ABSTRACT

MOHSENI, MARYAM. What is a Baseline for Effective Information Technology Governance for Higher Education Institutions that are Members of Research University CIO Conclave in United States? (Under the direction of Dr. Aaron Clark and Dr. Marc Hoit).

This research study provides the findings of a modified Delphi methodology conducted to define components and baseline for effective information technology governance for higher education institutions member of the Research University CIO Conclave (RUCC) in United States. The participating experts are Chief Information Officers (CIOs) of research-intensive universities and are members of the Association of American Universities (AAU) and RUCC. Three-round modified Delphi methodology was conducted to obtain consensus. At the end of Round III, the degree of consensus among the experts was measured by applying Kendall Coefficient of Concordance and conducting Chi-square analysis. The results of this research study provide assurance that there was an agreement among participants on the final list of the components of IT governance for higher education institutions. This study’s final components can be used as a platform to define an IT governance framework or model for higher education institutions. The list of components can be used as an invaluable resource to CIOs of the universities to choose elements from to form their specific IT governance model and practices. (Keywords: IT governance, RUCC, AAU, leadership, CIO, modified Delphi).
What is a Baseline for Effective Information Technology Governance for Higher Education Institutions that are Members of Research University CIO Conclave in United States?

by
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A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the degree of Doctor of Education

Technology Education

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Dr. William Deluca  Dr. Alice Scales
DEDICATION

This dissertation is dedicated to my Mom and Dad,

Shahin and Parviz

(Maman Joon and Baba Jan)

I would have not been here in my life without your unconditional sacrifices and love.

To my beautiful children,

Rodeen and Ryan,

You are the reason for me to be strong.

To my sister,

Najma,

Words cannot do the justice to a loving sister like you. You are my role model. Your wisdom was my encouragement every step of the way.

AND

This dissertation is dedicated to,

Alireza,

Your love, support and encouragement made this journey more bearable for me. I could not have accomplished this without you by my side.
BIOGRAPHY

Maryam “Samila” Mohseni received her Bachelor of Science degree and Master of Science degree from Azad University. Both her undergrad degree and master’s degree is in Computer Science.

Over the last decade, Maryam has worked in public education, private industry and higher education, with the majority of it in the Office of Information Technology at North Carolina State University. Outside of her academic and business activities, she enjoys designing haute couture and working on interior design projects.
ACKNOWLEDGMENTS

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She also expresses her appreciation to, Alireza who walked beside her throughout this journey and to her two beautiful children, Rodeen and Ryan, their hugs and smiles brought life to every step of the way; to her Mom, Shahin and her sisters Najla, Najma and Saba for believing in her and lastly to her niece and nephew, Kimia and Ilia.

As a full-time employee at the North Carolina State University while the researcher was pursuing her doctoral degree, she would like to thank all of her co-workers that encouraged her to move forward, especially her supervisors, Craig DeShong, Richard Merwin and John Black.

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CHAPTER 1: INTRODUCTION

As information technology (IT) occupies a more pivotal role in the sustainability and growth of higher education institutions, it is becoming exceedingly difficult for IT departments to provide the services for enhancing instruction and improving education and research initiatives at the same rate that technology expands. The consequence is that managers (from executives to supervisors) have to do more with less in order to accommodate the ever-increasing technological demands in their business, as well as possess the ability to effect necessary adjustments on a daily basis. The primary challenge is to engage in an IT decision-making process that ensures involvement of the appropriate individuals throughout the entire organization.

Weill and Ross (2004) indicate that there is a need for an alignment between IT-related decisions and organizational performance goals. As organizations become aware of this relationship, their mission is directed toward generating value from IT. Many of the decisions being made throughout an organization will influence the importance of information technology. Unfortunately, the decision makers will only occasionally involve IT in this process.

“IT governance is the process by which firms align IT actions with their performance goals and assign accountability for those actions and their outcomes” (Weill & Ross, 2004, p.1). Effective IT governance is a result of thoughtful procedural design and not the consequence of isolated implementation applied at diverse times in order to address the challenge of the moment.
Nicholas Carr (2003) believes that information technology’s power and its strategic importance did not develop at the same rate. There has always been a healthier market advantage for early adopters of the latest technology, especially in the field of IT. Examples of this are observed in businesses, such as amazon.com and ebay.com. As technology becomes more accessible and affordable to the public, it becomes more commoditized. At this point, the use of information technology no longer provides a competitive advantage, and IT leaders should adopt creative strategies to apply commoditized technologies to current issues (Carr, 2003). In this manner, information technology can continue to provide value and remain strategically significant. To improve strategic importance, IT leaders must modify the way they approach IT investment and management (Chester, 2006).

**BACKGROUND**

Information technology has a vast impact on almost every niche in higher education institutions, including research productivity, student experience, educational performance, campus-wide learning systems, faculty experience, financial business, recruitment, and program design. The spectrum of impact is so broad that it makes it impractical for IT leaders in higher education institutes to make high-level IT decisions without major input and acceptance from stakeholders (Dewey, 2006).

There is remarkable sensitivity and difficulty involved in investment decisions for IT departments within higher education institutes. Every department has a specific need and perhaps a budget to fulfill this need; however, there are so many elements involved in the process that the simple fact of “who will make the decision” remains controversial and
complex. Numerous constituents (who are very specific about their technological views and perspectives) have stakes in IT investment and spending for campuses.

“EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. EDUCAUSE helps those who lead, manage and use information resources to shape strategic decisions at every level” (www.educause.edu). The results of the 2006 EDUCAUSE Current IT Issues Survey indicate that IT governance is one of the top six issues in which IT leaders of higher education invest the most time. Funding for IT, which is directly associated with governance, is one of the most time-consuming efforts (Dewey, 2006). “Governance, organization and leadership” was consistently in the forefront as a top ten issue of strategic significance for higher education institutes from 2004 to 2009, as measured in EDUCAUSE’s annual surveys of interest in current IT issues (www.educause.edu). These issues result in major topics, which generate resource implications; therefore, a fastidious decision-making process becomes crucial for principal IT leaders in higher education institutes or universities.

IT governance is “the decision rights and accountability framework to encourage desirable behavior in using IT”(Weill & Ross, 2004, p. 2). Companies with effective IT governance have been known to generate twenty percent higher profit than other companies with similar strategies. The fact is that IT governance does not happen accidentally and there is an absolute need for a framework to model the methods. Peter Weill and Jeanne Ross introduce an IT governance framework, as a result of their extensive research of three hundred organizations in twenty-three countries. The research shows that governance must address three major questions:
1. What decisions to make?

2. Who should make the decisions?

3. How to make and monitor the decisions?

The research also identifies the components for IT governance for organizations in general, which addresses the above questions. IT governance defines five major decisions related to leadership and the use of IT in an organization (Weill & Ross, 2004):

1. IT Principles: A high-level statement about the role of IT in the organization

2. IT Architecture: An integrated and standardized set of logical and technical choices for data, application and infrastructure

3. IT Infrastructure: A centrally coordinated set of shared and reliable services which is the backbone of the IT in the organization and normally created before the need is recognized

4. Business Application Needs: An identification of IT decisions about business needs that generates value

5. IT Investment and Prioritization: The decisions about how much to spend and how to invest in IT with a worthwhile return

Recognizing the decisions that need to be addressed is one of the facets of the governance. The next challenge is to determine the combination of decisions and people who have either decision authority or input into IT decisions (Weill & Ross, 2004).
The components of IT governance can be defined as recognition of major IT decisions related to leadership, other stakeholders and individuals who have decision authority or are capable of providing input to IT decisions.

From the IT governance perspective, institutions have many characteristics that make the decision-making process more complicated. Faculty, administration, heads of departments and other major stakeholders have “shared” responsibilities. A statement of the American Association of University Professors explains shared responsibility regarding governance as: “The faculty has primary responsibility for such fundamental areas as curriculum, subject matter, and methods of instruction, research, faculty status, and those aspects of student life that relate to the educational process. Agencies for faculty participation in the government of the college or university should be established at each level where faculty responsibility is present.” (www.aaup.org). Administrative staff, students, and adjunct faculties often have a stake in institutional governance decisions. Higher education institutions have more complexity in the area of IT governance compared to other organizations. Healthy governance structure needs to be understood by its constituents (Dewey, 2006).

