergent Themes
1. CIO uncertainty definitions	No way to know or control (4 cites) Ambiguous (2 cites) Not certain, no plan (2 cites)	8	Theme 1: No control over uncertain changes.
	Reaction is emotional (1 cite)	1	Theme 2: Reaction to uncertainty is often emotional rather than rational; especially is uncertain changes are considered 'surprises.'
		9	
2. CIO uncertainty examples	*(Integrated CIO uncertainty examples with the definitions and causes.)*		
3. Causes of uncertainty	**Enterprise customers drive internal business changes (4 cites)** **Business marketplace changes (4 cites)** **Government regulations (1 cite)**	**9**	**Theme 3: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations.**
	Conscious decisions lead to uncertainty (5 cites)	**5**	**Theme 4: Needs of the internal customers also change because of conscious decisions to proactively change to stay ahead of market changes.**
	Natural or manmade disasters (1 cite)	**1**	**Theme 5: Business continuity plans should be made and continuously updated to prepare for natural or manmade disasters that might never happen. (risk mgmt)**
		14	

4.5.2 Emergent Themes

All of the emergent themes were then reviewed and labeled one of three types: 'U' themes were related to uncertainty or unexpected change; 'E' themes were related to expected change; and 'F' themes were related to flexibility. Several themes were also labeled 'Fed' because they were related to the mini-case on federated IT organizational structures conducted within this study. Table 4.9 lists the fourteen 'U' emergent themes, the fourteen 'E' emergent themes, and the 21 'F' emergent themes. The final part of the analysis was to map the emergent themes against the research model to determine how emergent themes reflect the issues in the research study domain.

4.5.2.1 Dynamic Business Environment Emergent Themes – Uncertainty and change from the dynamic business environment influence the enterprise IT organization (EITO) both externally and internally. The emergent themes related to the definitions of unexpected (U) and expected change (E) based on CIO comments are shown in Table 4.10. Also shown in Table 4.10 are the emergent themes related to the business drivers or causes of unexpected (U) and expected change (E) from external the enterprise, internal to the enterprise but external to the enterprise IT organization, and internal to the enterprise IT organization.

Table 4.9 Emergent Themes (Unexpected Change, Expected Change, Flexibility)

Unexpected Change (U)	Expected Change (E)	Flexibility (F)
Theme U1: No control over uncertain changes. *Theme U2*: Reaction to uncertainty is often emotional rather than rational; especially if uncertain changes are considered 'surprises.' *Theme U3*: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations. *Theme U4*: Needs of the internal customers also change because of conscious decisions within the enterprise to proactively change to stay ahead of the market changes. *Theme U5:* Business continuity plans should be made and continuously updated to prepare for natural or manmade disasters that might never happen. *Theme U6*: Uncertainty impacts cause more changes. *Theme U7:* EITO personnel need to change and will change when they develop a business awareness of the changing needs of customers. *Theme U8:* Even a well-planned, cost-effective IT infrastructure may need to be updated to meet the changing needs of external customers and partners. *Theme U9:* It is not easy to make the broad, organizational changes necessary for the dynamic driven business environment: - People barriers - Executive barriers. *Theme U10*: EITO needs to change as rapidly as IT customers need to change. Options include: - React to external changes	*Theme E1:* Since change is constant coming from both internal and external drivers, dealing with change should be a normal part of work within the IT environment (awareness, recognition, planning, evaluation, assessment). *Theme E2:* Change can be better for the organization by recognizing opportunities and moving to better technology, processes, people skills, etc. *Theme E3*: Technology changes, driven both from external and internal situations, generally occur less frequently than other types of change and can be planned for more easily. *Theme E4*: Even a well-planned, cost-effective IT infrastructure may need to be updated to meet the changing needs of external customers and partners. *Theme E5*: Business causes of common change are normal and should be anticipated. *Theme E6:* Internal EITO causes of change include: a) Planned performance improvements and b) Planned improvements to increase profitability. *Theme E7*: Planned changes can cause business disruption and lead to more changes, both positive and negative. *Theme E8*: IT leadership can enable organizational changes that allow IT personnel to be less fearful of change. *Theme E9*: IT leaders must be comfortable with change and be willing to allow risk-taking on the part of the IT personnel.	*Theme F1:* It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F2:* Ability to manage the customer. *Theme F3:* Either the EITO or the enterprise is considered to be 'on-top' of the marketplace. *Theme F4:* Can't adjust the planning list if the list doesn't exist. *Theme F5:* Must prepare for both man-made and natural disasters based on previous experiences. *Theme F6*: Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. *Theme F7:* Need a way to test anticipation to tell how well anticipating helps deal with uncertainty. *Theme F8:* Flexible roles and responsibilities, structures, processes, and technologies need to be defined based on the results of the business changes. *Theme F9:* Flexible roles and responsibilities, structures, processes, and technologies used to deal with the business changes for effectiveness need to be evaluated. *Theme F10:* Always re-evaluate planning and preparation assumptions to know when something happens that might affect the assumptions. *Theme F11*: The people need to be able to recognize opportunities. *Theme F12:* Being agile may set wrong expectations and also end up not using IT resources effectively. Hard to prove to customers that some of their requests are unnecessary and will have negative impacts on them and other clients. *Theme F13*: Learning occurs when people make mistakes. *Theme F14*: Teaching people how to fish instead of taking them fishing.

Unexpected Change (U)	Expected Change (E)	Flexibility (F)
- Be proactive by anticipating external changes - Be EITO proactive to changing environment. *Theme U11*: Conscious decisions from within the enterprise can lead to more uncertainty. *Theme U12:* Good technology choices can lead to unexpected opportunities. *Theme U13*: Decisions can be based on the type of change needed. *Theme U14:* There are both formal and informal methods for risk assessment.	*Theme E10*: Being proactive requires people to be identified who thrive on change (~ 15%) versus 15% who hate change and the 70% who are fence sitters. *Theme E11*: Management must: 1. Tolerate and even encourage risk-taking 2. Be willing to stop major projects when necessary. *Theme E12*: Work to have all IT people be more comfortable with change, setting an example for the IT customers. *Theme E13*: A flexibility goal should be an 80, but most organizations are currently at an 10. *Theme E14*: One size does not fit all. Different customers need different products, services, and support. *Theme Fed 1*: Divisional CIOs in a federated model deal with very different divisional and financial needs.	*Theme F15*: EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this. *Theme F16:* Implementation of new services and applications should be at request of clients or that clients perceive that it is from their request. Otherwise, clients {and enterprise executives} will not support IT innovation. *Theme F17*: Useful to develop critical questions for each box [of EFF], then create scenarios to help the organization prepare for the different scenarios. *Theme F18:* The existing teams must be able to respond to changes. *Theme F19*: Does learning from experience lead to standards and rules or to anticipation and agility? *Theme F20*: Created the term 'Enterprise IT Organizational Flexibility' to refer to the broader socio-technical IT organization and its components. Theme F21: Using the EFC will demonstrate that you can select your areas of excellence.

Table 4.10 Emergent Themes Concerning Definitions and Business Drivers of Dynamic Environmental Unexpected (U) and Expected (E) Change

TYPES OF CHANGE	ENVIRONMENTAL SOURCES OF CHANGE	BUSINESS DRIVERS EXTERNAL TO THE ENTERPRISE IT ORGANIZATION (EITO) ENVIRONMENT		BUSINESS DRIVERS INTERNAL TO THE ENTERPRISE IT ORGANIZATION (EITO) ENVIRONMENT
		External to the Enterprise	*Within the Enterprise*	*Within the EITO*
UNCERTAINTY / UNEXPECTED CHANGE	***CIO DEFINITIONS*** *Theme U1*: No control over uncertain changes. *Theme U2*: Reaction to uncertainty is often emotional rather than rational; especially is uncertain changes are considered 'surprises.' *Theme U3*: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations.	*Theme U3*: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations. *Theme U5*: Business continuity plans should be made and continuously updated to prepare for natural or manmade disasters that might never happen. (risk management) *Theme U6*: Uncertainty impacts cause more changes.	*Theme U3*: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations. *Theme U4*: Needs of the internal customers also change because of conscious decisions within the enterprise to proactively change to stay ahead of market changes. *Theme U11*: Conscious decisions from within the enterprise can lead to more uncertainty. (governance – issues) *Theme U12*: Good technology choices can lead to unexpected opportunities	*Theme U12*: Good technology choices can lead to unexpected opportunities
EXPECTED CHANGE	***CIO DEFINITIONS*** *Theme E1*: Since change is constant coming from both internal and external drivers, dealing with change should be a normal part of work within the IT environment (awareness, recognition, planning, evaluation, assessment). *Theme E2*: Change can be better for the organization by recognizing opportunities and moving to better technology, processes, people skills, etc. *Theme E3*: Technology changes, driven both from external and internal situations, generally occur less frequently than other types of change and can be planned for more easily. *Theme E4*: Even a well-planned, cost-effective IT infrastructure may need to be updated to meet the changing needs of external customers and partners.	*Theme E3*: Technology changes, driven both from external and internal situations, generally occur less frequently than other types of change and can be planned for more easily *Theme E5*: Business causes of common change are normal and should be anticipated. *Theme E7*: Planned changes can cause business disruption and lead to more changes, both positive and negative. *Theme E14*: One size does not fit all, different customers need different products, services, and support.	*Theme E5*: Business causes of common change are normal and should be anticipated. (An) *Theme E7*: Planned changes can cause business disruption and lead to more changes, both positive and negative.	*Theme E3*: Technology changes, driven both from external and internal situations, generally occur less frequently than other types of change and can be planned for more easily. *Theme E4*: Even a well-planned, cost-effective IT infrastructure may need to be updated to meet the changing needs of external customers and partners. *Theme E6*: Internal EITO causes of change include: a) planned performance improvements b) planned improvements to increase profitability.

4.5.2.2 Enterprise IT Organization Emergent Themes – Several of the emergent themes relating to the impacts and issues of unexpected (U) and expected (E) change were mapped to the CIO and the enterprise IT organizational components of governance, people, technology infrastructure, and technology services, products, and applications as shown in Table 4.11. Actions recommended by the CIOs from these impacts and issues were also mapped to the CIO and the enterprise IT organizational components of governance, people, technology infrastructure, and technology services, products, and applications as shown in Table 4.11.

4.5.2.2 Enterprise IT Organizational Flexibility Emergent Themes – In a similar manner, the flexibility (F) emergent themes from Table 4.9 were also grouped together and mapped according to the proposed definition of enterprise IT organizational flexibility cycle consisting of the three aspects of anticipation, agility, and anticipation. This mapping is shown in Table 4.12. Next, these flexibility emergent themes were mapped to the CIO and the enterprise IT organizational components of governance, people, technology infrastructure, and technology services, products, and applications as shown in Table 4.13. Finally, all the unexpected (U) change, expected (E) change, and flexibility (F) emergent themes were mapped to the proposed enterprise IT organizational flexibility framework as shown in Table 4.14.

Table 4.11 Impacts and Issues Relating to Unexpected (U) and Expected (E) Change and Actions for the Enterprise IT Organization

CIO Roles / EITO	Impacts on EITO Emerging Themes	Issues for EITO Emerging Themes	Actions for EITO Emerging Themes
CIO – roles / leadership	Theme E8: IT leadership can enable organizational change, which allows IT personnel to be less fearful of change.	Theme U9: It is not easy to make the broad, organizational changes necessary for the dynamic driven business environment: - People barriers - Executive barriers. Theme U13: Decisions can be based on the type of change needed. Theme E7: Planned changes can cause business disruption and lead to more changes, both positive and negative.	Theme E10: Being proactive requires CIOs to identify people who thrive on change (~ 15%) versus 15% who hate change and the 70% who are fence sitters. Theme E11: IT management must: 1. Tolerate and even encourage risk-taking 2. Be willing to stop major projects when necessary. Theme F6: Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. Theme F14: Teach people how to fish instead of taking them fishing.
Governance	Theme E2: Change can be better for the organization by recognizing opportunities and moving to better technology, processes, people skills, etc.	Theme U10: EITO needs to change as rapidly as IT customers need to change. Options include: - React to external changes - Be proactive by anticipating external changes - Be EITO proactive to changing environment. Theme U11: Conscious decisions can lead to more uncertainty. Theme F8: Define flexible roles and responsibilities, structures, processes, and technologies needed as a result of the business changes.	Theme U5: Business continuity plans should be made and continuously updated to prepare for natural or manmade disasters that might never happen (risk management). Theme U14: There are both formal and informal methods for risk assessment. Theme F9: Evaluate flexible roles and responsibilities, structures, processes, and technologies used to deal with the business changes for effectiveness.
People / Customer Relationships	Theme E8: IT leadership can enable organizational change, which allows IT personnel to be less fearful of change.	Theme U7: EITO personnel need to change and will change when they develop a business awareness of the changing needs of the customers. Theme E12: Work to have all IT people be more comfortable with change, setting an example for the IT customers. Theme F1: The people need to be able to recognize opportunities.	Theme E9: IT leaders must be comfortable with change and be willing to allow risk-taking on the part of the IT personnel. Theme E10: Being proactive requires CIOs to identify people who thrive on change (~ 15%) versus 15% who hate change and the 70% who are fence sitters. Theme E11: Management must: 1. Tolerate and even encourage risk-taking 2. Be willing to stop major projects when necessary.

CIO Roles / EITO	Impacts on EITO Emerging Themes	Issues for EITO Emerging Themes	Actions for EITO Emerging Themes
			Theme F15: EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this. Theme F18: The existing teams must be able to respond to changes.
Technology - Infrastructure	Theme U8 / E4: Even a well-planned, cost-effective IT infrastructure may need to be updated to meet the changing needs of external customers and partners. Theme E3: Technology changes, driven both from external and internal situations, generally occur less frequently than other types of change and can be planned for more easily.	No emerging themes	Theme U12: Good technology choices can lead to unexpected opportunities.
Technology – Services, Products, & Applications	Theme U3: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations. Theme U4: Needs of the internal customers also change because of conscious decisions to proactively change to stay ahead of market changes. Theme E6: Internal EITO causes of change include: a) Planned performance improvements and b) Planned improvements to increase profitability.	Theme E14: One size does not fit all, different customers need different products, services, and support.	Theme F1: Being able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. Theme F2: Ability to manage the customer. Theme F15: EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this.

Table 4.12 Emergent Themes Relating to Enterprise IT Organizational Flexibility

CIO				
Enterprise IT Organizational Flexibility (F)				
General	**Enterprise IT Organizational Flexibility Cycle (EFC)** Theme F19: Does learning from experience lead to standards and rules or to anticipation and agility? Theme F20: Created the term 'Enterprise IT Organizational Flexibility' to refer to the broader socio-technical IT organization and its components. Theme F21: Using the EFC will demonstrate that you can select your areas of excellence.			**EITO Flexibility Framework (EFF)**
	Anticipation	**Agility**	**Adaptability**	
Theme F1: It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F2:* Flexibility is the ability to manage the customer. *Theme F3:* Either the EITO or the enterprise is considered to be 'on-top' of the marketplace when flexible. *Theme F6:* Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. *Theme F16:* Implementation of new services and applications should be at request of clients or that clients perceive is from their request. Otherwise, clients {and enterprise executives} will not support IT.	*Theme F1:* It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F4:* Can't adjust the planning list if the list doesn't exist. *Theme F5:* Must prepare for both man-made and natural disasters based on previous experiences. *Theme F7:* Need a way to test anticipation to tell how well anticipating helps deal with uncertainty. *Theme F8:* Flexible roles and responsibilities, structures, processes, and technologies need to be defined based on the results of the business changes. *Theme F10:* Always re-evaluate planning and preparation assumptions to know when something happens that might affect the assumptions. *Theme E13:* A flexibility goal should be an 80, but most organizations are currently at a 10.	*Theme F1:* It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F4:* Can't adjust the planning list if the list doesn't exist. *Theme F6:* Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. *Theme F7:* Need a way to test anticipation to tell how well anticipating helped deal with uncertainty. *Theme F10:* Always re-evaluate planning and preparation assumptions to know when something happens that might affect the assumptions. *Theme F11:* IT people need to be able to recognize opportunities. *Theme F12:* Being agile may set wrong expectations and also end up not using IT resources effectively. Hard to prove to customers that some of their requests are unnecessary and will have negative impacts on them	*Theme F5:* Must prepare for both man-made and natural disasters based on previous experiences. *Theme F6:* Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. *Theme F9:* Flexible roles and responsibilities, structures, processes, and technologies used to deal with the business changes for effectiveness need to be evaluated. *Theme F10:* Always re-evaluate planning and preparation assumptions to know when something happens that might affect the assumptions. *Theme F12:* Being agile may set wrong expectations and also end up not using IT resources effectively. Hard to prove to customers that some of their requests are unnecessary and will have negative impacts on them and other clients. *Theme F13:* Learning occurs when people make mistakes. *Theme F14:* Teaching people how to fish instead of taking them fishing.	*Theme F15:* EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this. *Theme F17:* Useful to develop critical questions for each box [of EFF], then create scenarios to help the organization prepare for the different scenarios. *Theme F18:* The existing teams must be able to respond to changes. *Theme F20:* Created the term 'Enterprise IT Organizational Flexibility' to refer to the broader socio-technical IT organization and its components.

CIO				
Enterprise IT Organizational Flexibility (F)				
General	**Enterprise IT Organizational Flexibility Cycle (EFC)** Theme F19: Does learning from experience lead to standards and rules or to anticipation and agility? Theme F20: Created the term 'Enterprise IT Organizational Flexibility' to refer to the broader socio-technical IT organization and its components. Theme F21: Using the EFC will demonstrate that you can select your areas of excellence.			**EITO Flexibility Framework (EFF)**
	Anticipation	**Agility**	**Adaptability**	
	Use to evaluate technology - Example questions – How should we anticipate using wireless? Will wireless be important for our manufacturing plants and laboratories? Will it provide us a competitive advantage if we are early adopters or should we wait for later adoption?	and other clients. *Theme F18:* The existing teams must be able to respond to changes.		

Table 4.13 Flexibility Emergent Themes Applied to the Enterprise IT Organization

CIO			
Theme F6: Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. *Theme F14:* Teaching people how to fish instead of taking them fishing.			
Enterprise IT Organization (EITO) General			
Theme Fed 1: Divisional CIOs in a federated model deal with very different divisional and financial needs. *Theme F20:* Created the term 'Enterprise IT Organizational Flexibility' to refer to the broader socio-technical IT organization and its components.			
Governance (F)	**People (F)**	**Technology – Infrastructure (F)**	**Technology – Services, Products, & Applications (F)**
Theme F4: Can't adjust the planning list if the list doesn't exist. *Theme F5:* Must prepare for both man-made and natural disasters based on previous experiences. *Theme F8:* Flexible roles and responsibilities, structures, processes, and technologies need to be defined based on the results of the business changes. *Theme F9:* Flexible roles and responsibilities, structures, processes, and technologies used to deal with the business changes for effectiveness need to be evaluated.	*Theme F2*: Ability to manage the customer. *Theme F10:* Always re-evaluate planning and preparation assumptions to know when something happens that might affect the assumptions. *Theme F11*: The people need to be able to recognize opportunities. *Theme F13*: Learning occurs when people make mistakes. *Theme F15*: EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this. *Theme F18:* The existing teams must be able to respond to changes.		*Theme F1:* It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F3:* Either the EITO or the enterprise is considered to be 'on-top' of the marketplace. *Theme F12:* Being agile may set wrong expectations and also end up not using IT resources effectively. Hard to prove to customers that some of their requests are unnecessary and will have negative impacts on them and other clients. *Theme F15*: EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this. *Theme F16:* Implementation of new services and applications should be at request of clients or that clients perceive that it is from their request. Otherwise, clients {and enterprise executives} will not support IT innovation.