In preparation for the two-year University of California (UC) at Berkley strategic processing plan, the institution conducted a review on how to improve IT governance for Berkley. They devised a plan that defines IT governance as: “Good IT governance practices will determine, and communicate clearly, who should make and be held accountable for decisions for each of these domains in each part of the organizations (central, college, department, project and so forth)” (McCredie, 2006, p. 9).
McCredie (2006) has suggested that IT sustains all stages in higher education’s enterprise objectives. Although many institutions have devoted a great deal of their finances to upgrade various programs, there is apprehension that priorities are not being determined for new information technology, cooperation between departments, or sharing of costly infrastructure. There is a mass movement among universities to improve management of IT investments as well as achieve enhanced IT governance.

The distribution of IT among central offices, colleges, departments, projects and research in higher education institutions makes it very challenging for IT leaders in the universities to coordinate the total IT asset across the entire campus. As a result, IT assessments may be established with minimum involvement of individuals outside of the IT department, even though there may be common interests. The lack of involvement and collaboration leads to difficulties in developing mutual architectures and deters understanding the overall picture, which may undermine IT investments. In these cases, there is a redundancy of services campus-wide, which results in overlapping of expenditures.

IT architecture standards for higher education institutions are challenging to cultivate and employ when entities within the institution are autonomous. In these situations, global applications need to support a wide variety of operating systems, hardware configurations, browsers, and security protocols (McCredie, 2006). This usually results in expensive adaptations to out-of-the-box applications, which generally adds a considerable expense.

Research universities have already adapted to rapid environmental change, especially technology-wise, and IT governance falls in this same category. Most universities refer to IT governance as the structure which has evolved over the past thirty years. Recently,
understanding has intensified regarding what has been missing and what needs to be thoughtfully designed (McCredie, 2006).

Generally, the chief information officer (CIO), vice president, vice provost, or associate vice chancellor will designate an individual who is technically accountable for directing, determining, and managing the global state of IT for the institution. Unfortunately, this individual usually lacks authorization to enforce comprehensive architectural principles or to impose security guidelines. In reality, there are usually numerous IT operations; however, many have no direct affiliation with the CIO (McCredie, 2006).

It is clear that a standardized IT governance framework for higher education can facilitate the collaboration between IT departments and colleges and provide a defined pathway for CIOs and other IT leaders throughout the campus in order to share resources.

**STATEMENT OF PROBLEM**

Research identified in this dissertation is designed to recognize the components of information technology governance in higher education according to the members of a Research University CIO Conclave. The primary objective of this study is to define an IT governance framework for higher education based on its identified elements.

Peter Weill and Jeanne Ross (2004), as a result of their extensive research, found that there is a large group of IT leaders that are searching for a tool or a guideline that can define components of IT governance. This will help to design the IT governance of the specific organization and also help to learn how others represent and analyze decision rights.
Yanosky provides extensive research to CIOs, whom are members of EDUCAUSE Center for Applied Research, with information about the state of higher education IT governance. In addition, Yanosky’s research identifies practices that are associated with good IT governance. His research shows that there is no single, determined framework claimed by CIOs of higher education to be used in IT governance processes and structures for higher education institutes. Therefore, to design and implement a practical IT governance, they had to choose elements from frameworks available to organizations in general (and not specific to higher education), such as COBIT, ITIL, ISO 17799 and ISO 9000 (Yanosky, 2008).

Haes and Grembergen (2009) believe that IT governance best practices are divergent in all types of industries. They also believe that IT governance best practices can change, depending on the geographical area. Haes and Grembergen conducted a Delphi research in the subject of designing an IT governance baseline for a Belgian financial services sector in Europe. An expert panel of twenty-nine consultants, senior IT, and senior business professionals in financial services sector participated in the research. The research reveals a list of thirty-three IT governance practices at the level of strategic and executive business leaders. It also prioritizes the list based upon the ease of implementation and effectiveness. The final element of the research specifies a minimum baseline for IT governance for the Belgian financial sector. Researchers concluded that further investigation is needed to focus on other sectors (e.g., educational, human resource), which are operating in other countries and, if applicable, in the United States (Wim Van Grembergen & Steven De Haes, 2009). Haes and Grembergen research was used to define the preliminary steps and initial surveys for this research study.
RESEARCH QUESTION

To achieve this task, the following research question has been proposed:

What are the components of information technology governance in higher education according to the members of Research University CIO Conclave?

HYPOTHESIS

H₀: There is no agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.

The alternative hypothesis:

H₁: There is an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.

ASSUMPTIONS

Following is the list of assumptions considered throughout the study:

1- There was a need to establish a standard framework for information technology governance for higher education.

2- Chief Information Officers (CIOs) of higher education institutions that are members of Research University CIO Conclave responded to the data-collecting instrument in a non-biased manner.

3- CIOs of higher education institutions that are members of Research University CIO Conclave were knowledgeable of information technology governance concepts.
4- CIOs of higher education institutions that are members of Research University CIO Conclave and all participants comprehended and followed directions in order to respond to data-collecting instrument.

5- CIOs of higher education institutions that are members of Research University CIO Conclave and all participants had access to computer with internet connection.

6- CIOs of higher education institutions that are members of Research University CIO Conclave and all participants had email accounts.

7- All information gathered was current and precise to the information technology governance concept.

8- A panel of experts in the field of information technology leadership and governance in higher education, in conjunction with three rounds of modified Delphi, validated the components of information technology governance.

**LIMITATIONS**

1- The Web-based modified Delphi method was used in this study to collect information and participation was limited to participants with internet access.

2- Due to the geographical spread of the participants, three data-collecting instruments and six follow-up emails was used to conduct the modified Delphi method.

3- Respondents to this study were limited to chief information officers of higher education institutions in the United States of America, who was identified based on a predetermined criteria.
DEFINITION OF TERMS

Delphi Method: “Delphi technique is designed as a group communication process that aims at conducting detailed examinations and discussions of a specific issue for purpose of goal setting, policy investigation, or predicting the occurrence of future events” (Hsu & Sandford, 2007, p. 1).

Modified Delphi Method: “It utilizes rounds of a survey, with questions dropping off, new questions being added, and participants being able to see anonymous responses from other participants. Unlike the original Delphi, a modified Delphi method provides panelists with opportunity to provide their comments between rounds” (Murray & Hammons, 1995, p. 425).

Web-based Delphi: Web-Based Delphi, a kind of Technology-Enhanced Delphi, is an electronic form of Delphi using the Internet and World Wide Web as a primary data collection point (Andrews & Allen, 2002).

IT Governance: “IT governance is the decision rights and accountability framework for encouraging desirable behavior in using IT” (Weill & Ross, 2004, p.2).

CIO: Universities “use the title of chief information officer (CIO), vice president, vice provost, or associate vice chancellor to identify the single individual who is nominally responsible for guiding, shaping, and coordinating the overall condition of IT on campus” (McCredie, 2006, p. 4).

AAU: The Association of American Universities (AAU) is an association of 62 leading public and private research universities in the United States and Canada. Membership in AAU is by invitation and is based on the high quality of programs of academic research
and scholarship and undergraduate, graduate, and professional education in a number of fields, as well as general recognition that a university is outstanding by reason of the excellence of its research and education programs (AAU, 2010).

RUCC: Research University CIO Conclave (RUCC) is defined as a group of CIOs that are members of AAU. All of the members are a CIO or equivalent.

Technology Education: “Technology education is an educational program that helps people develop an understanding and competence in designing, producing and using technology products and systems and in assessing the appropriateness of technological actions” (Foster, 1994, p. 20).

EDUCAUSE: “EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. EDUCAUSE helps those who lead, manage and use information resources to shape strategic decisions at every level” (www.educause.edu).

CHAPTER SUMMARY

Research universities have already adapted to rapid environmental change, especially technology-wise, and information technology governance falls in this same category. Most universities refer to IT governance as a structure that has evolved over the past thirty years. Recently, the need for an understanding of what has been missing and what needs to be thoughtfully designed has intensified.

IT governance is “the decision rights and accountability framework for encouraging desirable behavior in using IT” (Weill & Ross, 2004, p.2). The challenge is to recognize the decisions that need to be made and individuals who have either decisions rights or input to IT
decisions. The components of IT governance can be defined as recognition of major IT
decisions related to leadership, other stakeholders and individuals who have decision rights
or are capable of providing input to IT decisions.

Through a three-round modified Delphi method, this study is designed to identify the
components of information technology governance in higher education according to the
members of Research University CIO Conclave.
CHAPTER 2: LITERATURE REVIEW

Information technology (IT) has a vast impact on almost every aspect of higher education institutions, including research productivity, student experience, educational performance, campus-wide learning systems, faculty experience, finances, recruitment, and program design. This means that IT leaders in those institutions must consider a broad set of stakeholders when making major decisions (Chester, 2006).

There is remarkable sensitivity and difficulty involved in investment decisions for IT departments within higher education institutions. Every department has a specific need and perhaps a budget to fulfill this need; however, there are so many elements involved in the process that the simple fact of who will make the decision remains controversial and complex (Weill & Ross, 2004).

This study began with a literature review that spanned major aspects of governance and IT in higher education. Based on what has been learned, the subject for research was narrowed to identifying components of IT governance in higher education. The targeted group was chief information officers (CIOs) of research-intensive universities in the US who are members of the Research University CIO Conclave (RUCC). The study employed the modified Delphi method using web-based instruments to survey the CIOs participating on the expert panel. Three rounds of surveys were conducted to produce consensus among those experts.
Research I Universities

The Carnegie Commission on higher education was established in 1967. One of the commission’s immediate tasks was to formulate a well-defined system for ranking U.S. colleges and universities. As explained by Alexander C. McCormick, the director of the Carnegie Classification Project, in 1973 the commission developed a new classification scheme for colleges and universities and published the results, to help many individuals and organizations that are engaged in research on higher education (McCormick & Zhao, 2005).

The first Carnegie Classification (1971) was based on the number of degrees awarded, federal research funding, curricular specification, admission selectivity, and the preparation of Ph.D. recipients. The system grouped educational institutions into five major categories (McCormick & Zhao, 2005):

1- Doctoral-Granting Institutions
2- Comprehensive Colleges
3- Liberal Art Colleges
4- Two-Year Colleges and Institutions
5- Professional Schools and Other Specialized Institutions

Although the initial intention behind the classification was not to label universities, identifications such as “Research University” or “Liberal Art College” were adopted to categorize higher education institutions. For example, in 2000 the Carnegie Foundation eliminated the categories of “Research Universities I & II” and “Doctoral Universities I & II” in favor of two new classifications:
1. Doctoral/Research Universities or Extensive, which award doctorates in sizeable numbers across a wide range of disciplines.

2. Intensive, which are universities that bestow doctorates in smaller quantities or for a narrower set of subjects.

However, the Commission did not anticipate that the new classifications would be abbreviated to “research-extensive” and “research-intensive.” This abridgment of the terms led to confusion in that “research-intensive university” came to be generally applied to universities labeled *extensive* and rarely to those identified as *intensive* (McCormick & Zhao, 2005).

For the purpose of this research, the phrase “research-intensive universities” refers to universities that are largely involved in research and award large numbers of doctorates in very diverse programs.

*Association of American Universities*

The Association of American Universities (AAU) is a nonprofit organization of 62 leading public and private research universities in the US and Canada. Founded in 1900 to advance the international standing of U.S. research universities, the AAU today focuses on issues that are important to research-intensive universities, such as funding for research, research policy issues, and graduate and undergraduate education. Membership in the association is by invitation (AAU, 2010). AAU universities try to maintain a productive relationship with the federal government in order to better contribute to the nation’s economy. “AAU member universities in the United States award more than one-half of all U.S. doctoral degrees and 55% of those are in the sciences and engineering” ("AAU Facts
and Figures," 2009). The Research University CIO Conclave (RUCC) consists of Chief Information Officers (CIOs) who are members of the AAU.

**INFORMATION TECHNOLOGY AND LEADERSHIP**

*Leadership Traits and Characteristics*

Leadership is a journey in pursuit of accomplishments toward a clear vision while providing opportunities for positive change. A clear vision, which supports long-term success and values short-term achievements, is vital. A flexible leader believes in people, motivates and encourages them to succeed together, and allows them to assume some of the leadership roles to make them feel valued and involved. Each individual deserves to be given an opportunity to contribute to the goal and present improvements. An intelligent leader is a constant learner who provides an open environment for the individuals to learn (Iyengar, 2007).

An effective leader adapts to the circumstances while maintaining openness and integrity, perceiving the multiple perspectives to an issue, and remembering the broader objectives and possible outcomes.

The literature has defined the following major leadership styles: autocratic leadership, bureaucratic leadership, charismatic leadership, democratic leadership, laissez-faire leadership, people-oriented leadership, servant leadership, task-oriented leadership, transactional leadership, and transformational leadership (Chester, 2006).

Although transformational leadership is often highly effective in business, there is no one “right” way to lead or manage that suits all situations. An effective leader will switch
wisely between styles according to the people and work. This is often referred to as “situational leadership.”

**IT Leadership in Higher Education (Chief Information Officer)**

The responsibility of Chief Information Officer (CIO) was among the first items to be addressed in literature dealing with the position of CIO in higher education institutions (Robert I. Benjamin, 1985; Rockart, 1980). The CIO role also depends on the level of acceptance of information technology in the organization or higher education institution (Rockart, 1980), 1980), in addition to the acceptance of incorporating information technology in to the strategic planning (Iyengar, 2007).

The chief information officer (CIO), vice president, vice provost or associate vice chancellor recognizes an individual who is technically accountable for directing, determining and managing the global state of information technology for the institution (McCredie, 2006).

The chief information officer is a fairly new executive position compared to the chief financial officer position. For that matter, the CIO career path is not as well-defined and standardized as its peers. However, the CIO role in higher education is very complex and has been in existence for more than 25 years (Brown, 2009).

Wayne Brown has conducted an extensive research study focusing on 325 CIOs from two and four year higher education institutions. According to Brown, the role of CIO is multifaceted and can be characterized as follows:

The CIO position may act as a business partner to assist in strategic planning and to help modify business procedures. The CIO generally functions as the key IT support
provider, whom is responsible for establishing a firm foundation for a responsive IT department. The CIO will most likely be involved in supervising contracted relationships with IT vendors. Ensuring and securing the accuracy of the institution’s data would be the CIO’s principal responsibility along with assuring the alignment of the IT department with that institution. The integration of all internal and external systems will be uppermost on the CIO’s agenda. Finally, the CIO position can serve the role as an educator to champion the use and understanding of computers and endorse how IT innovations can bring value to an organization (Brown, 2009).

There are two chief objectives of higher education: (1) improvement of self, family, employers, and society at large through learning, and (2) the generation, exchange, and distribution of knowledge for the advancement of all. To succeed in meeting these goals over the long term, colleges and universities must be economically proficient, be able to respond and adjust to the desires of their stakeholders, serve the greater good of the public, and exhibit effective judgment and leadership (Kelley & Sharif, 2005).

A CIO must be able to contribute to these goals. Studying and utilizing technological systems is an effective means to accomplish this endeavor. Technological systems are defined as man-made, intelligent-based resources, which have four interrelated components: tools, skills, information, and processes. All four components are required to operate concurrently and interact dynamically in order for a technological system to perform successfully. Technological innovation is the foundation for competition among modern organizations. This means that engendering sound decisions about which technologies to recommend and justifying these recommendations to presidents, provosts, and governing
boards is one of the chief responsibilities of CIOs in all progressive organizations, including academic institutions. This is a significant and challenging component of a CIO’s profession; and some presidents have admitted that these proposals from a CIO are not always understandable (Kelley & Sharif, 2005).