Table 4.14 Emerging Themes (U, E, & F) Mapped to the Enterprise IT Organizational Flexibility Framework

	CIO	Governance	People	Technology - Infrastructure	Technology – Services, Products, Applications
Anticipation	*Theme F6:* Create an environment that encourages risk-taking by following recommendations and by not chastising mistakes. *Theme F14*: Teaching people how to fish instead of taking them fishing.	*Theme U5:* Business continuity plans should be made and continuously updated to prepare for natural or manmade disasters that might never happen. *Theme Fed 1*: Divisional CIOs in a federated model deal with very different divisional and financial needs. *Theme F4*: Can't adjust the planning list if the list doesn't exist.	*Theme U7:* EITO personnel need to change and will change when they develop a business awareness of the changing needs of customers. *Theme F14*: Teaching people how to fish instead of taking them fishing. *Theme F10*: Always be re-evaluating planning and preparation assumptions to know when something happens that might affect the assumptions.	*Theme E3*:Technology changes, driven both from external and internal situations, generally occur less frequently than other types of change and can be planned for more easily. *Theme E4*: Even a well-planned, cost-effective IT infrastructure may need to be updated to meet the changing needs of external customers and partners.	*Theme U3*: Needs of the internal customers change because of changes in the needs of external customers, the external marketplace, and external government regulations. *Theme U4*: Needs of the internal customers also change because of conscious decisions to proactively change to stay ahead of market changes. *Theme F1:* It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F2*: Ability to manage the customer. *Theme F3:* Either the EITO or the enterprise is considered to be 'on-top' of the marketplace.
Agility	*Theme E9*: IT leaders must be comfortable with change and be willing to allow risk-taking on the part of the IT personnel.	*Theme U10*: EITO needs to change as rapidly as IT customers need to change. Options include: - React to external changes - Be proactive by anticipating external changes - Be EITO proactive to changing environment.	*Theme F11*: The people need to be able to recognize opportunities. *Theme F18:* The existing teams must be able to respond to changes.		*Theme F1:* It is critical that the enterprise IT organization be able to react as quickly as internal customers' business needs change while reacting to external customers' changing business needs. *Theme F12:* Being agile may set wrong expectations and also end up not using IT resources effectively. Hard to prove to customers that some of their requests are unnecessary and will have negative impacts on them and other clients. *Theme F16:* Implementation of new services and applications should be at request of clients or that clients perceive that it is from their request. Otherwise, clients {and enterprise executives} will not support IT innovation.

	CIO	Governance	People	Technology - Infrastructure	Technology – Services, Products, Applications
Adaptability	*Theme E7*: Planned changes can cause business disruption and lead to more changes, both positive and negative.	*Theme F5:* Must prepare for both man-made and natural disasters based on previous experiences.	*Theme F13*: Learning occurs when people make mistakes.		
EITO Flexibility Cycle		*Theme F4*: Can't adjust the planning list if the list doesn't exist.	*Theme E13*: A flexibility goal should be an 80, but most organizations are currently at an 10.	*Theme F20*: Created the term 'Enterprise IT Organizational Flexibility' to refer to the broader socio-technical IT organization and its components.	
EITO Flexibility Framework		*Theme F8:* Flexible roles and responsibilities, structures, processes, and technologies need to be defined based on the results of the business changes. *Theme F9:* Flexible roles and responsibilities, structures, processes, and technologies used to deal with the business changes for effectiveness need to be evaluated	*Theme F15* : EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this.		*Theme F15:* EFF finding – Key to success is flexible IT services and managed expectations. Must have well-trained IT account reps to achieve this.

4.6 Study Findings

The final part of conceptual qualitative analysis was to identify, compare, and combine the emergent themes into broad study findings. Using the mapping of the emergent themes against the research model as shown in Tables 4.11 – 4.15, the fourteen unexpected (U) change emergent themes, the fourteen expected (E) change emergent themes, and the 21 flexibility (F) emergent themes were compared and consolidated into 17 major findings. Table 4.15 shows each of the major findings and their related emergent themes. The discussion concerning the implications of these major findings is given in Chapter 5, Findings and Discussion.

Table 4.15 Enterprise IT Organizational Flexibility Major Findings

Finding Number	Major Findings	Related Emergent Themes
Enterprise IT Organization Management and Key Component Findings		
1	*CIO LEADERSHIP* - CIO leadership is critical to preparing the enterprise IT organization for uncertainty and unexpected change as well as expected change.	U9, U13, E7, E8, E10, E11
2	*GOVERNANCE* - The structure of the enterprise IT organization needs to insure strong relationships with the enterprise executives to minimize impacts of uncertainty and unexpected changes.	U4, U5, U10, U14
3	*PEOPLE* - IT personnel who thrive on change should be in positions most impacted by uncertainty and unexpected change.	U7, E8, E9, E10, E11, E12, F1, F15, F18
4	*TECHNOLOGY INFRASTRUCTURE* – A well-planned and cost-effective existing enterprise information technology infrastructure may still need to be updated in spite of the CIO's opinions in order to meet the changing business needs of the enterprise.	U8, U12, E3, E4
5	*TECHNOLOGY SERVICES, PRODUCTS, AND APPLICATIONS* - Well-managed customer relationships shortened the time required to sense and respond to unexpected changes affecting both internal and external enterprise IT customers.	U3, U4, E6, E14, F1, F2, F15

Finding Number	Major Findings	Related Emergent Themes
Dynamic Business Environmental Uncertainty and Expected Change Findings		
6	*CIO KNOWLEDGE* – Proactive CIOs must make a conscious effort to understand the external business environment as well the internal business environment.	U3, U4
7	*MANAGING UNCERTAINTY* – Proactive CIOs consider and manage uncertainty as if it were an opportunity.	E2
8	*CAUSES OF UNCERTAINTY* – External business drivers of change result in more uncertainty than the internal business drivers.	U5, U6
9	*EXPECTED CHANGE IMPACTS* – Change is constant, but its impact varies greatly.	U1, U2, E1, E5
10	*CHANGE LEADS TO CHANGE* – Both unexpected changes and planned changes lead to more changes.	U6, U13, U14, E3, E6, E7
Enterprise IT Organizational Flexibility Findings		
11	*ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY* – An enterprise is 'on-top' of the marketplace when it has the capability to anticipate the changing customer needs.	F1, F2, F3, F6, 3, 4, F16, 10
12	*ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY CYCLE MODEL* – Organizational flexibility considers the socio-technical characteristics of the enterprise IT organization, which may lead to 'areas of flexibility excellence.'	F17, F18, F19
13	*FINDINGS CONCERNING ANTICIPATION* – Planning is a critical capability that is more effective when combined with anticipation.	F1, F2, F4, F5, F6, F7, F8, F10, E5, E13
14	*FINDINGS CONCERNING AGILITY* – Agility is optimized when opportunities are recognized and leveraged as well as when threats are minimized.	F1, F4, F6, F7, F10, F11, F12, F18
15	*FINDINGS CONCERNING ADAPTABILITY* – Learning is optimized when the lessons learned from making mistakes are adapted within the EITO .	F5, F6, F9, F10, F12, F13, F14
16	*THE INTERRELATIONSHIPS OF ANTICIPATION, AGILITY, AND ADAPTABILITY* - The flexible enterprise IT organization is one that is able to anticipate and prepare for the unexpected, agilely respond to unexpected changes, and adapt its structure, processes, and services, products, and applications as necessary based on its experiences.	F1, F3, F4, F6, F7, F10, F12, F15, U10

Finding Number	Major Findings	Related Emergent Themes
Enterprise IT Organization Flexibility Framework		
17	*THE ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY FRAMEWORK* – A framework that evaluates how anticipation, agility, and adaptability affect and are affected by enterprise IT governance, personnel, infrastructure, and services, products, and applications components would be a useful.	F15, F17, F18

CHAPTER 5

FINDINGS AND DISCUSSION

"In the turbulent environment of the 21st century, the complexity of a firm's response to the environment must match the turbulence in the environment." (H. Igor Ansoff, foreword to Volberda 1998, p. vii)

5.1 Discussion Goals for Qualitative Research

In a qualitative exploratory study, the goal of the discussion of research findings is to answer both broad and general questions about the study's problem domain as well as more specific and detailed questions unique to the problem domain (Dougherty 2002, Wolcutt 1990). The goals of this particular study were to better understand:

- How the enterprise IT organization behaves as a socio-technical system.
- How the enterprise IT organization operates in dynamic business environments.
- How using flexibility within the enterprise IT organization may help manage uncertainty / unexpected change and expected change.

The discussion of this study's findings is based on the following broad category questions recommended by Wolcutt (1990) *modified for this study*:

1. What is currently going on in the *enterprise IT organization* under study?
2. What is the current situation managing *uncertainty / uncertain change and expected change* within the problem domain *treating the enterprise IT organization as a socio-technical organization* under study?
3. How do people in the *enterprise IT organization* work and contribute within the problem domain (*socio-technical enterprise IT organization*) under study?

4. As a potential solution to the problem under study, would *enterprise IT organizational flexibility be useful in managing uncertainty and unexpected change*?

The participant interviews were based on a number of more specific key exploratory questions based on the above broad categories. The seventeen primary findings from this study listed in Table 4.16 were mapped to these key exploratory questions and are shown in Table 5.1.

Table 5.1 Specific Enterprise IT Organizational Flexibility Exploratory Research Questions

General Questions to Gain Understanding of the Problem Domain		
Exploratory Questions	**Related Key Categories**	**Findings from Emergent Themes**
*1. WHAT IS **CURRENTLY GOING ON** IN THE **ORGANIZATION** UNDER STUDY?*		
How does the CIO lead and manage the EITO in dynamic business environments?	CIO Leadership Governance	1. CIO LEADERSHIP – CIO leadership is critical to preparing the enterprise IT organization for uncertainty / unexpected change and expected change. 2. GOVERNANCE – The structure of the enterprise IT organization needs to insure strong relationships with the enterprise executives to minimize impacts of uncertainty and unexpected changes.
How do CIOs deal with emerging technology and its expected value to the enterprise in order to provide competitive advantages in dynamic business environments?	Technology – Infrastructure	4. TECHNOLOGY INFRASTRUCTURE – A well-planned and cost-effective existing enterprise information technology infrastructures may need to be changed in spite of the CIO's opinion to meet the changing business needs of the enterprise.
How are services, products, & applications delivered within the enterprise in dynamic business requirements?	Technology – Services, Products, & Applications	5. TECHNOLOGY SERVICES, PRODUCTS, AND APPLICATIONS – Well-managed customer relationships shortened the time required to respond to unexpected changes affecting both internal and external enterprise IT customers.
*2. WHAT IS THE **CURRENT SITUATION** WITHIN THE **PROBLEM DOMAIN** UNDER STUDY?*		
What CIO knowledge about the enterprise IT organization environment (individually and	CIO Leadership	6. CIO KNOWLEDGE – Proactive CIOs make a conscious effort to understand the external business environment as well the internal business

General Questions to Gain Understanding of the Problem Domain		
Exploratory Questions	**Related Key Categories**	**Findings from Emergent Themes**
collectively) is necessary in order to manage the organization in a dynamic business environment?		environment.
How do CIOs currently manage uncertainty or unexpected change?	Uncertainty / Unexpected Change Governance People Technology – Infrastructure Technology – Services, Products, & Applications	7. MANAGING UNCERTAINTY – Proactive CIOs consider and manage uncertainty as if it were an opportunity. 8. CAUSES OF UNCERTAINTY – External business drivers of change result in more uncertainty than the internal business drivers.
Is managing uncertainty and unexpected change different than dealing with expected change?	Expected Change Governance People Technology – Infrastructure Technology – Services, Products, & Applications	9. EXPECTED CHANGE IMPACTS – Change is constant, but its impact varies greatly 10. CHANGE LEADS TO CHANGE – Both unexpected changes and expected changes lead to more change.
*3. HOW DO THE **PEOPLE** IN THE ORGANIZATION **WORK AND CONTRIBUTE** WITHIN THE **PROBLEM DOMAIN** UNDER STUDY?*		
What are the expected roles and responsibilities of the EITO people when working in a dynamic business environment?	People	3. PEOPLE - IT personnel who thrive on change should be in positions most impacted by uncertainty and change.
How do the EITO people acquire and develop their enterprise technical and business skills in a dynamic business environment?		
How does the CIO create the environment where necessary skills and attitudes to work in a dynamic business environment are developed and transmitted to others?	CIO Leadership	1. CIO LEADERSHIP – CIO leadership is critical to preparing the enterprise IT organization for uncertainty / unexpected change and expected change.
*4. AS A POTENTIAL **SOLUTION** TO THE PROBLEM, WOULD **EITO FLEXIBILITY** BE USEFUL IN MANAGING **UNCERTAINTY AND UNEXPECTED CHANGE**?*		
How do anticipation, agility, and adaptability affect the EITO?	EITO Flexibility Cycle	11. ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY – An enterprise is 'on-top' of the marketplace when it has the capability to anticipate the changing customer needs. 12. ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY CYCLE MODEL – Organizational flexibility considers the socio-technical characteristics of the enterprise IT

General Questions to Gain Understanding of the Problem Domain		
Exploratory Questions	**Related Key Categories**	**Findings from Emergent Themes**
		organization, which may lead to 'areas of flexibility excellence.' 13. FINDINGS CONCERNING ANTICIPATION – Planning is a critical capability that is more effective when combined with anticipation. 14. FINDINGS CONCERNING AGILITY – Agility is recognizing opportunities and minimizing threats. 15. FINDINGS CONCERNING ADAPTABILITY – Learning occurs when people make mistakes. (*F5, F6, F9, F10, F12, F13, F14)* 16. THE INTERRELATIONSHIPS OF ANTICIPATION, AGILITY, AND ADAPTABILITY – The flexible enterprise IT organization is one that is able to anticipate and prepare for the unexpected, agilely respond to unexpected changes, and adapt its structure, processes, and services, products, and applications as necessary based on its experiences.
Would the EITO Flexibility Framework (EFF) be a useful tool when managing uncertainty and change?	EITO Flexibility Framework	*17. THE ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY FRAMEWORK* – A framework that evaluates how anticipation, agility, and adaptability affect and are affected by the enterprise IT governance, personnel, infrastructure, and the services, products, and applications components would be useful.

This chapter describes the qualitative narrative for this study, providing a 'descriptive account' of the interpretation of the exploratory findings based on the iterative process of constructing an explanatory framework from the data collection, iterative data analysis, and findings (LeCompte and Schensul 1999). The next section of this narrative discusses the exploratory questions shown in Table 5.1 as well as the implications of the findings. The evaluation criteria and limitations for this study, the contributions of the study, and future research opportunities developed from this study are discussed in later sections.

5.2 Discussion of Findings Based on the Broad Exploratory Questions

This section discusses the findings of this study and their implications on the leadership and management of the enterprise IT organization.

5.2.1 What is currently going on in the Enterprise IT Organization?

The problem domain for this research is CIO management of the enterprise IT organization in turbulent business environments. The first two findings relate to the broad study categories of 'CIO Leadership' and 'Governance.'

Finding 1: ***CIO LEADERSHIP - CIO leadership is critical to preparing the enterprise IT organization for uncertainty / unexpected change and expected change.***

When using qualitative ethnographic interviewing research techniques, the sample population is an important part of the research process (Smith, Evans, and Westerbeek 2005). This study specifically selected study participants who represented a diverse group of industries, enterprise size, CIO education and experience, and enterprise IT organization characteristics using 'purposeful sampling' (LeCompte and Schensul 1999). The key characteristics used in this study for the comparative analysis included formal education, number of current and previous CIO positions, the enterprise size, industry, and number of locations supported, and the structure and characteristics of the enterprise IT organization. Nine of the twenty CIOs participating in this study had formal IT training including one who had an advanced MS degree in MIS. Ten had non-IT BS or BA degrees, with seven of those having MA, MS, or MBA degrees. One participant had a PhD degree in chemistry. All of these non-IT trained CIOs had worked in different functional areas including manufacturing, accounting, finance, marketing, etc., before

coming to the IT functional area. Most had been drawn to the IT area for one of two reasons. The first was because of their individual interest in developing technology tools that would help them increase their performance and be more efficient in their previous non-IT functional work. In the medium, small, and very small enterprises, this interest grew into an expertise that led the CIO to becoming the enterprise IT manager by default because of their knowledge. The others with non-IT education entered the IT functional area through job rotation either as part of executive grooming or because there was no one else to do the work at that particular time. Many of those stayed in enterprise IT and eventually were promoted through the IT ranks to the CIO position. Two CIOs, however, started their IT career as the CIO.

In dynamic business environments, CIOs mentioned that barriers are often caused by both employees and executive strategies that make it difficult for them to make broad, organizational changes. This is supported by Goldman, Nagel, and Preiss (1995) in their list of forces that threaten companies in rapidly changing global marketplaces. Some of those barriers caused by employees and executive strategies were shrinking product lifetimes, convergence of physical products and services, simultaneous inter-company cooperation and competition, and pressures to internalize prevailing social values. Generally, enterprise IT personnel fear change as do most enterprise employees. CIOs stated that if enterprise IT personnel were less fearful of change, the IT personnel would be better able to deal with changes affecting their functions. Through their leadership, CIOs can enable organizational changes to develop an atmosphere of continuous change and show employees the bigger picture of how uncertainty and unexpected change as well as expected change affect IT as a whole. Volberda's (1998) research confirmed that

the leaders of 'flexible' enterprises maintained coordination, control, and focus, while, at the same time, focusing on innovation, creativity, and speed. Poole and Van de Ven (1989) also showed the importance that leaders of organizations must mix stability and change as a way of life, since organizations are continuously changing. This need for leadership was also supported by Benamati and Lederer (2001, 2000) in their studies on coping mechanisms with changing IT. CIOs exhibit 'environmental determinism' by using coping mechanisms to deal with uncertainty and change. Unfortunately, the coping mechanisms are not usually the most effective. Research studies showed that enterprise IT executives are not always well adapted to managing successfully in dynamic environments (Knoll and Jarvenpaa 1994, Rackoff, Wiseman, and Ulrich 1985, Starling 1980). CIOs in this study appeared to be more flexible and adapted to dealing with uncertainty than those studied earlier. CIOs, themselves, also need to be comfortable with the impacts of change in order to set examples for the entire organization. Since enterprise IT organizations also operate in turbulent IT business environments. Just as the executives of the firm must be able to develop strategies to exploit opportunities and coping mechanisms to minimize threats, Knoll and Jarvenpaa (1994) described how CIOs must be able to do the same. Benamati and Lederer (2001, 2000) explained that enterprise IT executives would be more successful is they used coping mechanisms such as 'maintain your own training staff' or 'document differences between new and previous IT.'

Several CIOs pointed out that one way to position the enterprise IT organization to better handle uncertainty is to develop a strategic objective to be as 'reactive' as the enterprise IT customers must be. This is supported by research by Dietrich and Shipley

(1999) who pointed out that the enterprise IT environment is 'anything but stable' due to the nature of the IT business and the impact of IT on the business. Dietrich and Shipley recommended that enterprise IT organizations should develop a new model of business that is both more responsive and also more proactive.

Another way for CIOs to be more comfortable with change is to determine how well change is managed. A key measure of success when managing change and becoming more flexible is the enterprise IT organization's ability to focus on the needs of its internal and external enterprise customers by continuously changing and creating enterprise IT value as described by Davern and Kauffman (2000), Brown and Eisenhardt (1997) and Hitt and Brynjolfsson (1996). Shee (2001) showed that flexibility is critical to sustaining competitiveness in rapidly changing software and service industry [in India] and that flexibility measures are needed to improve and enhance competitiveness. When trying to determine measures, one CIO stated that he felt that his enterprise IT organization currently had a *flexibility quotient* [his term] of about a ten, but, in reality, he felt it should be closer to an eighty.