Kelley and Sharif (2005) have attempted to define a clearer description of the CIO’s role within the campus community:

- Develop a vision for the role of technology systems, consistent with organization’s mission and objectives, constituent goals and needs, economic responsibility, and community concerns.
- Implement that vision through the effective stewardship of resources and thorough communication with all constituencies.
- Focus questions about the benefits, disadvantages, and issues surrounding technological systems, which are in use or under consideration in the institution, as well as those in use elsewhere.

When considering this description, the CIO’s role has an expansive reach within the institution. CIOs are generally not engaged in a struggle to convince management that particular technology systems are needed. “Instead, through discussion, reciprocal influence, and collaborative learning, the CIO can influence campus stakeholders, and these agents can influence the CIO and president so that one vision results” . Of course, these decisions are subject to continual review. Overall, a CIO can make significant contributions to the collaborative vision for the future successes of higher education institutions (Kelley & Sharif, 2005, p. 41).
INFORMATION TECHNOLOGY GOVERNANCE

Definition

“IT Governance is the process by which firms align IT actions with their performance goals and assign accountability for those actions and their outcomes. To be effective, IT governance must be actively designed, not the results of isolated mechanisms (e.g. steering committee, office of IT architecture, service level agreements) implemented at different times to address the challenge of the moment” (Weill & Ross, 2004, p.I).

The Information Technology Governance Institute (ITIG) defines IT governance as “the leadership, organizational structures, and processes that ensure that the enterprise’s IT sustains and extends the enterprises strategic and objectives”. ITIG in the 2nd edition of Board Briefing on IT Governance (2003) adds that “While governance developments have primarily been driven by the need for the transparency of enterprise risks and the protection of shareholder value, the pervasive use of technology has created a critical dependency on IT that calls for a specific focus on IT governance” (ITGI, 2003, p. 7).

“IT governance is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategies and objectives”(ITGI, 2003, p. 10).

As IT Governance Institute defines information technology has major role in establishing and success of the social and economical activities, especially in the global perspective. Although incorporation of the technology to the global organizations processes and transactions seems inevitable but understanding the risks associated with introducing new technologies to the corporations is essential to be successful. According to the IT Governance Institute some of
the challenges and concerns that organizations encounter can be defined as aligning IT strategy with the business strategy, cascading strategy and goals down into the enterprise, providing organizational structures that facilitate the implementation of strategy and goals, insisting that an IT control framework be adopted and implemented, measuring IT's performance. To address these concerns, the executive officers need to extend the governance layer of an organization. Developing the IT governance processes and effective implementation of an IT governance framework are the responsibilities of the board of directors and executive officers (ITGI, 2003; Weill & Ross, 2004).

**Governance Model**

Value generated from the information technology (IT) investment has been a center of attention for organizations. It is very clear that there is a great need for aligning IT-related decisions and organizational performance goals as they influence one another.

“IT Governance is the process by which firms align IT actions with their performance goals and assign accountability for those actions and their outcomes. To be effective, IT governance must be actively designed, not the results of isolated mechanisms (e.g. steering committee, office of IT architecture, service level agreements) implemented at different times to address the challenge of the moment” (Weill & Ross, 2004, p. I).

As important as IT governance sounds specially in increasing profitability, it remains a mystery to major decision makers in organizations. Based on the best practices of 300 companies in 23 countries, only 38% of senior managers are aware of IT governance in their
companies. The results also reflect a 20% higher profit for the companies with effective IT governance when compared to other firms with similar strategies. (Weill & Ross, 2004)

Two research scientists, Peter Weill and Jeanne Ross at MIT define IT governance as, “specifying the decision rights and accountability framework to encourage desirable behavior in using IT. IT governance is not about making specific decisions - management does that – but rather determines who systemically makes and contributes to those decisions” (Weill & Ross, 2004, p. 2).

In order to maintain an IT decision-making process, each organization has a different combination of committees, meetings, councils, etc. in place. This combination can bring a different level of complexity into the process, which often makes it unreachable. As IT plays a significant role in the overall success of general performance goals, this combination should precisely look at and be designed to meet IT alignment requirements. A framework could respond to complexity. A framework can specify a decision making process, and include people that make the critical decisions and are accountable for the type of the decisions to be made in the environment that is involved.

There are different varieties of frameworks that have been introduced to the corporate world throughout the years, ITIL, Six Sigma, COBIT are few examples.

Peter Weill and Jeanne Ross (2004) have done an extensive research with 300 enterprises in 20 countries and developed the IT governance framework that can be developed by any organization. The framework includes three major components of domains, styles and mechanisms. Each component provides a question that by answering, any organization can design its decision making methodology towards IT governance.
Domains: What decisions need to be made?

In order to map the organizational business principles to IT principles, Weill has defined five major decisions (Table 1):

1. *IT principles*: How does IT create business value?
2. *IT architecture*: Integrated technical choices to guide the organization in satisfying business needs.
3. *IT infrastructure*: How to build centrally coordinated shared IT services?
4. *Business Application needs*: Business requirements for purchased or internally developed IT applications.

*Prioritization and investment*: How much and where to invest IT (Weill & Ross, 2004, p. 10).
# Table 1

**Key Issues for IT Decisions**

<table>
<thead>
<tr>
<th>Decision Points</th>
<th>Definition</th>
</tr>
</thead>
</table>
| IT Principles   | How do the business principles translate to IT principles to guide IT decisions making?  
What is the role of IT in business?  
What are IT desirable behaviors?  
How will IT be funded? |
| IT Architecture | What are the core business processes of the enterprise? How are they related?  
What information drives these core processes? How must this data be integrated?  
What technical capabilities should be standardized enterprise-wide to support IT efficiencies and facilitate process standardization and integration? |
| IT Infrastructure | What infrastructure services are most critical to achieving the enterprise’s strategic objectives?  
What infrastructure services should be implemented enterprise-wide and what are the service-level requirements of those services?  
How should infrastructure services be priced?  
What is the plan for keeping underlying technologies up-to-date?  
What infrastructure services should be outsourced? |
| Business Application Needs | What are the market and business process opportunities for new business application?  
How are strategic experiments designed to assess success?  
How can business needs be addressed within architectural standards? When does a business need justify an exception to standard?  
Who will own the outcomes of each project and institute organizational changes to ensure the value? |
| IT Investment and Prioritization | What process changes or enhancements are strategically most important to the enterprise?  
What is the distribution in the current IT portfolio? IS this portfolio consistent with the enterprise’s strategic objectives?  
What is the relative importance of enterprise-wide versus business unit investments? Do actual investment practices reflect their relative importance?  
What is the right balance between top down and bottom projects to balance standardization and innovation? |

©2004 MIT Sloan Center for Information Systems Research (Weill & Ross, 2004, p. 4)
Styles: Who has input and/or decision rights?

Who is making decisions and how they are involved in the process? Weill and Ross define six major groups or archetypes. Following is listed in order from more to less centralized:

1. *Business monarchy*: A senior business executive or a group of senior executives, including Chief Information Officer (CIO)
2. *IT Monarchy*: IT directors or executives acting as an individual or in the form of a group
3. *Federal*: Higher level executives and business representatives
4. *IT duopoly*: IT executives and business leaders; both parties are involved in decision making
5. *Feudal*: Business units’ leaders make isolated decisions based on their needs
6. *Anarchy*: Individual user/small group

Weill and Ross propose a matrix based on five decisions and six archetypes, which presents the IT governance (see Table 2) (Weill & Ross, 2004, p. 11).

Table 2

*IT Governance model*

<table>
<thead>
<tr>
<th>Domain</th>
<th>Archetype</th>
<th>IT Principles</th>
<th>IT Architecture</th>
<th>IT Infrastructure Strategy</th>
<th>Business Application Needs</th>
<th>IT Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Monarchy</td>
<td>IT Monarchy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feudal</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Federal</td>
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<tr>
<td></td>
<td>Duopoly</td>
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</tr>
<tr>
<td></td>
<td>Anarchy</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

©2004 MIT Sloan Center for Information Systems Research (Weill & Ross, 2004, p. 11)
Mechanisms: How IT governance designed and implemented?

Last two steps define who is responsible in decision making process and how the decision should be made. Next step is how to implement IT governance by defining structures, committees, service level agreements, charge back, etc. It is important to include the means of communication throughout the groups and committees. Weill and Ross model proposed three mechanisms to specify the implementation of IT governance:

1. **Decision-making structures:** Organizational committees and roles specify who is responsible for decisions.

2. **Alignment processes:** Alignment processes are IT management techniques which provide effective input into governance decisions. IT investment proposal process, service level agreements, project tracking and formal tracking of business value of IT are just a few to name.

3. **Formal communication:** There should be a formal communication process in place in order to keep the involving parties informed of the decisions made. Senior management announcements and formal committees are good examples (Weill & Ross, 2004, p. 6).
**Enterprise IT Governance**

Most of the organizations’ leadership team has been presented in three major layers: operational level, management level and strategic level as shown in Figure-2. Enterprise IT governance is presented in each of these layers, which indicates that both IT and business parties have to be involved in the IT governance processes and their roles and responsibilities should be defined within the framework. IT governance implementation requires defining structure (roles and responsibilities), processes and relational mechanisms at each of the operational, management and strategic levels within an enterprise (Figure 2).

“Organizational units and roles responsible for making IT decisions” form the structure of the IT governance. It defines how IT governance framework structurally organized and it empowers communication between business and IT management. Steering Committees are an example of such structure (Grembergen & Steven, 2009, p.22).

IT governance processes refer to “formalization and institutionalization of strategic IT decision-making to ensure that daily behaviors are consistent with policies”. IT balanced scorecard is an example of such processes (Wim Van Grembergen & Steven De Haes, 2009, p. 23).

![Figure 2. Structure, Processes and Relational Mechanisms of Enterprise IT Governance (Wim Van Grembergen & Steven De Haes, 2009, p. 22)]
The relational mechanisms are defined as “the active participation of, and collaborative relationship among, corporate executives, IT management and business management” (Wim Van Grembergen & Steven De Haes, 2009, p. 23).

Grembergen and De Haes has identified 33 practices or Enterprise IT governance and classified them in three categories of structure, processes and relational mechanism. This set of practices was partially used in creating the instrument for Round I of this modified Delphi study as initial components of IT governance (Wim Van Grembergen & Steven De Haes, 2009).

**Higher Education IT Governance**

In recent decades higher education institutions increasingly rely on information technology to achieve their administrative, academic and research goals. As a result, institutional governance needs to include IT as one of its major components and a call for an IT governance framework seems a necessity. Decision making process and rights are even more complex in higher education institutions compared to private or public organizations, where decision making involves sharing information and processes among faculty, administrators, students, board members and institutional executive officers such as Chancellor, President, Provost and CIO.

Andrew Clark, in his research in the field of IT Governance, indicates that institutional leaders who are known as governance designers have three major objectives (Clark, 2005). Understanding how IT is currently governed and providing improvements in the areas that IT does not generate expected value to the institution is their major goal. It follows by defining major IT decisions that need to be made and involving major
stakeholders throughout the institution in the decision-making process. They also ensure the alignment of IT investment with institutional goals and objectives through the governance processes.

*IT Governance Tools*

During past decades several standard IT governance frameworks and methodologies have been developed. After evaluating different methodologies, organizations can take on the available IT governance standards which have been perfected and used by companies throughout the years or approach governance in ad hoc basis and develop their own framework. Implementing IT governance following either approach will provide a number of benefits to the organization. Upon an extensive research, following table (see Table 3) list the well-known tools, methodologies and standards of IT governance (Spafford, 2003):

Table 3

*IT Governance Tools*

<table>
<thead>
<tr>
<th>IT Governance Tools</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITIL</td>
<td>Information Technology Infrastructure Library</td>
</tr>
<tr>
<td>COBIT</td>
<td>Control Objectives for Information and related Technology</td>
</tr>
<tr>
<td>ASL</td>
<td>Application Services Library</td>
</tr>
<tr>
<td>CMM/CMMI</td>
<td>Capability Maturity Model/ Capability Maturity Model Integration</td>
</tr>
<tr>
<td>Six Sigma</td>
<td>Six Standard Deviations from mean</td>
</tr>
<tr>
<td>SAS70</td>
<td>Auditing Standard</td>
</tr>
<tr>
<td>ISO 17799</td>
<td>Standard for information security</td>
</tr>
<tr>
<td>SOX</td>
<td>Sarbanes-Oxley Act of 2002</td>
</tr>
<tr>
<td>Weill &amp; Ross IT Governance Model</td>
<td></td>
</tr>
<tr>
<td>Weill &amp; Ross IT Governance Assessment</td>
<td></td>
</tr>
<tr>
<td>IT Governance Assessment Process (ITGAP)</td>
<td></td>
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</tbody>
</table>
Effective IT Governance

As McCredie and Yanosky (2008) present in their research, IT governance effectiveness can be positively connected to frequent constituent participation, effective communication of IT governance decisions and processes, and key participants understanding of the IT governance.

Relationship oriented factors has a major role in the success and effectiveness of IT governance, such as leadership support, key individuals’ roles and responsibilities, and participation of stakeholders. The absence or insufficiency of an IT governance structure and processes are recognized as major factors for ineffective IT governance (Yanosky, 2008)

IT governance performance and effectiveness can be measured with the parameters such as cost effective use of IT, effective use of IT to enhance teaching and learning, effective use of IT to enhance research, effective use of IT to enhance administrative processes and institution’s ability to develop important policies, such as privacy, security and business continuity; to implement important IT decisions, and to coordinate IT personnel activities effectively.

Chapter Summary

Information technology has a vast impact on almost every niche in higher education institutions. The spectrum of impact is so broad that it makes it impractical for IT leaders in higher education institutions to make high-level IT decisions without major input and acceptance from stakeholders. There is remarkable difficulty involved in investment decisions for IT departments that the simple fact of “who will make the decision” remains controversial and complex.
This research study began with a literature review that combines major fields of governance and information technology in higher education. This chapter reviews the available knowledge base in the definition of research universities according to the Carnegie Commission on higher education, Association of American Universities (AAU) and the Research University CIO Conclave (RUCC). It also provides the basic background knowledge necessary to comprehend the concept of leadership and information technology governance and what it means for higher education institutions. The basic IT governance tools have been introduced through this literature review as well as the best known IT governance model in industry.

This research used the body of literature and the modified Delphi methodology to draw consensus among CIOs of higher education institutions that are members of RUCC and provide a list of information technology governance components for higher education institutions.
CHAPTER 3: RESEARCH METHODOLOGY

THE MODIFIED DELPHI METHOD

The Delphi technique was initially developed and utilized by the Rand Corporation for an Air Force-sponsored study in 1953. It has long been used as a consensus-building and forecasting method in research, by employing a series of questionnaires to gather data from a panel of experts (Dalkey, 1969; Dulkey, 1963; Hsu & Sandford, 2007; Linstone & Turoff, 1975; Martino, 1983; Sarah J. Young, 2001). Delphi is “a method for the systematic collection and aggregation of informed judgments from a group of experts on specific questions or issues,” as Reid defines (Reid, 1993, p. 131).

“Delphi technique is designed as a group communication process that aims at conducting detailed examinations and discussions of a specific issue for the purpose of goal setting, policy investigation or predicting the occurrence of future events” (Hsu & Sandford, 2007, p. 1). Linstone and Turoff (1975, p.3) characterize Delphi as “a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.”

Although some recognize Delphi as a “well-known, popular and a well-established management technique” (Beech, 1991, p. 208), others believe that Delphi is not widely acknowledged (Critcher & Gladstone, 1998).

The modified Delphi technique is very similar to the Delphi technique in regard the series of rounds with selected expert panels reaching consensus. The major difference is that modified Delphi technique starts with a questionnaire that includes a set of carefully selected items compared to the Delphi technique, which starts with an open-ended questionnaire. The
pre-selected items will be chosen through extensive research and literature review. The modified Delphi technique improves the first round response rate and creates a solid platform based on previous researches (Rodney Custer, 1999).