A key role of CIOs is to manage issues, especially caused by unexpected and expected changes. One CIO explained that, in his experience, uncertainty follows the 80/20 rule. Eighty percent of change is expected, while twenty percent is a surprise, or completely unexpected. Galbraith (1977) supported this concept of some unexpected change happening when he defined uncertainty as the gap between how much information is required to do the work and how much information is known. Also, supporting this CIO's perspective about how uncertainty affects his business is Daft and Lengel (1986), who described uncertainty and unequivocality as two forces that influence

organizations and the way decisions are made within organizations. Several CIOs take action to avoid surprises by attempting to plan for any contingencies and by meeting with clients, vendors, and employees on a regular basis to check status of projects and day-to-day operations. One CIO disagreed with the concept that surprises are completely unexpected, however, emphasizing that "An issue is not a surprise. It would be a surprise to have no issues."

The following recommendations from the study findings summarize key activities for CIOs to better prepare the enterprise IT organization to deal with uncertainty / expected change and unexpected change.

- Create an environment that encourages and tolerates risk-taking to encourage employees not to fear change. Do not over-react when risk-taking doesn't work out as expected. This follows what Falkowski and Krebs (2004) found that organizations that were most successful had personnel who were good at dealing with change and adaptive, while those who were poor had people who could not deal with change and were not adaptive.
- Be willing to stop technology projects mid-way when necessary to mitigate the risk and to demonstrate that potential negatives can be turned into positives. Just because eighty percent or even ninety percent of a project is completed, if ten percent is a problem, which will negatively affect the enterprise, then the entire project is a problem.
- Manage across the hierarchy of the enterprise. An enterprise's CEO and senior executives will be more supportive of needs of the enterprise IT organization if they have a better understanding of the impact of unexpected changes on the on-

going support to the enterprise provided by the enterprise IT organization. According to Volberda (1998), flexible resources and strategic thinking are not enough for flexibility and adaptation. This also requires people to sense and make sense of their environment. All of the organizational stakeholders must understand the 'strategic schemas' or 'frames of reference' that are necessary to interpret and understand the organization and its environment. This is explained by Weick (1979) and Volberda (1998) as the 'Interpretive Model' of organizational flexibility. Hamel and Prahalad (1989) referred to this as 'strategic intent,' where the most successful enterprises develop foresight and can imagine new services and products and even businesses that do not exist as yet.

- Develop a management framework to use as a guide when dealing with uncertainty and unexpected change as well as expected change. Unexpected change can be managed by decomposing or breaking the problems into smaller parts.

Finding 2: ***GOVERNANCE - The structure of the enterprise IT organization needs to insure strong relationships with the enterprise executives to minimize impacts of uncertainty and unexpected changes.***

The primary purpose of the enterprise IT organization is to provide IT services, products, and applications that enable the enterprise to compete successfully in its industry. Therefore, the governance of the enterprise IT organization should support this objective. In this case, the structure of the enterprise IT organization is critical as it relates to who makes critical enterprise IT decisions and how these decisions are made. One of the major concepts learned from this study is that needs of the internal customer can change

unexpectedly for two main reasons: (1) The needs of the customers of the enterprise, referred to as external customers, can change without warning; and (2) The internal customers proactively change their business strategy to anticipate potential changes in the external environment to stay ahead of market changes. This is supported by Agarwal, Ross, and Sambamurthy (2003) and Sambamurthy, Bharadwaj, and Grover (2003) who described that in a digital enterprise, enterprise IT customers have changing needs that often conflict with each other, which requires that new enterprise IT solutions must interoperate with embedded IT services. External changes, for example, new government regulations or new competitive products, although unexpected, do occur on a regular basis. On the other hand, unexpected impacts on the enterprise from technology changes made within the enterprise IT organization occur less frequently. Either way, unexpected change causes business disruption, which means the enterprise IT organization should be structured in the best manner to be able to learn of unexpected changes as soon as possible.

Major enterprise mergers and acquisitions where either the enterprise merges with or acquires other companies or is acquired by another company were examples of uncertainty experienced by the CIOs in the study that significantly impacted the enterprise IT organization. So as a conclusion, what is the best structure recommendation? Several CIOs who had experienced enterprise mergers and recommendations recommended that to minimize the uncertainty of major enterprise changes, the enterprise IT organization should be structured to insure strong relationships with the different functional customer groups and the enterprise executive board. This is supported by Khandwalla (1972) who concluded that increased uncertainty heightens the

need for organizational structure and integration as well as the alignment of the IT strategy with the enterprise business strategy. The key is that the enterprise IT organization must be able to change as rapidly as the needs of the IT customer change. To do this, the leaders of the enterprise IT organization can react to changes after they occur or they can be more proactive by anticipating the external changes. As Rockart et al. (1996) and Gottschalk and Taylor 2000) recommended, instead of reacting to change, CIOs must create and lead a new type of enterprise IT organization that acts as a change agent and sets an example for flexibility and adaptability. For example, Verganti (1999) described that product development teams must be able to both anticipate and react. Verganti (1999) described this capability as 'structural flexibility,' where structured flexibility is impossible unless planned flexibility is built during the early stages of the project.

One CIO in a medium size enterprise pointed out that to successfully manage change, he needs to "*prospect for new information, instead of waiting for it to be delivered to him.*" To do this, he instituted a new reporting structure with new processes and relationships "*to get his [IT] eyes and ears in every possible place.*" This need to develop strong customer relationships supports the guiding business principles defined by Agarwal and Sambamurthy (2002) to structure and organize the enterprise IT organization to nurture relationships. Although they recommend the 'Partner' model as a means to foster innovative IT solutions for competitive advantage, strong partner relationships with external and internal customers also helps the enterprise IT organization better deal with unexpected changes. In this 'new' enterprise IT model, CIOs must balance innovation with efficiency while dealing with the turbulence and

uncertainties in today's competitive world. They must make difficult technology choices based on user needs that are continuously changing and often conflicting with technology budgets that are shrinking and using technologies that are rapidly changing (Knoll and Jarvenpaa 1994; Davis and Olson 1985)

Another key objective of the enterprise IT organization is to prepare business continuity plans for potential business disasters, either natural or man-made. Many CIOs had experience with different types of disasters and learned to prepare business continuity plans for securing and maintaining the enterprise IT systems, products, and applications as well as securing and maintaining key enterprise information and knowledge. Due to several severe disasters over the last eight years, such as the 9/11 terrorist attack and Hurricane Katrina, CIOs have better support from the enterprise executives to develop IT / business contingency plans. However, the full extent of support including necessary budget and resources depends on the industry. CIOs in IT-intensive industries such as financial / banking had extensive continuity plans, which included provisioned hot and cold back-up sites, periodic disaster drills, and several personnel responsible for preparing continuous updates to the continuity plans. CIOs in industries considered non-IT-intensive such as local or regional consulting firms or manufacturing firms have difficulty obtaining necessary resources for comprehensive and updated contingency planning and implementation. Risk assessment is one capability that many of the CIOs in this study thought was not as strong within the enterprise IT organization as they would prefer. Recognizing that there are both formal and informal methods to conduct risk assessment, several participating CIOs in this study made it a practice to incorporate

informal methods such as 'what-if' scenario planning into all their IT project implementations.

One of the objectives of this exploratory study was to determine if there was any difference how multiple CIOs within an enterprise with a federated IT organization structure managed uncertainty and unexpected change. Within the federated structure, the primary or corporate CIO office has primary responsibility for architecture, common infrastructure and services, and standards decisions. Major functional divisions within a federated enterprise have their own separate IT departments, each with its own CIO who has primary responsibility for applications supporting the functional business objectives (Agarwal and Sambamurthy 2001). The functional CIOs usually report directly to the functional executives with a dotted line connection to the corporate CIO, or in some cases, to the CTO.

Of the twenty CIOs participating in this study, eleven or fifty-five percent were in a centralized structure at the time of the study, five or twenty-five percent in a federated structure, and three or fifteen percent in a distributed IT structure. One was unknown. This split is a significant change from the structure of enterprise IT organization in the previous 26 CIOs positions held by the participating CIOs, where eight or thirty-five percent of the CIO positions were in a distributed structure and only one or .04 percent was in a federated structure. Fifty-four percent or fourteen of the previous CIO positions were in a centralized structure.

Four of the five CIOs operating in a federated structure in this study were in the same insurance company. As part of this study, four divisional CIOs from the same enterprise were included as separate participants to see if there were differences in how

CIOs within the same enterprise dealt with uncertainty / unexpected change and expected change. Other than the common IT architecture, centralized IT infrastructure and network, strong internal enterprise customer relationships, and the fact that the four were from the same large enterprise, the CIOs differed in their management style, their approach to dealing with uncertainty and change, and in their support of risk-taking and use of emerging technology. It became clear from the study analysis that dealing with uncertainty and unexpected change as well as expected change is driven more by the expectations of the divisional customer than by policies of the enterprise or even the corporate CIO / CTO organization. The external dynamic business environment affects large enterprises with autonomous divisions differently because of the different needs of the divisional customers. As one CIO pointed out this difference was driven by the different business strategies of the separate insurance businesses within the enterprise. One reason they moved to the federated model was because of the organizational flexibility it provided the different divisions to shift resources and to create teams and disband teams as necessary. The divisional CIO organizations developed different types of systems to support their very different types of insurance businesses. One other advantage of the distributed model, as pointed out by one of the divisional CIOs, was since the CIO reported to the divisional executive, the IT strategy is very aligned with the divisional business strategy. The divisional CIOs recognized that they had different divisional needs requiring different types of decisions.

Not all industries need or receive innovative IT services, products, and applications. The influence of the chief executive officer (CEO) and the executive board for some industries, especially utilities, result in a more conservative IT perspective when

it comes to dealing with uncertainty / unexpected change and expected change. CIOs in these industries are expected to include strict risk assessment and contingency planning for all IT development and provisioning. Reich and Benbasat (1996) also explained about how the impact of business uncertainty occurring in dynamic enterprise IT environments differs by industry and by whether an organization is information-intensive or not. Information intensity refers to the amount of information necessary for the acquisition, transformation, and delivery of resources to the customer.

Also, several CIOs reported that their chief financial officers (CFOs) prefer tight controls and standards such as using the Information Technology Infrastructure Library (ITIL) as an attempt to control IT costs. The CIOs reported that these tight controls are also an attempt to offset the perception that so many IT projects are failures.

CIOs in small to very small enterprises in the study pointed out that, when compared to medium or large enterprises, they have very limited resources and a lack of support from the enterprise executives when dealing with uncertainty / unexpected change and expected change.

When considering what is currently going on in the enterprise IT organization, the next specific exploratory question this study answered is how do CIOs deal with emerging technology and its expected value to the enterprise in order to provide competitive advantages in dynamic business environments?

Finding 4: ***TECHNOLOGY INFRASTRUCTURE – A well-planned and cost-effective existing enterprise information technology infrastructure may need to be changed to meet the changing business needs of the enterprise in spite of the CIO's opinion.***

CIOs in this study emphasized that planning, implementing, and maintaining a 'top-notch' technology infrastructure is one of their major responsibilities. However, when dealing with uncertainty / unexpected change and expected change, even a well-planned and cost-effective IT infrastructure may need to be updated to meet the unexpected changing needs of external customers and partners. One CIO mentioned that he had spent five years developing and implementing a very secure, closed technology architecture. Now, though, because of marketing strategy changes within his enterprise, he was in the process of opening his technology network to extend it to the external customers of the enterprise.

Many of the CIOs agreed that unexpected technology changes, driven both from external and internal situations, generally occur less frequently than other types of unexpected change and can be managed more easily. This is because technologists within the enterprise IT organization generally are able to stay up-to-date with emerging technologies and their impacts on the enterprise IT infrastructure and are not often forced to implement unplanned technologies.

One CIO pointed out that even when specific technology changes were requested by internal customers, she would always evaluate the proposed changes using a SWOT (strengths, weaknesses, opportunities, threats) analysis before implementing any new technology. She would use the result of the analysis to explain to the customers why certain changes could or could not be made.

Generally, the CIOs in this study responded to unexpected changes when implementing proposed new technologies using two approaches based on the culture of the enterprise and the risk-tolerance of the CEOs and enterprise executives. The first, a disciplined response that is risk adverse, focuses on gradually changing the technology and creating a high quality perspective, which results in a slower, wait-and-see, more incremental approach. The second approach, a bleeding / leading edge, more radical and fluid approach, is open to new ideas and opportunities resulting from the new technology. The selection of either approach sends a message to the enterprise IT personnel on how to manage unexpected change. This somewhat supports what Galy and LeMaster (2001) found when comparing performance differences between organizations that exhibit 'pioneering' changes versus 'strategic' changes. The key difference between these organizations is either (1) create continuous incremental effort to adapt to change or (2) radically create revolutionary change. The CIOs in this study explained that the key is that the personnel in the enterprise IT organization must know when and how to be able to change and to identify all the potential impacts of known or expected changes. An individual CIO may prefer to experiment with newer technologies, but may choose not to implement the new technology because of the culture of his or her enterprise executives within, for example, the banking industry. Or another CIO wants to use new technologies, but is unable to because of a limited budget, such as in a small firm where the executives feel there is not enough money to experiment with technology.

Many of the CIOs also agreed that good technology choices can lead to unexpected opportunities, which can result in new advantages for the enterprise customers. Galy and LeMaster (2001) also showed in their study on pioneering change

that technological developments accelerate change, and to be successful, organizations must follow suit. Conflicts occur as a result of the choices made concerning change. Cyclical change is predictable and comforting. Revolutionary change is unpredictable and brings chaos to the order in the organization (Galy and LeMaster 2001). Also, CIOs pointed out that CIOs also need to be careful when implementing new IT technology because IT complexity and uncertainty as accelerated by technological change, increased outsourcing and IT alliances, and compressed product life cycles as pointed out by Mahinda and Whitworth (2004) and Whitworth et al. (2005). The key, again, is conducting realistic evaluations of technology choices. One CIO gave an example where a vendor proposed a new network system that the enterprise IT personnel were not comfortable using. Rather than just refuse to try the new technology, the CIO had the vendor install the hardware at two corporate sites as a 'proof of concept.' The new system worked as expected, but when the costs were projected to all the enterprise sites, the CIO stopped the project because he felt that it would be too expensive for the expected returns. A CIO must be willing to stop new technology projects after conducting realistic evaluations. This CIO demonstrated to the enterprise IT personnel in his enterprise that realistic evaluations are an important way to make technology decisions.

Another specific exploratory question when considering what is currently going on in the enterprise IT organization, answered in this study, is how customer relationships are maintained and the IT services, products, and applications are delivered in dynamic business environments?

Finding 5: ***TECHNOLOGY SERVICES, PRODUCTS, AND APPLICATIONS - Well-managed customer relationships shortened the time required to respond to unexpected changes affecting both internal and external enterprise IT customers.***

Uncertainty / unexpected changes and expected changes affecting both the internal and external customers of the enterprise IT organization directly impact the planning and delivery of technology services, products, and applications (T-SPAs). As mentioned earlier the needs of the internal customers may change unexpectantly because of several environmental factors:

- External marketplace changes including the need for globalization,
- External government regulations such as new financial reporting requirements,
- External customers' decisions to purchase enterprise products and services because of the introduction of new competitive products, and
- Internal customers' conscious decisions to proactively stay ahead of expected market changes.

Depending on the extent of these changes, the T-SPAs must be updated, replaced, or eliminated, which may take months to implement in spite of a robust technology infrastructures. First, an evaluation of the needs must be completed, then alternatives must be evaluated, and, finally, decisions to make the T-SPA changes can be made. Design to implementation may also take months. Several CIOs who formed a small group within the enterprise IT organization to continuously evaluate emerging technologies were able to save valuable time when unexpected external customer changes did occur requiring new T-SPAs. This time savings occurs because these enterprise IT organizations had previously evaluated a number of technology solutions anticipating future needs. As a result, when needed, the solutions could be more quickly designed or

implemented than in organizations that first had to conduct technology evaluations. Changing technologies and economic conditions also require new employee skills, user training, re-allocation of personnel and resources, and the need to merge older embedded technologies with new technologies, which impacts carefully prepared budgets. This agrees with the observations of Reich and Benbasat (1996) who pointed out that the enterprise IT infrastructure is also rapidly changing, making it difficult to balance decisions concerning when to deploy new technology including the cost and disruption impact with maintaining the existing IT infrastructure. This also leads to further increasing turbulence in business environments caused by rapidly changing IT and the globalization of information systems as pointed out by Biehl (2007) and Purser and Passmore (1992).

Another recommendation that helps the enterprise IT organization to more quickly support unexpected changes impacting external and internal customers is to have dedicated IT customer support personnel. These IT personnel support various internal and external customer groups by meeting with them regularly, thus establishing strong and continuous relationships. Because of these strong relationships and frequent meetings, these IT personnel have a good understanding of the customer's business and how technology services, products, and applications support the customer's business needs and strategies. This direct understanding enables these enterprise IT customer representatives to suggest new technology solutions before customers are even aware of potential problems requiring new technology solutions. Finally, the internal enterprise customer often considers the enterprise IT personnel to be a critical part of their own business so they are included in critical strategy and business planning. This supports

Alter's (2004) 'Principle #18 - Support the firm's strategy,' which is the 'strategy element' focusing on aligning the enterprise IT strategy with the enterprise's business strategy. This also supports what Volberda (1998) described how shifting competitive relationships occur in turbulent business environments. However, Volberda (1998) did point out that that aligning the strategic plan in turbulent environments is not enough to deal with the uncertainty that occurs within the enterprise customer needs. He explained that part of the problem with strategic planning focusing on 'planning and control,' which may lead to 'rigidity and lack of innovation.'

CIOs reported that sometimes when managers within the enterprise IT organization make conscious decisions to change technology services, products, and applications, these new technologies may unintentionally lead to unexpected impacts. This is an example of what Malhorta (1993) described as the IT paradox where IT solutions lead to increased 'complexity' and 'uncertainty' in the environment, which then raises the demand for more advanced IT. Planned changes to technology services, products, and applications are usually made for two reasons:

- To provide new productivity tools to improve the performance of the customer groups, or
- To improve system performance for the objective of either lowering costs or increasing profitability.

CIOs pointed out several major issues affect the enterprise IT organization when dealing with uncertainty / unexpected changes and expected changes. First, one set of T-SPAs usually do not fit the needs of all the internal and external customers. Different functional groups within the enterprise have needs for different products, services, and support and

also have a different willingness to pay. This finding supports Alter's (2004) 'Principle #3 - Match process flexibility with product variability.' Alter explained that this principle is the 'product and work practices element.' This is a socio-technical principle that technological flexibility should match product variability. Sometimes existing services can be adapted for different customers. Sometimes, completely different types of services are required. Secondly, different functional groups have different priorities for new services, which affect available timeframes for planning and implementation. Customers may need a service as soon as possible, but it takes the enterprise IT organization months to provide the service. Longer timeframes may be needed because of a centralized purchasing process or because of problems obtaining necessary hardware or software.

Fundamentally, CIOs agreed that the customer needs must drive the necessary support of the enterprise IT organization as opposed to vice versa. To truly support the business, the enterprise IT organization needs to be able to change as rapidly as the internal or external customers' business changes. The planning dilemma in this dynamic environment is how to keep costs down in an accelerated business environment requiring new technology services, products, and applications.

This study recommended that there are several key actions that CIOs should consider when dealing with uncertainty and unexpected changes as they implement new IT services, products, and applications:

- Manage the customer perceptions of how well the enterprise IT organization responds to uncertainty by emphasizing what the customer wants – speed, flexibility, and lower costs – as opposed to the more traditional justifications used by the enterprise IT organization when making technology S,P,&A choices. This

supports 'The Adaptive Model' (Ansoff 1978). Volberda (1998) referred to the 'adaptive' model as an opportunistic behavior that emphasized flexible resources and capabilities. The adaptive organizational model focuses on the need for flexibility because uncertainty limits what can be pre-planned. The adaptive organizational model used what Mintzberg (1973) called 'preparedness strategies' and emphasized that flexible resources and management capabilities based on what Priem and Butler (2001), Bharadwaj (2000), and Penrose (1959) called the resource-based theory. Mintzberg and Waters (1985) also recommended that the organization should develop capabilities for strategic thinking and learning by being open and responsive, rather than deliberate and controlling.