Delbecq, Van de Ven, and Gustafson (1975) believe that the Delphi method can be used to achieve objectives, such as obtaining information, which may generate a consensus on the part of the respondent group, exploring future scenarios for the purpose of making informed decisions, determining or developing a range of possible program alternatives, discovering and exposing underlying assumptions or information leading to diverse judgments, correlating informed judgments on a topic, which spans a wide range of disciplines and finally educating the respondent group as to the diverse and interrelated aspects of the topic (Delbecq, Van de Ven, & Gustafson, 1975).

Hsu and Sandford highlight some of the major characteristics of Delphi (Hsu & Sandford, 2007). Delphi, in contrast to other data gathering and analysis techniques, employs multiple iterations designed to develop a consensus of opinion concerning a specific topic. Delphi technique has the ability to provide anonymity to respondents, which can reduce the influence of dominant individuals. Furthermore, controlled feedback in the Delphi process is designed to diminish the affect of noise or interference (Dalkey, 1969). He also believes that Delphi technique has the ability to use a variety of statistical analysis procedures to interpret data. This lessens the potential of conformity due to group pressure.

Hsu and Sandford also indicate drawbacks in the Delphi technique that should be considered when planning the process. The questionnaire method, which is used to collect data in the Delphi technique, may hamper communication, especially during the period
between rounds. This delay can be reduced to a degree by using electronic means of communication (e.g. email to impart communiqué and to follow up with respondents). Low response rates have always been a concern with the Delphi technique. Inadvertent influence on feedbacks is a concern as well. Surveying panelists about their limited knowledge of the topic, rather than soliciting their expert opinions, is also a matter that needs to be monitored (Hsu & Sandford, 2007).

Essentially, the pure format of the Delphi is used to predict the future, especially in the case of education. It primarily refers to research programs or policies, as there is a lengthy lag time between the initial decision making process and the measurement of the observable impact. Factors that have a major role in the current state of decision making may not be the most significant factors to consider in the long-term shaping of plans and policies. This relates to the educational choices that have both long-term consequences and immediate impacts. For that matter, incorporating the use of forecasting tools becomes more important. The purpose is to continually conduct and assess studies for the future. Delphi is used to develop long-term forecasts (Weaver, 1971).

Similar to the field of education, forecasting in the area of information technology is not a straightforward task. Technological forecasting evaluates possible future developments and options executives will use in their long term planning and decision making process. Rowlands (1969) believes that long-term planning and decision making process can significantly benefit from Delphi technique. The Delphi technique makes effective use of an expert panel’s opinion. Furthermore, there are no absolute answers to the research questions that have been fed through a Delphi but a Delphi can provide a probabilistic forecast that can
be used by decision makers and executives in the field of information technology (Rowlands, 1969).

There is always a factor of uncertainty in forecasting the future. A statement about the future can be accepted by the critics but cannot be proven false, even when what was foretold does not happen. Delphi is not a perfect tool for predicting the future. It has weaknesses, which is inherited from the nature of “forecasting.”

Despite its imperfections, the Delphi method has its advantages. Many researchers believe that the Delphi methodology is a valuable tool for planning (Martino, 1983). In order to determine the appropriateness of using the Delphi methodology for this research study, the criteria that Linstone & Turf (1975) established was used. They believe that if there is a problem that analytical techniques do not seem to be helpful in addressing the issue, the Delphi can be used as a subjective judgment solution. However, if the contributing experts attempting to reach an agreement are from diverse backgrounds or geography that makes it difficult to meet face to face, using Delphi methodology is helpful. In this scenario, time and cost requirements to make group meetings will be impractical. In the cases of severe disagreement on an issue, the communication process should reserve the anonymity of the participants. Delphi methodology also prevents the domination of the power of specific experts to bias the results and for that matter the Delphi process assures the validity of the results.

This study meets most of these criteria. Currently, there are no severe disagreements or politically unpleasant situations. Regardless, this study greatly benefited from the anonymity of its participants.
Delbecq, Van de Ven and Gustafson (1975) recommend that three groups of experts are qualified to be subjects of a Delphi study. First is the top management decision makers, who will utilize the outcomes of the Delphi study. Second is the professional staff members, together with their support team. Finally is the respondents to the Delphi questionnaire, whose judgments are being sought.

As most of the criteria were met and because of the need to have consensus on the components of information technology governance in higher education institutions according to the members of Research University CIO Conclave, a modified Delphi method was used to conduct this research study, which adds to the knowledge base of the profession. (Delbecq and et., 1975; Linstone & Turf, 1975).

**Research Question**

For the purpose of this study, the following research question has been proposed:

What are the components of information technology governance in higher education institutions according to the members of Research University CIO Conclave?

**Hypothesis**

H₀: There is no agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.

The alternative hypothesis:

H₁: There is an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.
RESEARCH METHODOLOGY

This research study began with a literature review as it combines major fields of governance and information technology. Based on what had been learned, the research subject for this study was narrowed down to identifying components of IT governance in higher education. The targeted group was the chief information officers of research intensive universities in United States that were members of Research University CIO Conclave (RUCC). The study used the modified Delphi method to conduct the research. The modified Delphi method was implemented using Web-based instruments to collect consensus data. This study was consisted of three rounds to obtain consensus among expert panels that were CIOs of higher education institutions and members of Research University CIO Conclave (RUCC).

Linstone (1975) recommended using three or four round process in Delphi research methodology in order to achieve maximum input and reflection from panel members. Research has shown that using more than three rounds of the modified Delphi method does not add major value to the study (Clayton, 1997). Meyer (2001) believed that increasing the number of rounds in the modified Delphi did not enhance the accuracy, but it enhanced the level of agreement (Meyer & Booker, 2001).

A review panel with three members was chosen randomly from the chief information officers of the American research intensive universities that were members of RUCC to review materials and provide suggestions before any material was sent to the expert panel in any given round of the study. The review panel also tested the instrument before each round.
Participants remained anonymous to each other to avoid the effects of dominant individuals (Hsu & Sandford, 2007).

The Round I instrument of the modified Delphi method in the format of an open-ended survey was formed based on the literature review. Generating a structured questionnaire based upon an extensive literature review was an acceptable and very common approach used in Round I of Delphi research methodology (Chia-Chien Hsu, 2007). After the instrument was finalized and approved by the review panel, the Delphi instrument was sent to the expert panel through a link embedded in an email, via an online survey publisher. In the first round, experts were asked to keep, reject, modify or add a new component. A reminder email was sent after two weeks to the expert panel. After receiving the responses back from the expert panel, results were analyzed and structured for Round II.

The Round II instrument of the modified Delphi method included responses generated by the first round and was reviewed by the review panel prior to notifying the expert panel. In this round, members of the expert panel were asked to value and rank the components identified in Round I on a five point Likert-scale. As a result of Round II, areas of disagreement and agreement were identified (Hsu & Sandford, 2007).

In Round III, the final round of the modified Delphi method, an instrument was sent to the expert panel and they were asked to revise their judgment by accepting or rejecting the components. Based on analysis of data collected in rounds I, II and III conclusions were drawn and the information technology governance components for higher education institutions in US were recognized. Figure-1 shows the graphical representation of the Delphi methodology used in this research.
Figure 1. Graphical representation of Delphi methodology
RESEARCH PARTICIPANTS

Delphi Panel Selection

Selection of appropriate experts qualified in the subject area is critical for a successful study using Delphi methodology. An effective panel selection increases the credibility and therefore the quality of the results. As the top management decision makers are one of the three groups that Delbecq, Van de Ven and Gustafson (1975) recommend as qualified to be subjects of Delphi study, it was certain that the members of Research University CIO Conclave are a perfect match for this study.

This study used email as a tool for panel selection over a traditional approach of mailing via a postal service. Time and cost are two primary advantages of this tool (Andrews & Allen, 2002). According to Lang (1998), in order to select participants, qualifications of desirable respondents should be recognized. For this study based on a modified Delphi method, the selection of the expert panel was done purposefully and emails were sent to all potential panelists simultaneously (Appendix B). Compared to sending individual mailings, response time was decreased, and the cost of postage was eliminated (Lang, 1998).

The size of the expert panel is one of the key factors for achieving a successful Delphi study. Hsu (2007) states that if the size of the panel is too small, it may not provide sufficient representation of the target research area. Furthermore, if the size of the panel is too large, an extended amount of time would be required to process the ideas, which can result in a low response rate. To avoid difficulty in summarizing and processing ideas and items generated by expert panel, Delbecq, Van de Ven and Gustafson (1975) highly recommends 15 to 20 respondents. If the background of the Delphi subject is homogenous; the number of
respondents can be reduced from 5 to 10 individuals. Ludwig (1997) also suggests that the majority of the Delphi studies have used between 15 and 20 respondents (Ludwig, 1997).

Regarding the criteria used to guide the selection of the Delphi panels, Hsu (2007) recommends that, in order to be eligible for an invitation to participate in the Delphi study, each individual must have experience related to the target issue, be capable of providing knowledgeable inputs, and be willing to compromise in order to achieve a consensus. For the purpose of this study, the following eligibility requirements were applied in order to serve as a member of the expert or the review panel. The panel member should hold the position of Chief Information Officer (CIO) or equivalent in one of the American Universities and be a member of Association of American Universities (AAU) and Research University CIO Conclave (RUCC).

**Group Nomination**

To select potential participants, an email was sent to all the members (currently 62) of the Research University CIO Conclave (RUCC). The email described the purpose of the study and inquired about interest in participation (Appendix B). The eligibility of the every respondent was verified. Fifteen participants out of those who agree upon participation were randomly chosen (using a random number generator). They formed the initial group, which is a combination of the expert and review panels. They were contacted through email to explain the study and process. The email contained an invitation letter (Appendix B) and the “Study Overview and Participation” document (Appendix B).

As Meyer (2001) indicates, the next step was to identify members of the review panel to pilot test all instruments of the Delphi study before delivery to the expert panel. The expert
panel members were selected randomly from the initial group of 17 respondents. This selection process placed all the names in a box and randomly chose 15 of the 17. Eleven of these served as the expert panel and the next four random names picked formed the review panel (Meyer & Booker, 2001). The remaining two names did not participate in the study. For the purpose of this study, researcher refers to them as the reserved group.

**INSTRUMENT DESIGN AND DATA COLLECTION**

**Round I**

The development of the Round I instrument (Appendix C) of the modified Delphi method was developed based on information gathered through the literature review. The components of IT Governance for higher education that gleamed from the literature were placed in a web-based survey instrument.

In order to provide better understanding of the study and clarifying the type of information needed, the Round I instrument included examples of the IT Governance components derived from the extensive research review conducted by the researcher. The major goal of Round I was to gather information on the components of IT Governance as stated in the research question.

Instrument one was sent to the review panel for the initial assessment. This instrument was revised based upon the review panel’s feedback. After their approval, Round I instrument was sent to the expert panel through email and the web-based survey instrument. A reminder email was scheduled for two weeks after the initial email for Round I (Appendix C). Once the responses from the expert panel were received, all answers were processed and the new suggestions/changes were incorporated in the instrument design for Round II.
**Round II**

The design of the Round II instrument of the modified Delphi method was based on rating of the information technology governance components that have been gathered and processed through Round I. Instrument two was developed by putting together all the information technology governance components that have been gathered in Round I and created a comprehensive list. After developing instrument two, it was sent to the review panel for their review and feedback. The approved and final version of the instrument was sent to the expert panel. The major goal of this round was to rate the responses given in Round I. Linstone and Turoff (1975), believe that a rating system must be established for such items as the relative importance, desirability, confidence, and feasibility of various policies and issues.

In the Round II instrument (Appendix D), expert panel members were asked to accept or reject only the comprehensive list of information technology governance components. The Likert Scale was utilized to rate the outcome of Round I. It has been over three decades that researchers have been using the Likert Scale, which was developed by Rensis Likert. He explained it as “A technique for the measurement of attitudes” (William E. Arnold, 1967, p. 31). Arnold also recommended four research areas that can benefit from using Likert Scale which are, measuring the credibility of an expert, an expert’s attitude towards a statement, evaluating speeches and a course by students. The Likert Scale works with a series of declarative statements. The expert panelists were asked to provide their opinion on a statement using five options. This scale used an opinion range of one to five, with one being “strongly disagree” and five being “strongly agree” (Table 4).
Table 4

*Likert Scale Definitions*

<table>
<thead>
<tr>
<th>Likert Scale</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td><em>Strongly Agree</em> that this component should be considered as one of the</td>
</tr>
<tr>
<td></td>
<td>components for the effective IT governance for higher education institutions</td>
</tr>
<tr>
<td>4</td>
<td><em>Agree</em> that this component should be considered as one of the components for the effective IT governance for higher education institutions</td>
</tr>
<tr>
<td>3</td>
<td><em>Neutral</em> position that this component should be considered as one of the effective components for the IT governance for higher education institutions</td>
</tr>
<tr>
<td>2</td>
<td><em>Disagree</em> that this component should be considered as one of the components for the effective IT governance for higher education institutions</td>
</tr>
<tr>
<td>1</td>
<td><em>Strongly Disagree</em> that this component should be considered as one of the effective components for the IT governance for higher education institutions</td>
</tr>
</tbody>
</table>

The rating system was incorporated into the web-based survey poll. The statistical mean was calculated for each component. Any component with a statistical mean greater than 3.01 was eligible for Round III.

*Round III*

The purpose of the Round III was to develop final consensus among expert panel, but the first step in Round III was to rank components in order of importance, meaning that expert panel members ranked the comprehensive list of IT governance components that have been accepted and rated by expert panel in Round II. Each expert panel member evaluated the list based on the level of importance of that specific component. Ranking the outcome from Round II took place in Round III (Meyer & Booker, 2001). Participants ranked each component in order of importance. To process the ranking of the components that were the result of Round II, components were listed randomly. To rank the components, each expert
panel member assigned one number to one component with the most important assigned the greatest value.

De Haes and Grembergen have conducted a modified Delphi research to gather consensus on the initial list of IT governance practices for the Belgian financial organizations (Wim Van Grembergen & Steven De Haes, 2009). According to them, modified Delphi method was very suitable technique for complex and interdisciplinary issues that often involves members of new or future trends. The goal of Round III of their 3-round Delphi research was to achieve greater consensus within the group. For that reason, at the end of the third round, they measured the degree of consensus between the experts by using Kendall’s Coefficient of Concordance W (Siegel & Castellan, 1988).

In this modified Delphi methodology, the researcher used the Kendall Coefficient of Concordance W in Round III to analyze data. After receiving responses, a list of the components of the IT governance for higher education was formed which reflects the expert panels’ ranking. The next step was to make sure that there has been an agreement on the list and their order of importance and the expert panel could be judged to have reached consensus. One way to measure consensus was to determine the degree of agreement among expert panel in their judgments. The Kendall’s Coefficient of Concordance is a measure that provides such an index (Siegel & Castellan, 1988).

The hypothesis for this test was:

$$H_0: \text{There is no agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.}$$
The alternative hypothesis for this test is:

$$H_a: \text{There is an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.}$$

Kendall’s Coefficient of Concordance, $\tilde{W}$, evaluates the degree of agreement between $m$ sets of ranks for $n$ subjects. Data needed to be arranged into a table with $n$ columns representing the components of information technology governance that has been passed from Round II to Round III and $m$ rows, representing the number of expert panel members who responded/ranked (Round III). Next, was to calculate the sum of the ranks ($T$) for each row of the table and then to calculate the variance of the $\sum (R)$ values, called $S$. The next step was to feed the sum of the ranks and the variance to the following formulas to calculate $S$ and $\tilde{W}$, the Kendall’s Coefficient of Concordance:

$$U = \sum (R)^2$$

$$S = \frac{(nU - T^2)}{n}$$

$$\tilde{W} = \frac{S}{\sqrt[2]{m^2n(n^2 - 1)}}$$
Table 5

*Kendall’s Coefficient of Concordance Formula Definition*

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>( m )</td>
<td>number of expert panel members who responded/ranked (Round III)</td>
</tr>
<tr>
<td>( n )</td>
<td>components that ranked by expert panel in Round III</td>
</tr>
<tr>
<td>( T )</td>
<td>Sum of the ranks, ( \sum (R) )</td>
</tr>
<tr>
<td>( U )</td>
<td>( U = \sum (R)^2 )</td>
</tr>
<tr>
<td>( S )</td>
<td>The variance of the ( \sum (R) ) values, ( S = \frac{(nU - T^2)}{n} )</td>
</tr>
<tr>
<td>( \tilde{W} )</td>
<td>Kendall’s Coefficient of Concordance, ( \tilde{W} = \frac{S}{\frac{1}{2}m^2n(n^2 - 1)} )</td>
</tr>
</tbody>
</table>