- Avoid surprises by maintaining regular communications with customers so that, if something unexpected occurs, everyone finds out at the same time and issues are worked out together as a partnership.
- Anticipate strategic client needs by planning for the unexpected rather than reacting to them.
- Consider as many customer requirements as possible when updating existing technology S,P,&As as well as the underlying infrastructure. Have a migration plan in place for every service, product, and application by considering the probable life cycle for each one.

5.2.2 What is the current situation within the Problem Domain?

This section focuses on what is the current situation managing uncertainty / uncertain change and expected change within the problem domain treating the enterprise IT organization as a socio-technical organization under study? As discussed in Chapter 4

and shown in the research model, both uncertainty or unexpected change and expected change affecting the CIO and the enterprise IT organization are caused by three main areas of the dynamic business environment: (1) the environment external to the enterprise IT organization; (2) the environment within the enterprise, but not including the enterprise IT organization; and (3) the environment internal to the enterprise IT organization. Finding #6 relates to the knowledge of the CIO about the external environment.

Finding 6: ***CIO KNOWLEDGE - Proactive CIOs make a conscious effort to understand the external business environment as well the internal business environment.***

Generally, CIOs have less knowledge about the external business drivers than they do about internal business changes. Several CIOs pointed out that the relationship they have with the enterprise executives is critical to preparing for and understanding about external changes. CIOs who felt they had a good day-to-day relationship with the enterprise executives reported that they usually find out about major unexpected external changes immediately after the enterprise executives learn about the changes. Those CIOs who thought they did not have a good relationship with the enterprise executives usually learned about changes until much later when they received dated or filtered information. Either way, once the CIOs learned of the external change, they needed to quickly be able to determine the impact and resulting changes on the enterprise IT organization.

CIOs commented that it is also important to understand and anticipate the needs of the internal customer. This minimizes although not eliminating the surprises. But, proactive CIOs recognize that the needs of the internal customers change because of

changes in the external business environment caused by external customers' needs, the external marketplace, and external government regulations. Not all changes affecting internal customers are caused by external influences. Internal customers also make conscious decisions to stay ahead of perceived market changes, which may result in changes for their own business needs for enterprise IT services, products, or applications.

Analysis of the CIOs' comments showed two different areas where CIOs appeared to have a better understanding of the external and internal enterprise customer environments. The first area was where CIOs had a great deal of experience managing the enterprise IT organization and the second was where CIOs had leadership roles in non-IT functional areas. CIOs with the most CIO experience spent more time strategically working with the enterprise's internal and external business than micro-managing the enterprise IT organization. One CIO pointed out that CIOs with more experience, especially in the same position, have matured in the position. This maturity leads to increases in perceived respect from the enterprise executives and results in trust to handle enterprise IT issues. One CIO of a large enterprise in the services industry was so respected for his management skills and trusted by the enterprise executives, that he was reassigned to lead a major merger operation just a few days before his scheduled interview for this study. Until CIOs achieve this maturity through experience, newer CIOs must first establish credibility concerning their ability to demonstrate that they can provide IT services efficiently and effectively. CIOs with this maturity and respect were also included at the executive strategic planning table.

Analysis of the emerging themes from this study showed that CIOs with non-IT functional experience appeared to be more innovative and interested in using new

technologies at least on an experimental basis. Two possible reasons for this trend may be a better understanding of the business of the enterprise combined with an earlier appreciation of IT by discovering IT solutions to improve their own work before they had any formal IT responsibilities. Although many of the CIOs mentioned the need to encourage risk-taking, the CIOs with previous non-IT functional experience also more often mentioned their practice of encouraging IT employee experimentation. One recommendation from this finding would be the importance of rotating IT people into non-IT functional areas to better appreciate the business needs of the internal IT customers. Rotating IT personnel into non-IT functional positions and then rotating back into the enterprise IT organization would increase the three major characteristics that Roepke, Agarwal, and Ferratt (2000) and Pennings and Harianto (1992) recommended would lead to a flexible enterprise IT organization. These three major characteristics include an environmental awareness of uncertainties and change, an increasing speed of response, and the capability to increase innovation.

CIOs from large enterprise IT organizations also provided either a senior coordinator or systems analysis to perform an 'account management' role link the enterprise IT organization with the customer organization to provide ongoing communications and coordination. One CIO emphasized that he would never be able to anticipate customer changes without a strong ongoing relationship with the customers. On the other hand, CIOs from the small or very small organizations stated that they know the needs of their customers because, in a small or a very small enterprise, they are usually a member of the executive board and have daily contact with the other enterprise executives.

The next set of findings focus on how CIOs currently manage uncertainty and unexpected change.

Finding 7: ***MANAGING UNCERTAINTY - Proactive CIOs consider and manage uncertainty as if it were an opportunity.***

Some CIOs considered all unexpected change as always negative. On the other hand, some CIOs view changes, both unexpected and expected, as opportunities to make positive changes, i.e., by implementing new technology or new processes to improve the business. CIOs with non-IT functional experience more often discussed how unexpected change can lead to opportunities. They provided examples how they modified IT processes, governance, and enterprise IT employee training to better prepare the enterprise IT organization to benefit from unexpected opportunities. Orlikowski and Hofman (1997) considered unexpected opportunities to be beneficial to the enterprise. However, these benefits can only occur if the changes are first identified and then recognized as an opportunity. The key is to have people who are able to first recognize the changes and then see the potential opportunities. For example, one CIO from a large utility enterprise mentioned that when WorldCom / MCI went bankrupt in 2002, companies who had network contracts with MCI were certainly impacted. Some worried about what they should do with all their embedded network services while others saw this as an opportunity to move to new network service providers and obtain new network products that they were unable to use before because of long term contracts.

Finding 8: ***CAUSES OF UNCERTAINTY - External business drivers of change result in more uncertainty than the internal business drivers.***

CIOs in the study agreed that generally the more control they have, the less uncertainty they have. They have the most control over the planned process or technology changes made within the enterprise IT organization. Occasionally, technology changes lead to unexpected incompatibility issues, but these types of surprises should never happen if a thorough analysis of alternative technologies is conducted. The unexpected changes directly affecting the internal enterprise IT organization are when vendors or suppliers suddenly go out of business or are acquired by the vendor's own competitors. These surprises limit current and emerging technology choices. So even though, the CIO had negotiated long-term contracts, which are beneficial to his or her technology infrastructure, these types of unexpected changes may require the CIO to completely change their technology strategy.

By developing strong relationships with the internal enterprise IT customers, CIOs also were able to minimize unexpected changes from within the enterprise. They were able to align their technology strategies with the enterprise business strategies. Nearly half of the CIOs in this study were aware of Luftman's Strategic Alignment Maturity (SAM) Model (Luftman and Kempaiah 2007, Sledgianowski et al. 2004, Luftman 2000). The CIOs who felt they had the level 4 rating mentioned that several attributes supporting their rating. Under governance, they listed a strong emphasis on business and IT strategic planning as well as a strong understanding of the enterprise business by the CIO and an understanding of IT by the enterprise executives. They also identified the integration of their IT infrastructure across functional, enterprise, and inter-enterprise objectives. Finally, they agreed that they used formal assessments and reviews

of their enterprise customer needs as part of their support of the technology S,P,&As. One CIO commented that his IT program was at a maturity level 4 / 5 until a new CEO was hired. This one unexpected change meant that this particular CIO had to start over building his and his organization's credibility with the new executive board of directors.

Even CIOs who felt they had a good understanding of the business and industry of their enterprise stated that they were not able to anticipate the uncertainty from the external enterprise business environment. One CIO mentioned that he tried to attend one or two external industry strategy meetings each year. Others relied on their internal customers to include them when external impacts were affecting their enterprises. These CIOs agreed that one key was to be able to react quickly when they were unable to anticipate and weigh the significance of all impacts of the actions taken. One CIO specifically mentioned that, because of the uncertainty from the turbulent business environment, he is torn between trying to be innovative and use newer, advanced IT services to be better prepared versus being cautious and using the tried and proven technologies. His caution and this dilemma faced by other CIOs in the study support what Malhorta (1993) called the 'IT paradox,' more advanced and sophisticated IT services and products lead to more complexity thus increasing uncertainty. This also supports what Reich and Benbasat (1996) described that with the enterprise IT infrastructure also rapidly changing, it is difficult for CIOs to balance decisions concerning when to deploy new technology including the cost and disruption impact with maintaining the existing IT infrastructure.

The last specific question about the current situation under study asks if managing uncertainty or unexpected change differs from managing expected change.

Finding 9: ***EXPECTED CHANGE IMPACTS - Change is constant, but its impact varies greatly.***

CIOs consider change and change management to be very different from uncertainty and managing uncertainty in many ways. For example, many of the CIOs agreed that change happens daily. As a result, managing change could be about 'pacing' and it can be about 'migrating' from something that is little-known to something that is more routine. This is opposed to the difficulty of 'managing' uncertainty since it is unknown. Several CIOs defined change as a modification to business practices, to enterprise IT services, products, or applications, or to customer needs. Change may be both positive and negative. Many CIOs felt that since change is constant, it also can and must be managed. For example, changes caused by the external environment can be managed by following a few basic rules:

- Functionally 'decompose' the situation or problem so as to reduce its complexity.
- Recognize that managing change is a 'paradox' and full of 'ambiguity.'
- Be willing to take risks but also stop a project whenever necessary to minimize the business threats and negative consequences.
- Use staged roll-out plans for longer term projects to be more flexible.

Managing uncertainty needs a different set of basic rules. CIOs suggested several practices to managing uncertainty:

- After reacting to uncertainty, assess the impacts and actions so that an analysis can be made of what was done right and what could have been done differently.
- Use the above experiences to adapt the enterprise IT organization components including its structure, development of its IT people and processes, planning and

maintenance of the IT infrastructure, and development, provisioning, and support of the IT services, products, and applications.

- Create scenarios to compare potential uncertainty trends such as impact of the global economy or emergence of new technologies.
- Prepare for likely or anticipated outcomes of scenarios. (Consider risk, financial, and business planning aspects.)
- Prepare IT personnel to continuously monitor the on-going events and recognize when unexpected events occurs.

All of the CIOs in the study commented that since change is constant, then anticipating change should be a normal part of managing the business. However, their experiences and recommendations differed about the impact of change and how to deal with it. Several of the CIOs used the same formal change management process that consisted of five steps awareness, recognition, planning, evaluation, and assessment. However, this particular change management process is used primarily only with expected or planned change. None of the CIOs used a formal process for dealing with unexpected change. One CIO commented that she could plan for the unexpected if she knew what the unexpected was going to be. Once defined it is no longer unexpected. This finding supports why Orlikowski and Hofman (1997) pointed out that traditional or formal change management processes with specific steps do not work in turbulent business environments.

Part of the problem of managing the impact of change comes from defining change. For purposes of this study, change was considered to be a continuum with expected change, certain to happen, at one end and completely unexpected or unknown

change at the other end of the continuum. However, various grades of uncertainty, defined by CIOs in this study as not being sure if something might happen, exist over approximately three quarters of the continuum to the extreme unexpected end. Therefore, the impact of change differs when it is expected change versus dealing with unexpected change versus dealing with complete uncertainty. This is comparable to the uncertainty hierarchy / continuum. Faucheux and Froger (1995) described based on probability and reliability. Certainty is defined as when a situation is unique and expected to happen. The hierarchy moves from 'weak,' which has several options with different levels of probability assigned to each alternative; through 'strong,' which has possible alternatives with little reliability; to 'ignorance,' which is considered the upper limit of strong and where none of the alternatives is reliable.

Several CIOs defined uncertainty as dealing with events that they had no control over. One CIO reported that in his experience, reactions to uncertainty were often more emotional than rational. CIO examples of these completely unexpected changes were being acquired by different enterprise with different IT strategies, the replacement of CEO or key enterprise executives, and restructuring of the organizations or departments within their own enterprise.

Finding 10: CHANGE LEADS TO CHANGE - *Both unexpected changes and planned changes lead to more changes.*

Several CIOs explained that the different types of change from completely expected to completely unexpected result in different decisions. One CIO pointed out that even planned changes are business decisions that often cause business disruption that result in both positive and negative or unintended impacts. When one enterprise in this study faced

a tremendous amount of uncertainty, the Board of Directors fired the previous CIO and hired a new CIO, the participant in this study. This CIO was challenged to ask hard questions such as:

> "*Are we making the right decisions, are we choosing the right products, are we doing the right things, will the projects be completed on time, will data integrity be maintained? So based on the Board's decision, we knew what we were chartered to do. My predecessor had been unable to stay up with the changes so we also had to make up for lost time and repair mistakes that had been made.*"

CIOs stated that they can never be absolutely sure what the impact of the changes will be. For example, decisions to implement certain technologies may create unexpected issues because of compatibility problems. This could become an opportunity, however, if obsolete or incompatible technology is replaced by newer, emerging technology because new services may be delivered. Conscious strategic and tactical decisions also can lead to more uncertainty causing even more changes. As mentioned earlier, an enterprise strategic decision to move into a new market place may result in incompatibility issues with the enterprise's current networks and systems when compared to networks and systems generally used in that new market. Also, existing network service providers used within the company may have no experience in the new market place. CIOs must remember, according to Galy and LeMaster (2001), that decisions about technological developments also accelerate change. Also, conflicts occur as a result of the choices made concerning change.

CIOs make strategic and tactical plans that lead to internal changes to technology infrastructure, to the design, development, and implementation processes, and to people job assignments. These internal changes are usually triggered by the goal of improving enterprise performance or profitability. All of these decisions may result in unintended impacts, which require action.

5.2.3 How do the people in the organization work and contribute within the problem domain under study?

This section focuses on the third major exploratory question concerning the people in the enterprise IT organization. Finding #3 focused on the people within the enterprise IT organization. This section also discussed the CIO leadership on the development of enterprise IT people.

Finding 3: ***PEOPLE - IT personnel who thrive on change should be in positions most impacted by uncertainty and unexpected change.***

As mentioned earlier, IT personnel follow the example of their leaders when dealing with uncertainty / unexpected change and expected change. Several CIOs stated that when IT personnel are comfortable with change and are provided processes for dealing with change, they set positive examples for their internal customers. IT people who thrive on uncertainty tackle change as a challenge: they try to find solutions for any problems, they are anxious and willing to try all types of new technology, they develop new methods for handling troubles, etc. These 'get-it-done' type of IT people are valued by the CIOs in this study because they initiate solutions to problems without waiting for direction. On the other hand, when IT people try to avoid or ignore change, whether expected or

unexpected, the resulting changes can escalate into major problems affecting the entire organization or even the entire enterprise. By not reporting a change in customer needs or requested changes when they first occur, decisions are made later in a project without consideration of the customer changes. These decisions may lead to project delays to fix the problem, which lead to customer dissatisfaction.

Problem IT personnel as reported by CIOs include fear of change or the avoidance of work. To deal with these problems, several CIOs tried to create an environment that incorporated and developed an enterprise IT organization-wide awareness of ongoing changes that do occur and expected changes that do not occur. Atlas and Vadi (2006) explained that it is good to focus on enterprise IT personnel because they first must learn from their experiences before the organization can learn. However, this does not guarantee organizational learning. One method to create this environment was to encourage and allow IT personnel risk-taking by demonstrating a willingness to tolerate any setbacks.

Another was to demonstrate to IT employees that, by changing how they work, they can actually make their jobs easier and more rewarding rather than continuing to do things the way they had in the past. Finally, a third method was to introduce into the enterprise IT organization new roles and responsibilities related to dealing with uncertainty / uncertain change and expected change. Again, this is supported by Benamati and Lederer (2001, 2000) pointing out that changing IT requires enterprise IT professionals to develop different or new skills and competencies.

CIOs in this study were generally very supportive and encouraged by the capabilities of enterprise IT personnel within their organizations. Another way to help

enterprise IT personnel better deal with uncertainty and change mentioned by several CIOs was to give their personnel business training to develop better business awareness of the needs of their customers. When enterprise IT personnel understand the business requirements of their customers, they are better able to anticipate the impacts of changing customer needs and may even be able to proactively suggest technology solutions for business problems. They will also be able to identify when expected changes are not occurring. Many of the CIOs in this study, especially in the largest enterprises, had employees assigned to be customer analysts representing the business and technology needs of the various functional customer groups within the enterprise. The objective of these positions was to insure that the some in the enterprise IT organization would become very aware of the customers' business situations. A recommendation from the CIOs for dealing with uncertainty was to determine how to find the estimated fifteen percent of the enterprise IT people who thrive in an uncertain environment and determine which skill sets best match the skill sets necessary to implement change.

5.2.4 As a potential solution to the problem, would EITO Flexibility be useful in managing uncertainty and unexpected change?

The findings discussed in the previous sections have contributed to an understanding of the problem domain – CIO experience managing uncertainty / unexpected change and expected change in dynamic business environments. The last part of this exploratory narrative is a discussion of a potential solution to the problem – the systematic integration of enterprise IT organizational flexibility within the enterprise IT organization. The first part of this narrative discusses the study findings relating to organizational flexibility in

general. It then discusses the definition and potential benefits of the proposed enterprise IT organizational flexibility cycle, which consists of the three aspects of anticipation, agility, and adaptability. The last part of this narrative discusses the questions concerning how CIOs evaluate the flexibility of their own enterprise IT organization. It includes findings that relate to the proposed EITO Flexibility Framework as a method to improve organizational flexibility within the enterprise IT organization.

Finding 11: ***GENERAL FINDINGS ON ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY – An enterprise is 'on-top' of the marketplace when it has the capability to anticipate the changing customer needs.***

When asked to define flexibility, the twenty CIOs participating in this study provided several different definitions, supporting the concept that flexibility is ambiguous, without a clear definition understood by all. One of the most interesting flexibility definitions was given by several CIOs - defining flexibility as the ability to manage the customer. This is supported by Davern and Kauffman (2000) who defined that a key success measure of a flexible enterprise IT organization is its ability to focus on the needs of its internal and external enterprise customers by continuously changing and creating enterprise IT value. Several of the CIOs also equated flexibility with innovation. These CIOs felt that internal enterprise customers and executives are more likely to support innovative technology services, products, and applications (T-SPAs) when they perceive that the T-SPAs were implemented to meet their own changing needs rather than being introduced by the enterprise IT organization. One way to increase this perception is to include the customers in the decision and development of the innovative T-SPAs. CIOs discussed CIO leadership, which, they explained, can result in a more flexible organization by

creating an environment that encourages risk-taking, by developing broad recommendations for dealing with uncertainty and change, and by not chastising mistakes. Finally, a key finding of this study was that CIOs concluded that being flexible equates with being 'on-top' of the dynamic marketplace. This is true for both the enterprise and also the enterprise IT organization. The critical capability that will allow the organization to be 'on-top' of the marketplace is to be able to anticipate the customers' changing business needs.

Finding 12*: THE ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY CYCLE MODEL – Organizational flexibility considers the socio-technical characteristics of the enterprise IT organization, which may lead to 'areas of flexibility excellence.'*

CIOs were comfortable with the concept introduced in this study, 'Enterprise IT Organizational Flexibility.' They agreed that it reinforces the broader concept of a socio-technical IT organization rather than individually considering only IT infrastructure flexibility or flexible IT personnel. Tushman and Nadler (1980) support this concept because they defined fit as the degree to which the needs, demands, goals, objectives, and/or structure of one component are consistent with those of another component. This then implies that all the components of the enterprise IT organization (governance, people, and technology) should change to fit to the dynamic environment. The concept of enterprise IT organizational flexibility also clarifies a way to define flexibility as it relates to the broad discipline of information technology. Several CIOs stated that 'IT flexibility' implies only IT infrastructure flexibility rather than an organizational approach to flexibility. Several CIOs pointed out that one advantage of viewing flexibility from an organizational perspective is that individual organizations may be able to select specific

'areas of flexibility excellence' based on their unique situation or industry rather than following a standardized approach. On the other hand, as Sushil (2001) cautioned that some may consider flexibility as moving to the extreme when, in fact, in a potentially negative situation, flexibility should be considered as balancing the extremes.

A potential issue with an organizational flexibility approach raised by one CIO from a large utility was how 'adaptability - learning from experience' would impact enterprise IT organization leadership. Would it result in fixed standards and rules when dealing with uncertainty and unexpected change as well as expected change or would it lead to more anticipation and agility? Frost (1999) provided the initial thinking about how flexibility should be considered for the enterprise IT organization based on what is happening in the armed forces. He explained that when working in an environment that is characterized as vague, ambiguous, uncertain, and complex, flexibility must be considered a critical operating principle.

Finding 13: ***FINDINGS CONCERNING ANTICIPATION – Planning is a critical capability that is more effective when combined with anticipation.***

As mentioned earlier, the capability to anticipate should allow the enterprise IT organization to more quickly react to internal and external customers unexpected and expected changing business needs. However, in order to anticipate, one must have learned from previous experience. An example is preparing for man-made or natural disasters. One can plan for disasters, but previous experience with disasters results in better preparation. Also, one cannot modify or change plans going forward if the plans do not exist in the first place. So planning is critical when anticipating.

CIOs emphasized that specific areas of enterprise IT organizational flexibility, such as flexible roles and responsibilities, structures, processes, or technologies, need to be customized according to different impacts of any unexpected or expected business changes. Therefore, enterprise IT managers must include a continuous re-evaluation of all planning and preparation assumptions in the planning and preparation processes.

Two issues raised by CIOs when dealing with anticipation were: (1) how to test how well anticipation works when dealing with uncertainty / unexpected changes, and (2) what is a reasonable goal for determining how flexible an organization should be? For example, Verganti (1999) studied IT product development teams. He determined that a product development team could use 'planned flexibility' as the capability to clearly identify all critical areas early in a project and to plan for the key reaction measures that may be necessary later in the project in order to link both anticipation and reaction to minimize the problems of anticipating constraints and opportunities too early in the product development process when uncertainty is less defined. This approach versus delaying product development process decisions until later in the process when uncertainty decreases, but the cost and time to take corrective action increases. One CIO gave an example of testing the ability to anticipate by providing example questions of how to evaluate wireless technology.

- *"How should we anticipate using wireless?*
- *Will wireless be important for our manufacturing plants and laboratories?*
- *Will it provide us a competitive advantage if we are early adopters or should we wait for later adoption?"*

The only way to determine how well this particular company anticipated the use of wireless technology was to re-evaluate the development and deployment results of the technology regularly. Based on the re-evaluation, the organization would be able to determine which expectations were right and which were wrong. None of the CIOs was able to determine a reasonable goal for flexibility within his or her organization, although one thought he should be able to reasonably anticipate needs and changes at a rate of 80 out of 100 times. Currently, that same CIO felt that his organization was probably successfully anticipating at a rate of only 10 out of 100 times.

Finding 14: ***FINDINGS CONCERNING AGILITY – Agility is about recognizing opportunities and minimizing threats.***

Planning and anticipation are the first step in the systematic approach of organizational flexibility described in this study. Normally, plans are implemented and all goes well except, when the unexpected occurs, which many of the CIOs agreed usually does happen. Only when the unexpected occurs is agility required. Agility is defined by CIOs as rapidly responding to changes, but, as stated in this study, it is really rapidly responding to 'unexpected' change. This is because the organization has planned for the 'expected' change. This approach compares with how Schrage (2004) defined agility as the ability to both create and respond to change in order to profit in a turbulent business environment. He explained that agile managers must be able to both create and respond to change to provide a competitive advantage. Agile managers act (versus react) to respond quickly and effectively to both anticipated and unanticipated business environment changes.

The next step is recognizing that something unexpected has occurred. One issue is that this recognition does not always happen. Often, executives do not learn about the unexpected changes until after it is too late to take advantage of the changes. Therefore, enterprise IT personnel need to be trained to recognize unexpected changes when they happen. To be aware of unexpected changes, the enterprise IT personnel need to be aware of the original plans. Several CIOs stated that there is more to just recognizing changes, these same enterprise IT personnel should also be trained to recognize when a change is also an unexpected opportunity.

One main finding based on agility is that it is possible to be too agile. In several CIO examples, when the enterprise IT organization had responded quickly in the past, enterprise customers perceived that the enterprise IT organization was agile. These customers defined agility as being able to respond quickly to all of their own particular changes. Unfortunately, this perception set wrong expectations and demands to use enterprise IT resources in ways that were inefficient for the entire enterprise. Several CIOs are concerned because in their experience it is sometimes hard to prove to customers that some of their requests are unnecessary. One CIO faced another dilemma where it was practically impossible for him to satisfy all the needs of all the customers. Meeting the needs of one group of customers will have negative impacts on them and other clients as well.

Finding 15: ***FINDINGS CONCERNING ADAPTABILITY – Learning occurs when people make mistakes.***

The third aspect of flexibility is the capability to adapt the enterprise IT organizations based on experiences. A learning organization is one that builds on its experiences and

modifies roles and responsibilities, structures, processes, and technologies to better prepare for the future. The key is that CIOs must lead the organization to better be able to manage change and deal with uncertainty on their own. Learning occurs when people make mistakes.

Finding 16: ***THE INTERRELATIONSHIPS OF ANTICIPATION, AGILITY, AND ADAPTABILITY – The flexible enterprise IT organization is one that is able to anticipate and prepare for the unexpected, agilely respond to unexpected changes, and adapt its structure, processes, and services, products, and applications as necessary based on its experiences.***

Besides the individual findings relating to the aspects of enterprise IT organizational flexibility described above, several emergent themes emerged from analyzing the interrelationships of flexibility aspects. The following summarizes the interrelationships of the individual aspects of flexibility.

ANTICIPATION with AGILITY

- By anticipating unexpected changes and preparing potential solutions, the enterprise IT organization is able to more quickly respond to both the internal and external customers' changing needs.
- Planning is a pre-requisite for agility because plans cannot be modified or changed as necessary unless the plans exist.

AGILITY with ADAPTABILITY

- Internal and external enterprise customers may begin to have unreasonable expectations of the enterprise IT organization's agility capability because the enterprise IT organization had quickly responded to previous unexpected changes

in a successful manner. Sometimes potential technology solutions are not good for all the customers or the enterprise as a whole, although it might be the right solution for one particular customer.

ADAPTABILITY with ANTICIPATION

- It is easier to anticipate and prepare for situations, such as man-made or natural disasters, based on previous experiences. The key is the capability to adapt the organization in a positive manner based on the experiences. This fits with what Tushman and O'Reilly (1996) and Duncan (1996) called 'ambidexterity' to refer to organizations that have both of the separate but complementary capabilities of 'alignment' and 'adaptability' Lee, DeLone, and Espinsoa (2006) described how ambidextrous coping strategies could be used to increase flexibility / agility as well as rigor / discipline when dealing with challenges of global software development. These ambidextrous coping strategies included: common platform, labor organization, education / understanding, technology readiness, doing more, awareness / teamwork, and adaptive use of technology.

THREE ASPECTS of FLEXIBILITY

- The enterprise IT organization must be able to change as rapidly as its internal and external customers' needs change. The CIOs generally have three ways to do this: react to the unexpected changes after they occur, be proactive by anticipating unexpected changes and preparing for them, or become familiar with the dynamic external environment to proactively adjust to the changing environment before

customers even ask for the net technology services, products, or applications. This supports Alter's (2004) 'Principle #21 - Maintain the ability to adapt, change, and grow (the system as a whole).' He concluded that the environment will change over time, therefore, the enterprise IT organization, a system as a whole, should have the capability to adapt, change, and grow.

- The description of flexibility in this study is composed of the three aspects of anticipation, agility, and adaptability. When studying supply chains, Lee (2004) observed that efficient supply chains were not competitive because they could not adapt to market changes. Lee's (2004) solution was a 'Triple-A Supply Chain' that consisted of three aspects:
  - *Agility* – responding quickly to short-term changes in demand or supply.
  - *Adaptability* – adjusting the supply chain to meet the changing needs of the markets from evolving strategies, products, and technologies.
  - *Alignment* – creating incentives for better performance by building strong relationships.

This supports the enterprise IT organizational flexibility cycle concept developed for this study.

The previous section described what is currently going on in the enterprise IT organization as it relates to managing uncertainty / unexpected change and expected change. It discussed the leadership capability of the CIOs and impacts on the individual components of the enterprise IT organization – governance, personnel, infrastructure, and services, products, and applications, and secondly, the enterprise IT organizational flexibility aspects – anticipation, agility, and adaptability. This next area of the discussion

combines the analysis of these first two groups of findings and considers the proposed 'enterprise IT organizational flexibility framework (EFF).'

A framework provides a way to consider how assumptions, concepts, values, and practices affect reality. Whitman, Liles, Huff, and Rogers (2001) pointed out that a framework is useful to provide a means of explanation, focus for discussion, basis for analysis and design, and become a baseline for process improvement. During the participant interviews in this qualitative study, the 'research model' and proposed EFF were reviewed with each CIO to obtain his or her feedback and suggestions about how the EFF could be used. CIO suggestions from earlier interviews were incorporated into the research model and the EFF. Then, each of these revisions was reviewed in later interviews by different CIOs for their feedback and suggestions. Examples of changes suggested by CIOs which were incorporated into the final version of the research model and EFF included:

- Creating two separate components for 'technology' by separating technology services, products, and applications' from 'technology architecture / infrastructure.' This excellent suggestion allowed the CIO to consider how the impacts of uncertainty and the flexibility aspects of anticipation, agility, and adaptability directly affect customers' needs and use of technology services, products, and applications.
- Adding the concept of governance/management processes, which are the responsibilities of the organization leaders to the 'governance' component. Originally, this component included structure of the enterprise IT organization, strategic and tactical planning, and alignment of the enterprise IT strategies with

the enterprise business strategies. Eventually, the management processes included under governance were planning, financial, risk, and change.

- Recognizing that three sources of environmental business drivers lead to both unexpected change and expected change, which must be considered by the CIOs and affect the enterprise IT organization. Through the CIO discussions, it became clear how to discuss the differences between unexpected changes versus expected changes once the source of the change was identified: business drivers external to the enterprise; business drivers internal to the enterprise, but external to the enterprise IT organization; and business drivers from within the enterprise IT organization itself.
- Determining how each aspect of IT flexibility improves the enterprise IT organization's ability to deal with uncertainty / unexpected change and expected change thus improving IT performance. CIOs gave examples of situations that affected each of the twelve boxes of the EFF.

One suggestion made by several CIOs, but not incorporated into the research model or the EFF was to create a separate component for 'processes.' This suggestion was based on the 'people, processes, technology' concept used in MIS textbooks to describe the business of the enterprise IT organization. Since each of the four components include their own set of processes, it would be too difficult to separate these processes from the component descriptions and then combine into a separate component. Plus, the current three-by-four framework would become a much more complex three-by-five framework.

Several CIOs determined that the 'enterprise IT organizational flexibility framework' will be useful to develop critical questions and create scenarios to help the organization prepare for the different situations. Different situations and scenarios could be analyzed by considering modifications for each of the boxes in the framework. Table 5.2 shows the basic framework.

Table 5.2 Enterprise IT Organizational Flexibility Framework

Enterprise IT Organizational Cycle	CIO: Enterprise IT Organization Components			
	Governance	Personnel	Technology – Infrastructure	Technology – Services, Products, and Applications
Anticipation				
Agility				
Adaptability				

Finding 17: *THE ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY FRAMEWORK* – A framework that evaluates how anticipation, agility, and adaptability affect and are affected by the enterprise IT governance, personnel, infrastructure, and the services, products, and applications components would be useful.

Ultimately, the key to success of the enterprise IT organization in turbulent business environment is to manage the enterprise customers' expectations and to be able to provide flexible IT services, products, and applications. Experienced and well-trained enterprise IT personnel who build strong relationships with the enterprise customers and ongoing enterprise IT support teams operating and maintaining the IT services, products, and applications are necessary to accomplish this. Whitman et al. (2001) described a framework as a set of assumptions, concepts, values, and practices that constitute a way

HANDOUT – IS/ IT FLEXIBILITY CYCLE: ANTICIPATION, AGILITY, AND ADAPTABILITY

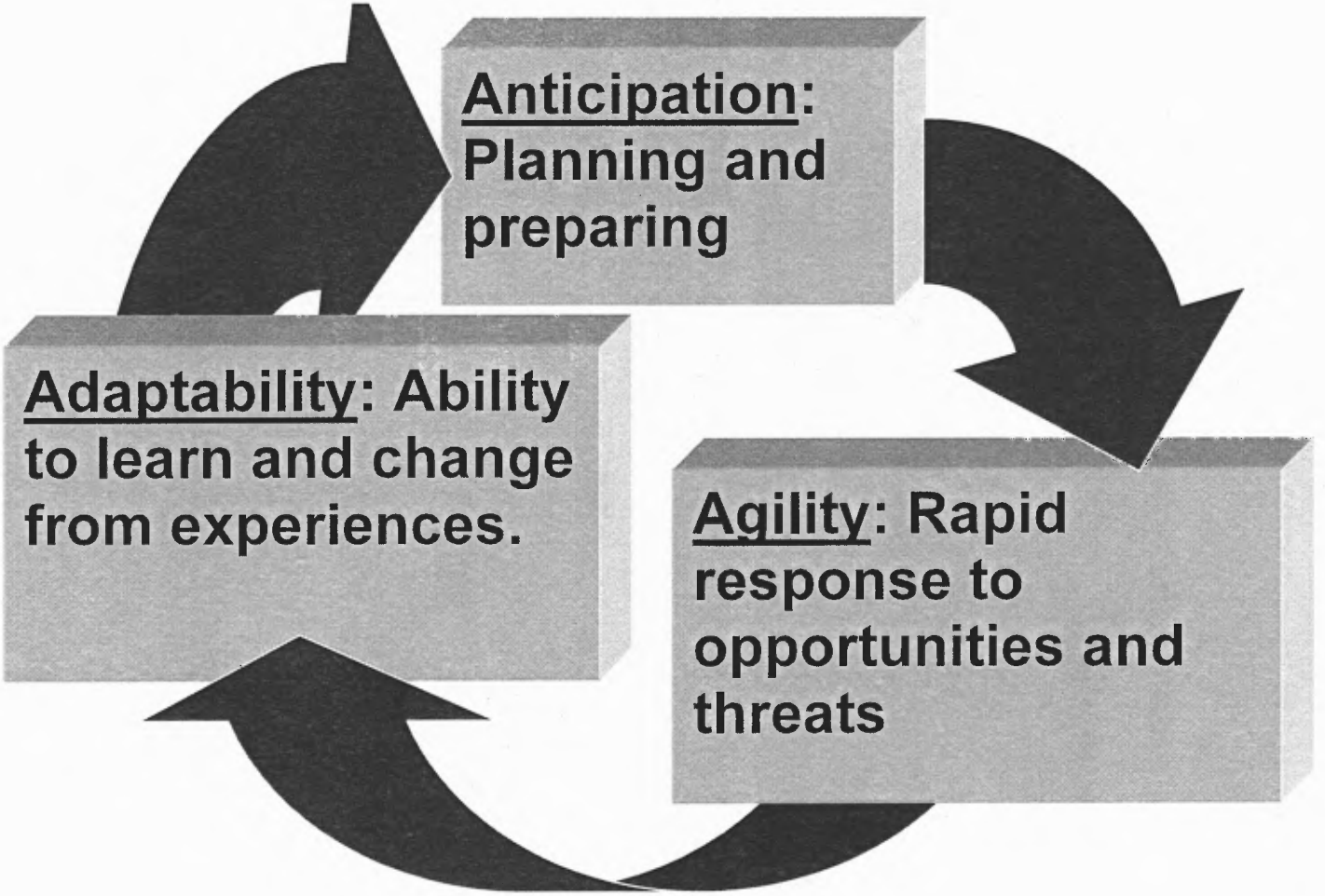


Table 5.3 Characteristics of a Flexible Enterprise IT Organization

	Governance	People	Technology - Infrastructure	Technology – Services, Products, Applications
Anticipation	*Cooperate – Enhance Competitiveness:* • Creates an environment that encourages risk-taking and anticipates expected and unexpected change. • Develops clear intellectual property rights policies. *Master Change and Uncertainty* • Maintains flexible and dynamic organization.	*Cooperate – Enhance Competitiveness:* • Link people, capabilities, and facilities electronically. *Master Change and Uncertainty* • Invests in work life quality. • Conducts continuing competence assessments.	*Cooperate – Enhance Competitiveness:* • Develops plug-n-play compatible open architecture system designs. • Develops plug-n-play open architecture business processes. *Master Change and Uncertainty* • Implements enterprise-wide information integration.	*Enrich the customers:* • Targets many niche markets. • Sells core competencies and solutions, not just products.
Agility	*Cooperate – Enhance Competitiveness:* • Internalizes message that cooperation and competition are not mutually-exclusive. *Master Change and Uncertainty* • Internalizes message that change creates opportunities.	*Leverage Impact of People and Information* • Recognizes that people and information are differentiators. • Authorizes people to be innovative and take initiative.		
Adaptability	*Leverage Impact of People and Information* • Creates an environment conducive to continuous learning.	*Leverage Impact of People and Information* • Develops cross-functional teams • Accepts ownership of problems.		*Enrich the customers:* • Offers services, products, and applications based on value to the customers. • Adopts pricing and marketing strategies based on value to the customers • Builds to order, not to forecast.

(Adapted from Meade, 1997, Table 2-1, p. 34.)

5.3 Evaluation of Qualitative Research

Klein and Myers (1999) discussed how to evaluate the contributions of an information systems ethnographic and exploratory research study. The story of the findings should provide new interpretations to the field by providing rich insights into the subject matter. Sufficient material and data should have been collected through participant interviews and observation. Finally, the calibration of the research instrument in ethnographic research, which is the researcher, must be demonstrated. Therefore, it is important to know what the researcher did and how it was done

There are two ways to evaluate the quality of the ethnographic research in information systems. The first is the trustworthiness of the research, which is demonstrated when the findings are dependable, credible, confirmable, and transferable (Smith, Evans, and Westerbeck 2005; Anfara, Brown, and Mangione 2002; Creswell 1994; Krefting 1991; Guba and Lincoln 1989.) The second is that the written narrative should be authentic, plausible, and critical to insure it is convincing and publishable (Schultze 2000; Golden-Biddle and Locke 1993.) Table 5.4 describes each of the evaluation criteria and explains what action was taken within this enterprise IT organizational flexibility study.

Table 5.4 Evaluation Criteria for the Enterprise IT Organizational Flexibility Research Study

Qualitative Research Evaluation Criteria for Trustworthiness[1] and for Publishability[2]	**Enterprise IT Organizational (EITO) Flexibility Research Examples**
DEPENDABILITY[1] • Extent to which the findings are unique to time and place. • Consistency of explanations. • Similar to *reliability* in quantitative research.	1. Methods used for recording the interviews and transcribing the interviews are detailed. 2. Interviews were conducted until key concepts were exhausted. 3. Verbatim accounts of interviews were used within the narrative per Miles and Huberman (1994) 4. Some participants provided reflections from more than twenty years earlier. 5. Core categories existed across all industries. 6. Consistency of the coding was validated by using *check-coding* where two researchers coded the same data separately, compared results, and then continued the separate coding process until they achieved and maintained consistency and reached a satisfactory level, determined by Miles and Huberman (1994) to be greater than 70 percent. Also, considered *inter-rater reliability.*
CREDIBILITY[1] • Extent to which the findings appear to be acceptable representations of the data. • Exceptions to the interpretations of the researcher by participants are identified. • Similar to *internal validity* in quantitative research.	1. Organizational documents were used to support data from participants as a simple form of triangulation. 2. Comments and suggestions from CIOs were reviewed with later CIOs for feedback as a form of *member check.*
CONFIRMABILITY[1] • Extent to which the interpretations of the findings are corroborated by others such as the participants as opposed to researcher biases. • Similar to *objectivity* in quantitative research.	1. An audit trail for all steps of the research process was documented. 2. Organizational documents used to support participant data were checked and rechecked. 3. Organizational documents were used to support data from participants as a simple form of triangulation. 4. Self-reflection of the researcher was included.
TRANSFERABILITY[1] • Extent to which the findings from one study in context will apply to other contexts.	1. *Purposeful sampling*, or the conscious selection of certain subjects, was used to select participants. 2. Participants' demographic information was used to provide a platform for transferability.

• Similar to *external validity* in quantitative research.	3. Detailed description of data collection and data analysis was provided.
AUTHENTICITY[2] • Concerned with the quality of the field work, researcher was present in the field, conducting quality research, representing the participants' understanding of their world through written text. • Similar to both *reliability* and *validity* in quantitative research.	1. Described the day-to-day situations faced by the participants (CIOs). 2. Used common terms and language from the enterprise IT organization domain. 3. Provided insight about what the participants thought about themselves and their organizations. 4. Clearly defined the disciplined process used to collect and analyze the field data.
PLAUSIBILITY[2] • Concerned with the quality of the deskwork including the analyses and the written narrative. • Findings should make distinctive contribution to understanding domain issues. • Written narrative should be relevant to intended audience and consistent with academic articles, as well as describe the justifications of the research and the findings. • Research should contribute to practice-oriented research.	1. Described the day-to-day situations faced by the participants (CIOs). 2. Used common terms and language from the enterprise IT organization domain. 3. Purposeful sampling, or the conscious selection of certain subjects, was used to select participants. 4. Participants' demographic information was used to provide a platform for transferability. 5. Detailed description of data collection and data analysis was provided. 6. Comments and suggestions from CIOs were reviewed with later CIOs for feedback as a form of 'member check.'
CRITICALITY[2] • Reflects on the life of the participant's world. • Reflects on the life of the researcher's world. • Cause readers to re-examine their own taken-for-granted assumptions.	1. Described day-to-day situations faced by the participants (CIOs). 2. Used common terms and language from the EITO domain. 3. Provided insight about what the CIOs thought about themselves and their organization.

Adapted from Smith, Evans, and Westerbeck 2005; Anfara, Brown, and Mangione 2002; Schultze, 2000; Creswell 1994; Golden-Biddle and Locke, 1993; Krefting 1991; Guba and Lincoln 1989.

5.4 Limitations

Conducting an exploratory ethnographic study and discussing the implications of its findings is not an exact science. Atkinson (1992) points out that the epistemological and theoretical foundations for this research are not perfect. The data collection methods are not perfect. And, representing the implications is also not perfect. However, by following a disciplined and methodological research process, the implications do represent valuable understanding of the situation within the problem domain and potential solutions.

Another limitation of this type of research is the fine line between reporting 'what is' as opposed to the researcher's own speculation on 'what ought to be.' Wolcutt (1990) calls this the fine line between 'descriptive' and 'prescriptive.' The key is being able to identify essential issues without providing personal solutions. The emerging future research areas are where the more personal interests can be further explored.

A common limitation of exploratory qualitative research is the ambiguity of sample size. This study used 'purposeful sampling,' which is intended to select information-rich participants with 'maximum variation sampling,' to pick a diverse set of participants to get a variation on the exploratory questions (Patton 2002.) The participant selection used for this study was a form of 'stratified' purposeful sampling by focusing on certain characteristics to facilitate comparisons among the participants. As a result, the findings from this study cannot be generalized to all CIOs or even smaller sets of CIOs. Its purpose was to describe central themes or patterns common across a great deal of variation. In turn, it is hoped that these common patterns capture the core experiences and shared management styles within the problem domain. Finally, the goal to maximize

information from the smallest number of participants necessary 'to the point of redundancy' determines the actual number of participants (Lincoln and Guba 1985).

Two other limitations to this study include temporal sampling where data was collected over a specific area of time and the selectivity of the participants where each of the participants represented different situations at different times in their individual careers.

5.5 Conclusions and Contributions

The goal of this research study was to evaluate the potential systematic integration of flexibility by chief information systems (CIOs) into the enterprise IT organization to better manage uncertainty and unexpected change. Among existing studies, there is no commonly understood definition for IT flexibility and little theoretical advancement regarding aspects of enterprise IT organizational flexibility including:

- specific definitions
- impacts of environmental uncertainties on the enterprise IT organization
- specific factors that enable or inhibit enterprise IT organizational flexibility
- competitive aspects of enterprise IT organizational flexibility.

As a result, the first objective of this research study was to establish current CIO management practices for managing uncertainty and unexpected change in dynamic business environments. The second objective was to determine if a proposed 'enterprise IT organizational flexibility cycle' consisting of the three separate, but complementary aspects of anticipation, agility, and adaptability, is an appropriate flexibility definition for use within the enterprise IT organization. And, finally, the study also evaluated if the use

of a proposed 'enterprise IT organizational flexibility framework' would help CIO to lead the enterprise IT organization to do three things better:

plan for expected changing business needs as well as prepare for unexpected changes

leverage opportunities and minimize threats when unexpected changes do occur

learn from dealing with unexpected experiences and identify ways to adapt the enterprise IT organization as necessary to meet new challenges.

These objectives are all incorporated into the research question for this study:

How do CIOs think about and use flexibility within the enterprise IT organization when dealing with uncertainty and change?

The following sections describe the significant conclusions and contributions from this research. The first section discusses the current state of enterprise IT organization management practices when dealing with uncertainty or unexpected change as well as expected change in dynamic business environment. The six conclusions listed, based on the experiences of the diverse group of CIOs participating in this study, also included related literature references if available. The second section lists four conclusions and related literature references if available, and describes the potential benefits to the CIOs from the use of the proposed enterprise IT organizational flexibility cycle and framework. Both the flexibility cycle and framework were reviewed and modified based on feedback from the study participants. Although the proposed framework needs more detailed research to further validate its potential value, CIOs expressed interest in using the framework to develop organizational flexibility capabilities to better manage uncertainty as well as expected change.

5.5.1 Establish current CIO management practices for managing uncertainty and unexpected change in dynamic business environments.

An analysis of the emergent themes identified from this exploratory study provided a benchmark for how participating CIOs currently manage uncertainty or unexpected change as well as expected change in their dynamic business environments. The following describes key conclusions from the study findings.

1. ***Federated Structure*** **- Generally, it is better to have a federated enterprise IT organization when dealing with dynamic business environments.**

According to Luftman et al. (2006), over 72 percent of participants in the 2005 survey of key issues for IT executives had centralized organizations primarily to insure consistency and standardized IT management and infrastructure. This study showed that this 'control' approach is less effective in dynamic business environments. CIOs in this study with federated structures stated that this organizational structure was selected because of the organizational flexibility it provided the different divisions to shift resources and to create teams and disband teams as necessary. This conclusion was also supported by the 'mini-case' study within a study with four divisional CIOs from same insurance enterprise. They agreed that the largely autonomous divisions in very large enterprises were affected differently by the dynamic external business environment because of the needs of the divisional customers. It became clear from the study analysis that dealing with uncertainty / unexpected change and expected change is driven more by the expectations of the divisional customer than by policies of the enterprise or even the corporate CIO / CTO organization. Each CIO had strong customer relationships with their divisional customer, but they differed in their management style, their approach to dealing with

uncertainty and change, and in their support of risk-taking and use of emerging technology. This conclusion was supported by Volberda's (1998) research confirmed that the leaders of 'flexible' enterprises maintained coordination, control, and focus, while, at the same time, focusing on innovation, creativity, and speed. Poole and Van de Ven (1989) also showed the importance that leaders of organizations must mix stability and change as a way of life, since organizations are continuously changing

2. ***Dedicated IT Account Reps*** **- CIOs in large enterprises who use dedicated account managers assigned to key customer groups have enterprise IT organizations that are potentially more agile than the medium or small enterprises.**

CIOs from large enterprise IT organizations agreed that their strong ongoing relationship with their customers allowed them to better anticipate customer changes, which enabled the CIOs to respond more quickly to unexpected changes. This need to develop strong customer relationships is supported by the guiding business principles defined by Agarwal and Sambamurthy (2002) to structure and organize the enterprise IT organization to nurture relationships. Although they recommend the 'Partner' model as a means to foster innovative IT solutions for competitive advantage, strong partner relationships with external and internal customers also helps the enterprise IT organization better deal with unexpected changes.

Many of the CIOs had dedicated 'customer account managers' who had strong ongoing relationships with their dedicated customer groups. In some organizations, the 'customer account managers' were IT systems analysts who assessed their customer's needs while also developing a strong business relationship with their customers and becoming very knowledgeable about their customers' businesses. They usually learn

when unexpected change occurs at the same time customers learn of the unexpected changes, which increases their agility and, therefore, the enterprise IT organization's ability to respond. These strong relationships with the internal enterprise IT customers, also allowed CIOs to better align their technology strategies with the enterprise business strategies. Nearly half of the CIOs in this study were aware of Luftman's Strategic Alignment Model (Luftman and Kempaiah 2007; Sledgianowski, Luftman, and Reilly 2004; Luftman 2000) and rated their organization's strategic alignment scale between 3 and 4. This supports Alter's (2004) 'Principle #18 - Support the firm's strategy,' which is the 'strategy element' focusing on aligning the enterprise IT strategy with the enterprise's business strategy. We did not find literature supporting the use of dedicated account managers within the very large enterprises. We speculated that only the largest enterprise IT organizations could afford dedicated customer account managers. Medium, small, and very small enterprises do not have the luxury of full-time IT customer reps, therefore, they may not learn of the unexpected changes until customers come to them for IT help, thus reducing their agility.

3. ***Innovative CIOs*** **- Non-IT educated CIOs appear to be more innovative and willing to take more risks.**

Several of these non-IT educated CIOs first became involved with IT by discovering IT solutions to improve their own work before they had any formal IT responsibilities. We did not find literature supporting this conclusion, but we speculated that a better understanding of the business of the enterprise combined with an earlier appreciation of problem solving IT applications may make these CIOs more inventive and willing to try new technology.

Many CIOs said they were risk-takers, CIOs with previous non-IT functional experience more often mentioned their practice of encouraging IT employee experimentation. Falkowski and Krebs (2004) support this conclusion when they found that organizations that were most successful had personnel who were good at dealing with change and adaptive, while those who were poor had people who could not deal with change and were not adaptive.

4. ***Experienced CIOs*** **- CIOs with more experience are better (or appear to be better) at establishing strong business relationships with their internal and external clients.**

Several CIOs discussed how CIOs must mature within the position and over time will gain experience. A new CIO in a position must earn credibility by first demonstrating his or her ability to keep cost down and maintain service. This is the cost-effectiveness stage. Over-time, credibility allows the CIO to focus on ways that new technology can provide better solutions to business problems and the CIO can begin to take some risks. This is the problem-solving and innovation stage. After being viewed as strong business problem-solver by the enterprise executives, the CIO is perceived to be a business peer and becomes part of the executive management team. It's only with experience that the CIOs become part of the executive board and partner with the enterprise executives. CIOs with the most CIO experience can spend more time strategically working with the enterprise's internal and external business than micro-managing the enterprise IT organization. This maturity leads to increases in perceived respect from the enterprise executives and results in trust to handle enterprise IT issues. We did not find any literature that supports this three-stage CIO maturity model.

Several CIOs pointed out that the relationship they have with the enterprise executives is critical to preparing for and understanding external changes. CIOs who felt they had a good day-to-day relationship with the enterprise executives reported that they usually learn about major unexpected external changes immediately after the enterprise executives learn about the changes. Those CIOs who thought they did not have a good relationship with the enterprise executives usually learned about changes much later when they received dated or filtered information. This conclusion was supported by Khandwalla (1972) who concluded that increased uncertainty heightens the need strong relations and alignment of the IT strategy with the enterprise business strategy.

5. ***Managing Unexpected Changes*** **- Managing unexpected change has some similarities with expected change, but is mostly very different to managing expected change.**

Although there are similarities, CIOs considered change and change management to be very different from uncertainty and managing uncertainty in many ways. For example, many of the CIOs agreed that change happens daily. As a result, managing change is about 'pacing' and 'migrating' from something that is little-known to something that is more routine where the unexpected change may require an immediate reaction.

- *Treat Unexpected Changes as Opportunities – Several* CIOs recommended that all unexpected changes should be considered as opportunities, which Orlikowski and Hofman (1997) considered to be beneficial to the enterprise. However, these benefits can only occur if the unexpected changes are first identified and then recognized as an opportunity. Hamel and Prahalad (1989) referred to this ability to recognize opportunities as 'strategic intent,' where the most successful

enterprises develop foresight and imagine new services and products and even businesses that do not exist as yet. Volberda (1998) and Weick (1979) supported this conclusion by explaining that everyone involved in the business, in this case, the enterprise IT personnel, must understand the current strategy in order to be able to interpret and understand the implications of uncertain change. Volberda (1998) called this the 'Interpretive Model' of organizational flexibility. CIOs suggested that rotating IT personnel into non-IT functional positions and then rotating back into the enterprise IT organization would increase the IT personnel's ability to know when something unexpected occurred and recognize a potential opportunity. Roepke et al. (2000) also supported this conclusion when they recommended that a flexible enterprise IT organization must increase its environmental awareness of uncertainties, its speed of response, and its capability to increase innovation.

- *Unexpected change occurs less frequently than expected change* - CIOs generally agreed that unexpected changes, driven both from external and internal situations, generally occurred less frequently than expected change. They also agreed that unexpected technology changes occur less frequently than other types of unexpected change and can be managed more easily. We did not find any literature supporting this conclusion. However, we speculate that this may be because IT specialists are able to stay up-to-date with emerging technologies and their impacts on the enterprise IT infrastructure.
- *No formal process exists for managing uncertainty* - CIOs agreed that managing change is normal and basically a routine part of managing the business. However,

none of the CIOs used a formal process for dealing with unexpected change. Research by Orlikowski and Hofman (1997) supported this conclusion because they pointed out that traditional or formal change management processes with specific steps do not work in turbulent business environments. Volberda (1998) also found that strategic planning in turbulent environments is not enough to deal with the uncertainty because strategic planning focuses on 'planning and control,' which could lead to 'rigidity and lack of innovation.' Volberda (1998) also recommended that a 'flexible' enterprise maintains coordination, control, and focus, while, at the same time, focusing on innovation, creativity, and speed.

- *Most unexpected change occurs from external environmental factors* – Even CIOs who felt they had a good understanding of their business and their industry stated that they were not able to anticipate the uncertainty from the external enterprise business environment. This conclusion was supported by Khandwalla (1972) who concluded that increased uncertainty heightens the need for organizational structure and integration as well as the alignment of the IT strategy with the enterprise business strategy.
- *Planned technology changes may lead to unexpected changes* – Several CIOs discussed how planned technology changes sometimes lead to unexpected incompatibility issues when a thorough analysis of alternative technologies is not conducted. Since technology is also rapidly changing, CIOs discussed the difficulty balancing decisions concerning when to deploy new technology including the cost and disruption impact with maintaining the existing IT infrastructure. Galy and LeMaster (2001) found that certain decisions about

technological developments accelerate change and may result in conflicts over technology choices, which also support these conclusions. One other type of unexpected technology changes occurs when technology vendors or suppliers suddenly go out of business or are acquired by a vendor's own competitors which may require the CIOs to completely change their technology strategy.

- *Uncertainty occurs when CIOs have less control* – Many CIOs defined uncertainty as any situation where they have less control. Several CIOs defined uncertainty as dealing with events that they had no control over. CIOs in the study agreed that generally the more control they have, the less uncertainty they have. Examples of these areas include when the enterprise is acquired by an enterprise with different IT strategies, the replacement of CEO or key enterprise executives, or the restructuring of the organizations or departments within their own enterprise. We did not find supporting studies for this conclusion.

6. ***Small Enterprise CIOs*** **- CIOs from small enterprises deal with less uncertainty from changing internal customer needs.**

CIOs from small and very small enterprises mentioned that because they are members of their enterprises' executive group, they felt that they are more aware of the daily business of the enterprise and less surprised by internal enterprise uncertainty. However, these same CIOs pointed out that, when compared to medium or large enterprises, they have very limited resources and a lack of support from the enterprise executives when dealing with uncertainty or unexpected changes from external the enterprise. This second part about support is supported by what Verdú-Jover, Lloréns-Montes, and García-Morales (2006) found in their study comparing the impacts of environmental uncertainty and

flexibility co-alignment on the performance of large enterprises versus small enterprises. They concluded that small enterprises were more sensitive to external environmental fluctuations and had fewer resources restricting the small enterprise's capacity to react to the changes quickly. On the other hand, they found that the small enterprise can actually better adapt to the new situation over time because of their smaller scale of operations. (Verdú-Jover et al. 2006).

5.5.2 Determine if the proposed 'enterprise IT organizational flexibility framework' will help CIOs to better manage uncertainty and unexpected change.

By the end of the iterative data collection and analysis stage of this study, the final form of the 'enterprise IT organizational flexibility framework (EFF)' evolved into a three-by-four framework. As mentioned earlier, several CIOs discussed how the concept of using a flexibility framework could help them in two different ways. The first is that the framework could be used to assess the current flexibility capabilities within the enterprise IT organization. The second is that based on this assessment, the CIOs could target areas where flexibility improvements may help them be more successful supporting the enterprise.

1. ***Organizational Flexibility Assessment*** **- Assessing the flexibility of the enterprise IT organization would lead to better support to customers.**
    - *Flexibility is managing the customer's changing needs* – One of the most interesting flexibility definitions given by several CIOs was that flexibility is the ability to manage the customer. This definition was also supported by Davern and Kauffman (2000) who defined that a key success measure of a flexible enterprise

IT organization is its ability to focus on the needs of its internal and external enterprise customers by continuously changing and creating enterprise IT value.

- *Flexibility is being 'on-top' of the dynamic marketplace* - CIOs concluded that being flexible equated to being 'on-top' of the dynamic marketplace. The critical capability necessary to be 'on-top' of the marketplace is anticipating the customers' changing business needs. This is supported by Agarwal et al. (2003) and Sambamurthy et al. (2003) who described that in a digital enterprise, enterprise IT customers have changing needs that often conflict with each other, which requires that new enterprise IT solutions must interoperate with embedded IT services.
- *Options to change* – CIOs identified three ways to be able to change as rapidly as their internal and external customers' needs change:

  1) React to the unexpected changes after they occur,

  2) Be proactive by anticipating unexpected changes and preparing for them. In Verganti's (1999) research on product development teams, he described how the teams must be able to both anticipate and react. Verganti called this capability 'structural flexibility,' where structured flexibility is impossible unless planned flexibility is built during the early stages of the project. or

  3) Become familiar with the dynamic external environment to proactively adjust to the changing environment before customers even ask for the net technology services, products, or applications. First, one set of technology services, products, and applications usually do not fit the needs of all the

internal and external customers. Different functional groups within the enterprise have needs for different products, services, and support and also have a different willingness to pay. This conclusion is supported by Alter's (2004) 'Principle #3 – Match process flexibility with product variability.' Alter explained that this principle is the 'product and work practices element.' This is a socio-technical principle that technological flexibility should match product variability. Sometimes existing services can be adapted for different customers. Sometimes, completely different types of services are required.

- *Customer-requested innovative technology services, products, and applications* – These CIOs felt that internal enterprise customers and executives are more likely to support innovative technology services, products, and applications (T-SPAs) if they perceive that the T-SPAs were implemented to meet their own changing needs rather than just being introduced by the enterprise IT organization. This supports what Ansoff (1978) called 'The Adaptive Model.' Volberda (1998) referred to the 'adaptive' model as an opportunistic behavior that emphasized flexible resources and capabilities. The adaptive organizational model focuses on the need for flexibility because uncertainty limits what can be pre-planned in advance.

2. **Which comes first? Anticipation or adaptability?**

Several CIOs questioned the sequence of the three aspects of the 'enterprise IT organizational flexibility cycle.' The sequence in this study was first anticipation, then

agility, then adaptability. The CIOs felt that the 'flexibility cycle' should start with 'adaptability' because one cannot anticipate or prepare for unexpected change without first having previous experience. The concept of starting with anticipation fits with what Gibson and Birkinshaw (2004) and Duncan (1996) called 'ambidexterity,' organizations that have both the separate but complementary capabilities of 'adaptability' and 'alignment.' It is easier to anticipate and prepare for situations, such as man-made or natural disasters, based on previous experiences. The key is the capability to adapt the organization in a positive manner based on the experiences. Lee's et al. (2006) research on global software development also supported indirectly the three aspects of the 'flexibility cycle' when they described how ambidextrous coping strategies could be used to increase agility as well as rigor and discipline when dealing with challenges of global software development.

3. A socio-technical organizational flexibility perspective would lead to better support of customers than an individual IT component flexibility perspective.

CIOs pointed out that viewing flexibility from an organizational perspective allows individual organizations to select specific 'areas of flexibility excellence' based on their unique business rather than following a standardized approach. They agreed that this approach reinforces the broader concept of socio-technical IT organizational flexibility where changes in one part impact the entire system rather than considering component flexibility such as IT infrastructure flexibility or flexible IT personnel. Tushman and Nadler (1992, 1980) also concluded that a system perspective should be considered when designing the organization, especially in dynamic business environments.

CIOs also emphasized that specific areas of enterprise IT organizational flexibility, such as flexible roles and responsibilities, structures, processes, or technologies, need to be customized based on impacts of unexpected business changes. This conclusion is supported by Alter's (2004) 'Principle #21 - Maintain the ability to adapt, change, and grow (the system as a whole).' Alter concluded that the environment changes over time, therefore, the enterprise IT organization must be able to adapt, change, and grow over time. CIOs who continuously reevaluate planning and preparation assumptions will be able to meet changing needs of their external and internal customers.

4. **The 'enterprise IT organizational flexibility framework' would be useful to better manage uncertainty and unexpected change.**

A framework is a set of assumptions, concepts, values, and practices viewing reality by providing a means of explanation, focus for discussion, basis for analysis and design, and a baseline for process improvement (Whitman et al. 2001). Most CIOs agreed that they must manage the enterprise customers' expectations and provide flexible IT services, products, and applications in turbulent business environments. The EITO framework helps focus on different components of the enterprise IT organization and its support of the customers. This conclusion is supported by the description of four key characteristics of flexibility and agility recommended by Meade (1997). Table 5.5 summarizes these conclusions and the related research finding and literature references for each conclusion. It also summarizes some of the recommendations suggested by the CIOs.

Table 5.5 Enterprise IT Organizational Flexibility Study Conclusions

5.5.1 Establish current CIO management practices for managing uncertainty and unexpected change in dynamic business environments.

Conclusion	Related Study Finding / Related Reference	Enterprise IT Organizational Flexibility Study CIO Recommendations
1.1 *Federated Structure* - Generally, it is better to have a federated enterprise IT organization when dealing with dynamic business environments.	Finding # 2 *Federated Structure* – Luftman, Kempaiah, and Nash (2006) Luftman and Kempaiah (2007) Volberda (1998) Poole and Van de Ven (1989)	
1.2 *Dedicated IT Account Reps* - CIOs in large enterprises who used dedicated accounted managers assigned to key customer groups have enterprise IT organizations that are potentially more agile than medium or small enterprises.	Finding # 5 *Partner Model* – Agarwal and Sambamurthy (2002) *Business / IT Alignment* – Luftman and Kempaiah 2007 Sledgianowski, Luftman, and Reilly 2004 Alter 2004 Luftman 2000 *Dedicated IT Account Rep* – Luftman and Kempaiah 2007	• Manage customer perceptions of enterprise IT organization response to uncertainty by emphasizing what the customer wants – speed, flexibility, and lower costs. • Avoid surprises by maintaining regular communications with customers so that everyone finds out at the same time when something unexpected happens. • Anticipate strategic client needs by preparing alternative scenarios for the unexpected rather than reacting to them when they occur. • Consider as many customer requirements as possible when updating existing technology services, products, and applications as well as the underlying infrastructure. • Have a migration plan in place for every technology service, product, and application by considering the probable life cycle for each one. • Rotate enterprise IT people into non-IT functional areas to better appreciate the business needs of the internal IT customers.
1.3 *Innovative CIOs* - Non-IT educated CIOs with non-IT	Finding # 6	

functional experience appear to be more innovative and willing to take more risks.	*Agile and Adaptive Personnel* - Falkowski and Krebs (2004)	
1.4 *Experienced CIOs* - CIOs with more experience are better (or appear to be better) at establishing strong business relationships with the internal and external customers.	Finding # 6 *CIO Maturity* – None *Quick Notification of Unexpected Changes* – Khandwalla (1972)	• Create an environment that encourages and tolerates risk-taking to encourage employees not to fear change. • Do not over-react when risk-taking doesn't work out as expected. • Be willing to stop technology projects mid-way when necessary to mitigate the risk and to demonstrate that potential negatives can be turned into positives. • Manage across the hierarchy of the enterprise. • Attend one or two external industry strategy meetings each year to learn about external impacts that may affect the enterprise. • Meet with internal customers on a regular basis to learn about external impacts affecting their enterprises.
1.5 *Managing Unexpected Changes* - Managing unexpected change has some similarities with expected change, but is mostly very different to managing expected change.	Findings # 4, 7, 8, 9, & 14 *Unexpected Opportunities* – Roepke, Agarwal, and Ferratt (2000) Volberda (1998) Orlikowski and Hofman (1997) Hamel and Prahalad (1989) Weick (1979) *Less Frequent Unexpected Changes* – None *No Unexpected Change Management Process* – Volberda (1998) Orlikowski and Hofman (1997) *More External Unexpected Change* – Khandwalla (1972)	CIOs suggested several practices to managing uncertainty: • Focus on turning as many unexpected changes into opportunities as possible. • After reacting to uncertainty, assess the impacts and actions so that an analysis can be made of what was done right and what could have been done differently. • Use the above analysis to adapt the enterprise IT organization components including its structure, development of its IT people and processes, planning and maintenance of the IT infrastructure, and development, provisioning, and support of the IT services, products, and applications. • Create scenarios to compare potential uncertainty trends such as impact of the global economy or emergence of new technologies. o Prepare for likely or anticipated outcomes of scenarios. (Consider risk, financial, and business planning aspects.) o Prepare IT personnel to continuously monitor the on-going

	Planned Technology Unexpected Changes – Galy and LeMaster (2001) *Uncertainty Means Less Control* – None	events and recognize when unexpected events occurs. • Need…The key is to have people who are able to first recognize the changes and then visualize the potential opportunities. o Identify IT personnel who thrive on change and place them in critical positions that are most impacted by unexpected changes. o Include IT personnel in all plans so that they recognize when something unexpected occurs. o Train IT personnel to think of opportunities whenever possible by preparing potential alternative actions as necessary. • Need…A systematic or formal process for anticipating unexpected change to better manage the business.
1.6 *Small Enterprise CIOs* - CIOs from small enterprises deal with less uncertainty from changing internal customer needs.	Finding # 6 *Small versus Large Flexibility* – Verdú-Jover, Lloréns-Montes, and García-Morales (2006) *Internal Uncertainty in Small Enterprises* – None	

5.5.2 Determine if a proposed enterprise IT organizational flexibility cycle and framework will help CIOs to better manage uncertainty and unexpected change.

Conclusion	Related Study Finding / Related Reference	Enterprise IT Organizational Flexibility Study Recommendations
2.1 *Organizational Flexibility Assessment* - Assessing the flexibility of the enterprise IT organization would lead to better support to customers.	Finding # 11 *Focusing on Customer Needs* – Davern and Kauffman (2000) *On-top of the Marketplace* –	• Include internal enterprise customers in the decision and development of innovative T-SPAs.

		Agarwal, Ross, and Sambamurthy (2003) Sambamurthy, Bharadwaj, and Grover (2003) *Options to Change* – Alter's (2004) Verganti's (1999) *Customer-requested Services* – Volberda (1998) Ansoff (1978)
2.2	Which comes first? Anticipation or adaptability?	Finding # 16 *Ambidexterity* – Lee, DeLone, and Espinosa (2006) Gibson and Birkinshaw (2004) Duncan (1996)
2.3	A socio-technical organizational flexibility perspective would lead to better support of customers than an individual IT component flexibility perspective.	Findings # 12, 13, & 17 *Organizational Flexibility* – Alter 2004 Tushman and Nadler (1992, 1980)
2.4	The 'enterprise IT organizational flexibility framework' would be useful to better manage uncertainty and unexpected change.	Finding # 17 *Value of Frameworks* – Whitman, Liles, Huff, and Rogers (2001) *Flexibility Characteristics* – Meade (1997)

We believe that this exploratory qualitative research and the written narrative do make a substantial contribution to our understanding of how CIOs currently manage uncertainty / unexpected change as opposed to expected change. This study:

- Developed a clearer understanding of the role and impact of different activities within the enterprise IT organization affecting each of the three aspects of flexibility - anticipation, agility, and adaptability.
- Determined how each aspect of IT flexibility improves the enterprise IT organization's ability to deal with uncertainty / expected change and expected change thus potentially improving the enterprise IT organization performance.
- Collected CIO reactions and feedback about the specific components of the 'enterprise IT organizational flexibility framework' leading to a more useful framework as a result.

Enterprise IT organizational flexibility does have benefits. A measure of success for a flexible enterprise IT organization will be its ability to focus on the needs of its customers to be competitive by adding IT value. Therefore, a common understanding of flexibility is useful for developing a flexible enterprise IT organization. Also, the enterprise IT organizational flexibility framework, defined as a specific set of assumptions, concepts, values, and practices that constitute a way of viewing reality, that was formed based on the CIO feedback, also would be useful. Dynamic business environments will continue as information technology becomes more critical to the success of the global competitive organization. And, as Leidner, Beatty, and Mackay (2003) concluded, that since uncertainty and unexpected change are continuous, CIOs in this study agreed that they do need to consider the potential benefits of a flexibility organization.

5.6 Future Research

One of the goals of qualitative research analysis is to identify future research questions from an analysis of the finding implications. Volberda (1998) developed a hierarchy of tasks relating to improving organizational flexibility. Several future research areas relating to enterprise IT organizational flexibility are listed in Table 5.6 classified according to Volberda's (1998) hierarchy.

Table 5.6 Future Enterprise IT Organizational Flexibility Research Areas

Volberda's General Organizational Flexibility Tasks	
Enterprise IT Organizational Flexibility Future Research Areas and Questions	*Comments from study participants supporting future research suggestions.* Researcher comments about future research.
The Managerial Task: *Creating Flexible Capabilities*	
CIO leadership research areas: • Increasing the flexibility of enterprise IT organization people: o What are the characteristics of enterprise IT people who thrive in a flexible versus a more stable environment? o Should the EITO have both flexible and stable types of IT people? o Is it important that all enterprise IT people be able to anticipate, be agile, and be adaptable or just a few? • Should some components of the EITO be more flexible than others? • How should 'anticipatory' work necessary to prepare for uncertainty be funded?	"If you could find people who thrive in this *[dynamic]* environment and identify the characteristics and traits of those people that enable them to work in this environment – now that would be valuable." "We actually have exercises that we've gone through with managers to try and identify people that thrive on change. Somebody once told me that 15% of your staff thrives on change, 15% of your staff hates change, 70% are the fence sitters. We try to identify that top 15%."
Understand the external enterprise environment: • Identifying if there are any differences in how CIOs manage uncertainty /	

unexpected change based on how well CIOs understand external business environment because they are members of the executive board for the enterprise (both in large and small and very small enterprises) versus not being on the executive board.	
Develop a measure for enterprise IT organizational flexibility: • Developing a *flexibility quotient* that could be used to measure existing flexibility capability within the EITO.	*"The overall flexibility quotient would probably vary by industry. For example, in pharmaceuticals, which are highly regulated, governance is very important. On the other hand, a manufacturing company would probably consider the technology infrastructure as more important."*
The Organization Design Task: *Reduce Organizational Barriers*	
• Compare the EITO-F cycle of anticipation, agility, and adaptability with the adaptive model of strategic management including preparedness, agility, and organizational learning strategies (Mintzberg 1973; Chaffee 1985).	
Ways to Improve the Firm's Flexibility: *Tools and Techniques*	
Use the EITO Flexibility Cycle model as a teaching tool.	One CIO thought that the 'flexibility cycle' was a perfect way to teach [IT] people how to be more flexible. Consider 'individual perspectives' of each IT person: *"Who are anticipating, who are being agile, and who are adapting basically learning from the past?"* This CIO felt that this would help people to develop skills to learn from the past, to anticipate, and how to be more agile. People are the key to success of EITO flexibility.
Use the EITO Flexibility Framework as a tool to assess the flexibility of the enterprise IT organization.	This research would test the EFF by using specific EITO examples through case study analysis. This would also test Sanchez's (1995) description of how organizational flexibility depends on the inherent flexibility of resources available to, in this case, the EITO, and on the EITO's managerial capabilities to apply these resources as well as the emphasis on flexibility as a key to the 'resource-based theory" of the firm (Penrose 1959; Learned, Christensen, Andrews, and Guth 1969).

5.7 Conclusion

The goal of this exploratory ethnographic inquiry was to better understand the complex organizational, social, and human issues dealing with the impact of uncertainty from the perspective of CIOs who lead enterprise IT organizations in dynamic business environments. We explored many key factors associated when managing uncertainty. The findings identified and reinforced some logical and expected management practices, but we also found some unexpected conclusions. For example, CIO leadership is critical to success when managing uncertainty, however, proactive CIOs *understand the external business environment* as well as they understand the internal business environment, which means CIOs need to become as knowledgeable about their industry as they are about information technology. Also, proactive CIOs consider and manage *uncertainty* as if it were an *opportunity.* CIOs using dedicated IT 'account reps' for key customer groups were more agile than other IT organizations because they were prepared for the unexpected changes and they always looked for how IT could solve business problems.

Some of the other conclusions are that, even though we all know that change is constant, its impact varies greatly. *External business change* almost always results in more uncertainty than internal business changes. Also, both unexpected changes and planned or expected changes usually lead to additional changes not anticipated. CIOs agreed that managing unexpected change is very different than managing expected change. More research needs to be done to further explore these findings and develop specific recommendations. However, hopefully some of these findings can be used by CIOs to better manage uncertainty in today's dynamic business environments.

APPENDIX A – CONSENT FORM

NEW JERSEY INSTITUTE OF TECHNOLOGY
323 MARTIN LUTHER KING BLVD.
NEWARK, NJ 07102

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY:

Enterprise Organizational Information Technology Flexibility: Managing Change, Complexity, and Uncertainty.

RESEARCH STUDY:

I, _____, have been asked to participate in a research study under the direction of *Drs. Jerry Fjermestad and Brian Whitworth.* The principle investigator for this research study is *Karen P. Patten*. Other professional persons who work with them as study staff may assist to act for them.

PURPOSE:
(1) Describe the scope of the business problem - Identify current executive IT management practices for dealing with change, complexity, and uncertainty and the perceived effectiveness of these practices.
(2) Explore the potential of a proposed solution - Identify characteristics of a flexible enterprise IT organization.
(3) Evaluate the potential value of the flexibility solution – Identify and evaluate the advantages and benefits of a proposed 'IT Flexibility Framework (IFF)' and its potential use by the enterprise IT organization.

The analysis of the results from this study will be used to develop an understanding of the scope of the problem within the enterprise IT organization, assess the potential benefits and validity of the 'IT Flexibility Framework (IFF),' and evaluate the potential use and effectiveness of the 'IFF.'

DURATION:

My participation in this study consists of one interview with potential follow-up within two months of the initial interview. Potential follow-up may include telephone calls, emails, or surveys.

PROCEDURES:

I have been told that, during the course of this study, the following will occur:

- *Participation in at least one forty-five to sixty minute semi-structured interview (either in person or over the telephone.)*

- *I may be asked to participate in follow-up questioning by telephone or to distribute or fill-out a follow-up survey.*

PARTICIPANTS:

I will be one of about *20 participants* in this research study.

EXCLUSIONS:

I will inform the researcher if any of the following do not apply to me, for which I should be excluded:

- Participants should currently or previously have had senior IT executive experience within small, medium, or large enterprises or companies.

RISKS/DISCOMFORTS:

I have been told that the study described above may involve the following risks and/or discomforts:

- If any questions are uncomfortable, I may choose not to answer them.

There also may be risks and discomforts that are not yet known.

I fully recognize that there are risks that I may be exposed to by volunteering in this study which are inherent in participating in any study; I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in the study.

CONFIDENTIALITY:

I understand confidential is not the same as anonymous. Confidential means that my name and/or the name of my company will not be disclosed if there exists a documented linkage between my identity and/or my company's identity and my responses as recorded in the research records. Every effort will be made to maintain the confidentiality of my study records. If the findings from the research study are published, *I and/or my company* will not be identified by name. My identity will remain confidential unless disclosure is required by law.

AUDIO RECORDING:

I understand that, with my permission, I will be digitally audio-recorded during the course of the research study interview. Digital audio recordings will be transcribed and stored for (eighteen months) after the end of this research project (until December 2007). After that time, the digital audio recordings will be deleted. Access to these digital audio recordings will be restricted to only those researchers (Drs. Jerry Fjermestad, Brian Whitworth, Karen Patten and specific research assistants) who are involved in this research. I also give my permission for the investigator to make detailed notes during the interview.

PAYMENT FOR PARTICIPATION:

I have been told that I will receive *no monetary compensation* for my participation in this study. *I will, however, be given results of the general study at the end of this research project.*

RIGHT TO REFUSE OR WITHDRAW:

I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

INDIVIDUAL TO CONTACT:

If I have any questions about my treatment or research procedures, I understand that I should contact the principal investigator at:

Karen Patten, School of Management, New Jersey Institute of Technology, CAB Room 4034, University Heights, Newark NJ 10702, 973-596-3257, email – karen.p.patten@njit.edu.

If I have any additional questions about my rights as a research subject, I may contact:

Dawn Hall Apgar, Ph.D., IRB Chair
New Jersey Institute of Technology
323 Martin Luther King Boulevard
Newark, NJ 07102
(973) 642-7616
Dawn.apgar@njit.edu .

SIGNATURE OF PARTICIPANT

I have read this entire form and I understand it completely. All of my questions regarding this form and this research study have been answered to my complete satisfaction. I agree to participate in this research study.

Participant Name: _____

Participant Signature: _____ Date: _____

SIGNATURE OF INVESTIGATOR OR RESPONSIBLE INDIVIDUAL

To the best of my knowledge, the participant, _____, has understood the entire content of the above consent form, and comprehends the study. The participant's questions have been accurately answered to his/her complete satisfaction.

Investigator's Name: ***Karen P. Patten***

Investigator's Signature: _____ Date: _____

INITIAL SEMI-STRUCTURED INTERVIEW SCRIPT

PARTICIPANT _____ DATE _____

TITLE OF STUDY:
Enterprise Organizational Information Technology (IT) Flexibility: Managing Change, Complexity, and Uncertainty

Remember these general points throughout the INTERVIEW:

- *Be flexible with each of the categories and the specific questions. Drop any of the questions if they do not make sense within the discussion.*
- *Have the participant do the bulk of the talking. What they say is the data we gather and need.*
- *There's no preferred order for any of the sections, though it usually makes more sense to do follow the suggested order given.*

☐ **OPENING**

1. thank participant for agreeing to meet me and participate in this research study
2. introduce myself
3. ask participant to read and sign consent form noting that this is an NJIT standard operating practice and is required by NJIT
4. get permission to record
5. emphasize complete confidentiality and secure storage of data
6. answer any questions about the interview and research study.

☐ **BACKGROUND (ESTABLISHES RAPPORT)**

1. Collect demographic information using attached demographic data sheet.

☐ **SET THE DISCUSSION FRAME**

1. Communicate purpose
   a. We are interested in trying to understand how CIOs and IT executives deal with change and uncertainty in today's dynamic global business environment.
   b. Our objective is to get in-depth information from each of you about your management style, your interaction with your customers, vendors, and employees, and the context within which the impacts of expected and unexpected changes will differ between individuals, so we are conducting these interviews in person.
2. Indicate that we are also interested in understanding potential benefits of a introducing flexibility systematically into the enterprise IT organization
   a. By discussing a common definition of flexibility
   b. By evaluating a potential IT Flexibility Framework
   c. By considering its use within the enterprise IT organization.

PARTICIPANT _____ DATE _____ PAGE __ of ___

1. GENERAL QUESTIONS – ENTERPRISE IT ORGANIZATION

Enterprise IT Organization (Build on information received during the "demographics" survey.).

a. General Questions on **Current Governance**:
   i. Determine participant's definition of governance.
   ii. Probe for current / future status of:
      - Organizational structure
      - Strategic/tactical planning - level of alignment
      - Risk assessment strategies
      - IT outsourcing.
   iii. Probe for needs to better manage governance.

b. General Questions on **Employees**:
   i. Determine participant's employee management philosophy
   ii. Determine different general IT and specialized IT skills and capabilities required
   iii. Determine use of contractual, outsourced "employee" functions
   iv. Probe for current training and education programs for employees.

PARTICIPANT _____ DATE _____ PAGE __ of ___

c. General Questions on **IT Infrastructure**:
   i. Determine participant's general IT architecture as basis for IT infrastructure
   ii. Determine major technologies used in network (may be on demographics worksheet)
   iii. Determine major information systems provided to enterprise (may be on demographics worksheet)
   iv. Determine use of contractual, outsourced network / information systems (may be on demographics worksheet)
   v. Probe for plans about new technologies / IS planned.

d. Show the participant a copy of **Table 1[Handout].** ***Enterprise IT Organization Components*** (attached) and discuss the table based on the above information. Collect any other impressions and thoughts from the participant about the enterprise IT organization. (Record specific notes on Table 1, column 1.)

2. GENERAL QUESTIONS – CHANGE AND UNCERTAINTY IMPACTS

a. Determine participant's **definition of change; or uncertainty**
b. Identify types of changes and uncertainties impacting the enterprise IT organization

c. Determine participant's procedures for dealing with change and uncertainty (Record specific notes on Table 1, column 2):
   I. Probe for examples of change and uncertainty **impacts on governance**
   II. Probe for examples of change and uncertainty **impacts on employees**
   III. Probe for examples of change and uncertainty ***impacts on infrastructure***.

PARTICIPANT _____ DATE _____ PAGE __ of ___

3. GENERAL QUESTIONS – ENTEFRPRISE IT FLEXIBILITY

a. Determine participant's **definition of flexibility**
b. Identify situations where flexibility is beneficial
c. Identify situations where flexibility is currently used
d. Do the experiences from Mfg and SWD "flexibility" apply to the enterprise IT organization?

e. Determine participant's **definition of anticipation.**

c. Determine participant's **definition of agility.**

d. Determine participant's **definition of adaptability.**

e. Determine participant's **procedures** for dealing with flexibility (Record specific notes on Table 1, Column 3):
   I. Probe for examples of flexibility impacts on **governance**
   II. Probe for examples of flexibility impacts on **employees**
   III. Probe for examples of flexibility impacts on **infrastructure.**

f. Show the participant a copy of **Figure 1|Handout],** ***Flexibility Cycle*** (attached) and discuss the figure based on the above information. Collect any other impressions and thoughts from the participant about the flexibility cycle. (Record specific notes on Figure 1.)

4. GENERAL QUESTIONS – IT FLEXIBILITY FRAMEWORK (IFF)

Show the participant a copy of Table 2, *IT Flexibility Framework* (attached), and discuss the figure based on the above information. Collect any other impressions and thoughts from the participant about the each of the grid boxes in the IFF. (Record specific notes on Table 2.)

☐ **CLOSING**

1. thank participant for spending the time to meet with us for this interview.
2. ask if participant would like copy of "Current IT Change and Uncertainty Impacts" White Paper, to be prepared after finishing dissertation research.
3. answer any additional questions about the interview and research study.

REVISIONS TO THE SEMI-STRUCTURED INTERVIEW SCRIPT

The following revisions were made to the initial script based on suggestions from the CIOs during the interviews.

In the first section, **GENERAL QUESTIONS – ENTERPRISE IT ORGANIZATION,** the general questions for Part C were divided into two parts: one for **Part C: IT Infrastructure** and one for **Part D: IT Services, Products, and Applications**. As a result of these changes, the *Table 1, Enterprise IT Organization Components* was also revised to include the new 'component" **IT Services, Products, and Applications.**

c. General Questions on **IT Infrastructure**:
   i. Determine participant's general IT architecture as basis for IT infrastructure
   ii. Determine major technologies used in network (may be on demographics worksheet)
   iii. Probe for plans about new technologies / IS planned.

d. General Questions on **IT Infrastructure**:
   i. Determine major information systems services, products, and applications provided to the enterprise (may be on demographics worksheet)
   ii. Determine use of contractual, outsourced network / information systems (may be on demographics worksheet)
   iii. Probe for plans about new IT services, products, and applications .

e. Show the participant a copy of **Table 1[Handout].** ***Enterprise IT Organization Components*** (attached) and discuss the table based on the above information. Collect any other impressions and thoughts from the participant about the enterprise IT organization. (Record specific notes on Table 1, column 1.)

In the second section, **GENERAL QUESTIONS – CHANGE AND UNCERTAINTY IMPACTS,** the new component, **IT Services, Products, and Applications,** was added to the discussions of impacts of change and uncertainty.

d. Determine participant's procedures for dealing with change and uncertainty (Record specific notes on Table 1, column 2):
   i. Probe for examples of change and uncertainty **impacts on governance**
   ii. Probe for examples of change and uncertainty **impacts on employees**
   iii. Probe for examples of change and uncertainty **impacts on infrastructure**
   iv. Probe for examples of change and uncertainty **impacts on services, products, and applications.**

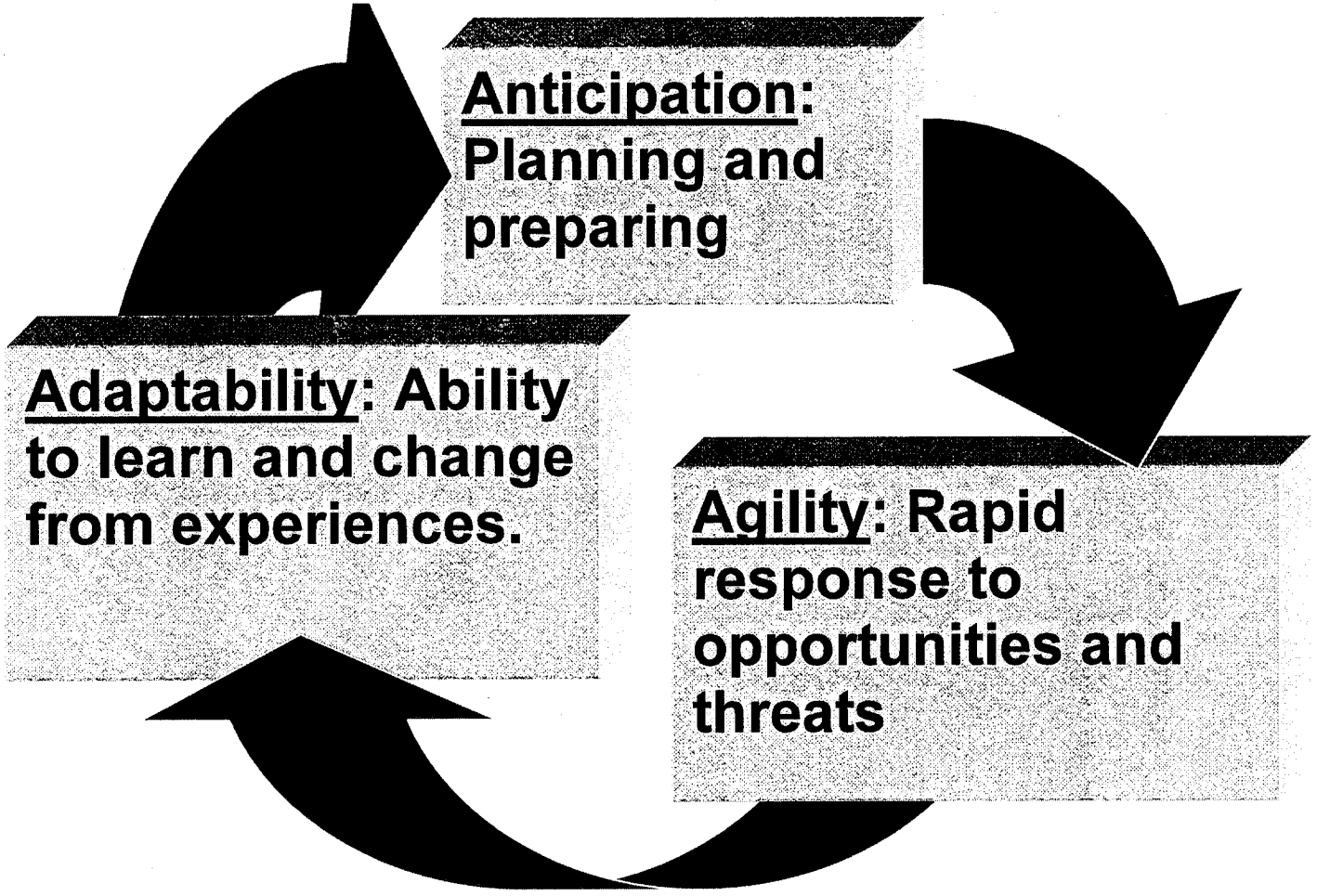
In the third section, **GENERAL QUESTIONS –ENTEFRPRISE IT FLEXIBILITY,** the new component, **IT Services, Products, and Applications,** was added to the discussions of impacts of flexibility.

e. Determine participant's **procedures** for dealing with flexibility (Record specific notes on Table 1, Column 3):
   i. Probe for examples of flexibility impacts on **governance**
   ii. Probe for examples of flexibility impacts on **employees**
   iii. Probe for examples of flexibility impacts on **infrastructure**
   iv. Probe for examples of flexibility impacts on **services, products, and applications.**

HANDOUT: COMPONENTS OF THE ENTERPRISE IS/ IT ORGANIZATION

Table 1 - Enterprise IS/ IT Organization			
Governance	**IT Organization Leadership and Structure** includes: - strategic and tactical planning - business/IT alignment - risk management - financial management - _____		
People	**IT / IS People** including their: - knowledge - capabilities - skills - relationships with customers, vendors, and partners.		
Technology Infrastructure	**Components** includes: - technology architecture - networks - hardware - software, and - infrastructure design and implementation, day-to-day operations, and maintenance processes.		
Technology Services, Products, and Applications	**Services, Products, and Applications** include: - Development - Provisioning - Suppor.		

HANDOUT – IS/ IT FLEXIBILITY CYCLE: ANTICIPATION, AGILITY, AND ADAPTABILITY



HANDOUT – ENTERPRISE IT ORGANIZATIONAL FLEXIBILITY FRAMEWORK

Flexibility Dimension Enterprise IT Organization	Anticipation	Agility	Adaptability
Governance			
People			
Technology Infrastructure			
Technology Services, Products & Applications			

APPENDIX C – DEMOGRAPHIC DATA COLLECTION FORM

IT EXECUTIVE DEMOGRAPHIC BACKGROUND INFORMATION

TITLE OF STUDY

Enterprise Organizational Information Technology (IT) Flexibility: Managing Change, Complexity, and Uncertainty

COLLECTION OF DEMOGRAPHIC BACKGROUND

This information is collected at the beginning of the semi-structured interview as part of the actual interview. This method approach has two benefits: 1. It starts the interview with questions easily answered providing the participant a chance to talk about his or her experience and organization; 2. It helps establish a rapport between the interviewer and participant early in the interview.

CONFIDENTIALITY (from "Consent Form"):

Remind the participant that the demographic information collected is confidential meaning that specific information about the individual, his or her experience, and his or her company will not be disclosed. (See "confidentiality" wording on "consent form."

USE OF DEMOGRAPHIC BACKGROUND INFORMATION:

It is the intent of this research study to use demographic background information of participants only for analysis purposes. Specific information will only be available to research study members and will not be released nor published outside of the analysis of this particular research study (Gopal and Prasad 2000)

PARTICIPANT INFORMATION

Name: _____ Date: _____

Company: _____

PART 1: Internal environment factors (*IT executive expertise*)

1. *Current IT executive position / title:* _____

2. *Previous IT executive positions: yes no*
   a. Previous IT executive 1 position / title:_____
   b. Previous IT executive 2 position / title:_____

3.

Years in current position:	*Years in exec IT position 1:*	*Years in exec IT position 2:*
☐ < 3 years	☐ < 3 years	☐ < 3 years
☐ 3-6 years	☐ 3-6 years	☐ 3-6 years
☐ 6-9 years	☐ 6-9 years	☐ 6-9 years
☐ > 10 years	☐ > 10 years	☐ > 10 years.

4. *Formal education / specialized training*:

☐ Bachelors (field: _____) ☐ Masters (field: _____)

☐ Ph. D. (field: _____) ☐ Other (field: _____)

☐ Other (field: _____) ☐ Other (field: _____)

5. *Career Path: Years in functional business areas < executive IT position (mark all that apply):*

☐ Acctg ____ yrs ☐ Finance ____ yrs ☐ H. R. ____ yrs

☐ IT ____ yrs ☐ Mfg ____ yrs ☐ M & S. ____ yrs

☐ R&D ____ yrs ☐ Other ____ yrs ☐ Other ____ yrs

PART 2: Internal environment factors (enterprise IT organization)

6. *Current IT organ structure:* *IT position 1 organ structure:* *IT position 2 organ structure*:

☐ Centralized ☐ Centralized ☐ Centralized

☐ Distributed ☐ Distributed ☐ Distributed

☐ Federated ☐ Federated ☐ Federated

☐ Other _____ ☐ Other _____ ☐ Other _____.

7a. *Current IT organization characteristics*:

☐ Location 1 _____ ☐ # of empl. _____

☐ Location 2 _____ ☐ # of empl. _____

☐ Location 3 _____ ☐ # of empl. _____

☐ Location _ -_ _____ ☐ # of empl. _____

7b. *Previous IT exec position 1 organization characteristics*:

☐ Location 1 _____ ☐ # of empl. _____

☐ Location 2 _____ ☐ # of empl. _____

☐ Location 3 _____ ☐ # of empl. _____

☐ Location _ -_ _____ ☐ # of empl. _____

7c. *Previous IT exec position 2 organization characteristics:*

☐ Location 1 _____ ☐ # of empl. _____

☐ Location 2 _____ ☐ # of empl. _____

☐ Location 3 _____ ☐ # of empl. _____

☐ Location _ -_ _____ ☐ # of empl. _____

8. *Current IT budget:* *IT position 1 budget:* *IT position 2 budget:*

☐ Capital $_____ ☐ Capital $_____ ☐ Capital $ _____

☐ Expense $_____ ☐ Expense $_____ ☐ Expense $ _____.

9a. *Current key IT products / systems / services*:

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

9b. *Previous executive IT position 1 key IT products / systems / services*:

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____..

9c. *Previous executive position 2 key IT products / systems / services:*

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____.

PART 3: External environment factors (<u>enterprise organization / industry characteristics</u>)

10a. *Current enterprise name:* _____

10b. *Previous IT position 1 enterprise name*: _____

10c. *Previous IT position 2 enterprise name*: _____

11. *Current IT industry type:* *IT position 1 industry type:* *IT position 2 industry type*:

☐ Financial services ☐ Financial services ☐ Financial services

☐ Pharmaceutical ☐ Pharmaceutical ☐ Pharmaceutical

☐ Telecommunications ☐ Telecommunications ☐ Telecommunications

☐ Retail ☐ Retail ☐ Retail

☐ Health Services ☐ Health Services ☐ Health Services

☐ Manufacturing ☐ Manufacturing ☐ Manufacturing

☐ Hospitality ☐ Hospitality ☐ Hospitality

☐ Utilities ☐ Utilities ☐ Utilities_____

☐ _____ ☐ _____ ☐ _____

12. *Current IT enterprise size (rev$):* *IT pos 1 enterprise size ($):* *IT pos 2 enterprise size ($):*

☐ > $10 billion	☐ > $10 billion	☐ > $10 billion
☐ $ 9 B > x > $1 B	☐ $ 9 B > x > $1 B	☐ $ 9 B > x > $1 B
☐ $ 999 M > x > $100 M	☐ $ 999 M > x > $100 M	☐ $ 999 M > x > $100 M
☐ $ 99M > x > $1 M	☐ $ 99M > x > $1 M	☐ $ 99M > x > $1 M
☐ $ .5 M > x > $.99 M	☐ $ .5 M > x > $.99 M	☐ $ .5 M > x > $.99 M
☐ $ .1 M > x > $.49 M	☐ $ .1 M > x > $.49 M	☐ $ .1 M > x > $.49 M
☐ $ .5 K > x > $ K	☐ $ .5 K > x > $ K	☐ $ .5 K > x > $ K
☐ _____	☐ _____	☐ _____

13. *Current IT enterprise size (empl#):* *IT pos 1 enterprise size (#):* *IT pos 2 enterprise size (#):*

☐ > 50,000	☐ > 50,000	☐ > 50,000
☐ 49,999 > x > 10,000	☐ 49,999 > x > 10,000	☐ 49,999 > x > 10,000
☐ 9999 > x > 1000	☐ 9999 > x > 1000	☐ 9999 > x > 1000
☐ 999 > x > 100	☐ 999 > x > 100	☐ 999 > x > 100
☐ 99 > x > 21	☐ 99 > x > 21	☐ 99 > x > 21
☐ < 20	☐ < 20	☐ < 20

14a. *Current IT enterprise geographical characteristics:*

- o Single location [location: _____]
- o Multi-U.S. locations [number: _____]
- o Multinational Corporation (MNC)[countries: _____]

14b. *IT position 1 geographical characteristics:*

- o Single location [location: _____]
- o Multi-U.S. locations [number: _____]
- o Multinational Corporation (MNC)[countries: _____]

14c. *IT position 2 geographical characteristics:*

- o Single location [location: _____]
- o Multi-U.S. locations [number: _____]
- o Multinational Corporation (MNC)[countries: _____]

15a. *Enterprise products and services:*

☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____
☐ _____	☐ _____	☐ _____

15b. *Enterprise products and services:*

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

15c. *Enterprise products and services:*

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

***PART 4:* Business / IT Alignment; Outsourcing; Partnerships**

16. *Maturity of business / IT alignment*:

17. *Status of outsourcing arrangements (types of services; budget):*

☐ type _____ ☐ budget. _____

☐ type _____ ☐ budget _____

☐ type _____ ☐ budget _____

☐ type _____ ☐ budget _____

18. *Status of partnership arrangements (types of services; budget):*

☐ type _____ ☐ budget. _____

☐ type _____ ☐ budget _____

☐ type _____ ☐ budget _____

☐ type _____ ☐ budget _____

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