After the completion of the Kendall’s Coefficient of Concordance, \( \tilde{W} \), a final form with the components of information technology governance for higher education was created and a final copy was sent to the review and expert panels.
Modified Delphi Methodology – Data Analysis Chart

1. Develop Instrument One
   - Review Panel
   - Revised version of Instrument One
     - Expert Panel
     - Process responds

2. Develop Instrument Two (Likert Scale, rating)
   - Review Panel
   - Revised version of Instrument Two
     - Expert Panel
     - Data analysis
     - Develop Instrument Three
       - Review Panel
       - Revised version of Instrument Three
         - Expert Panel (Ranking)

3. Review the rankings and determine the degree of agreement among raters
   - Develop the components into final form
   - Email the final components into the participants

Figure 3. Data Analysis Chart
CHAPTER SUMMARY

This chapter explains the details of the procedure that the researcher took in order to conduct the modified Delphi technique. The major question to be asked for this research is what are the components of information technology governance in higher education institutions according to the members of Research University CIO Conclave? The main participants of this research were selected randomly to form expert and review panels. Three instruments were developed as part of the modified Delphi technique to be used by all participants. The main goal of the modified Delphi technique for this research was to reach consensus on the components of information technology governance for higher education institutions through three rounds.

This research study began with a literature review. Based on what has been learned, the subject for the research was narrowed down to identifying components of IT governance in higher education. The targeted group was the chief information officers of research intensive universities in the United States that were members of Research University CIO Conclave (RUCC). The study used the modified Delphi method to conduct the research. The modified Delphi method was implemented using web-based instruments to collect consensus data. This research focused on three rounds to obtain consensus among expert panels that were CIOs (chief information technology) of higher education institutions and members of the Research University CIO Conclave (RUCC). A review panel with four members was chosen randomly from the chief information officers of the American research intensive universities that were members of RUCC to review materials and provide suggestions before any material was sent to the expert panel in any given round throughout the research. The
review panel also tested the instrument before each round. It is important to mention that participants remained anonymous to each other to avoid the effects of dominant individuals (Hsu, 2007).

The Round I instrument of the modified Delphi method, in the format of a survey was formed based on extensive literature review. After finalizing the instrument and the approval of the review panel, the modified Delphi instrument was sent to the expert panel through a link embedded in an email via an online survey publisher. In first round experts were asked to keep, reject, modify or add a new component. A reminder email was sent after two weeks to expert panel. After receiving the responses back from the expert panel, results were analyzed and structured for the Round II.

Round II instrument of the modified Delphi method based on the responses generated by the first round and was reviewed by the review panel prior to notifying the expert panel. In this round, members of the expert panel were asked to value and rank the components identified in Round I on a five point Likert-scale. As a result of Round II, areas of disagreement and agreement were identified (Hsu, 2007).

In Round III or the final round of the modified Delphi method, the Round III instrument was sent to the expert panel and they were asked to revise their judgment by accepting or rejecting the components. Based on analysis of the data collected in Rounds I, II and III, conclusions were drawn, and the information technology governance components for higher education institutions in US were recognized.
CHAPTER 4: RESEARCH FINDINGS

My research was designed to identify the components of information technology governance in higher education institutions, based on input from members of the Research University CIO Conclave.

Weill and Ross (2004) found that many IT leaders are searching for a tool or a guideline that can define the components of IT governance. Such a tool or guideline would help an organization design its IT governance and also help identify how others represent and analyze decision rights (Weill & Ross, 2004).

Yanosky (2008) provided extensive research about the state of higher education IT governance. He identified practices that are associated with good IT governance. He showed that there is no single, determined framework claimed by CIOs of higher education to be used in IT governance processes and structures for higher education institutes. Therefore, to design and implement practical IT governance, they had to choose elements from frameworks available to organizations in general (and not specific to higher education), such as COBIT, ITIL, ISO 17799, and ISO 9000 (Yanosky, 2008).

Haes and Grembergen (2008) believed that IT governance best practices are divergent across industries. They also believed that IT governance best practices depend on the geographical area. Haes and Grembergen conducted Delphi research on designing an IT governance baseline for a Belgian financial services sector in Europe. An expert panel of 29 consultants, senior IT professionals, and senior business professionals in the financial services sector participated in the research. The research reveals 33 IT governance practices at the level of strategic and executive business leaders. It also ranked these practices by ease
of implementation and effectiveness. The final element of the research specified a minimum baseline for IT governance for the Belgian financial sector. Haes and Grembergen concluded that further investigation is needed to focus on other sectors (e.g., educational, human resources) that are operating in other countries and if applicable, in the United States (Wim Van Grembergen & Steven De Haes, 2009).

This research study began with an extensive literature review as it combines major fields of governance and information technology. Based on what has been learned, the subject for research narrowed down to identifying the components of IT governance in higher education.

**Research Question**

This research study used three rounds of modified Delphi methodology to answer the following research question: What are the components of IT governance in higher education institutions according to the members of the Research University CIO Conclave?

**Hypothesis**

H$_0$: There is no agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.

The alternative hypothesis:

H$_a$: There is an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education institutions.
**PARTICIPANT DEMOGRAPHIC INFORMATION**

For the criteria to be eligible to participate in a Delphi panel, Hsu (2007) recommended that each individual must have experience related to the target issue, be capable of providing knowledgeable inputs, and be willing to compromise in order to achieve a consensus. This study employed the following eligibility requirements for serving on the expert panel or the review panel. The panel member should hold the position of Chief Information Officer (CIO) or equivalent in an American university and be a member of the Association of American Universities (AAU) and the Research University CIO Conclave (RUCC).

The study used the modified Delphi method and employed web-based instruments to collect consensus data. Participants were formed into two panels: the review panel and the expert panel. To fill these panels, a general email along with a summary of the research and requested level of participant involvement, “Research Study Overview and Participation” document (Appendix B), were sent to the 62 members of the RUCC to request their participation. Of those, 17 responded to the invitation with the consent form attached. The research process started with randomly selecting the final participants out of the potential participants (all the volunteers who had accepted to participate). The next step was to randomly assign each final participant to either the review panel or the expert panel. Using a random procedure, 11 of the 17 were randomly selected to participate as the members of the expert panel and 4 more randomly selected to participate as members of the review panel. An email was sent to individual participants to inform them of their selection (Appendix C).
After panel selection, a general questionnaire (Appendix B) to gather demographic information was sent to all 15 participants, to gain a better understanding of their institution’s involvement in IT governance. There was a return of 80%. Responses have been analyzed in Table 6.

Table 6

General Questionnaire Responses

<table>
<thead>
<tr>
<th>Questions</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long have you been in CIO position at your current higher education institution or throughout your career?</td>
<td>Below 5 years: 3 CIOs 5-10 years: 5 CIOs More than 10 years: 4 CIOs</td>
</tr>
<tr>
<td>What is the status of your higher education institution current IT governance?</td>
<td>Non-existent: 8.3% Initial: 25% Repeateable: 25% Defined Process: 0% Managed &amp; Measurable: 16.7% Optimized: 8.3% Other: 16.7%</td>
</tr>
<tr>
<td>Is your higher education institution current IT governance successful?</td>
<td>Strongly disagree: 0% Disagree: 8.3% Neutral: 25% Agree: 25% Strongly agree: 33% Not Applicable: 8.3%</td>
</tr>
</tbody>
</table>

The panel members participated in three rounds of survey instruments to obtain consensus among the expert panels. Each participant took approximately 20 minutes to respond to each round’s survey instrument. Participants had two to three weeks to respond. The researcher spent one week to analyze received data and to prepare the next round’s survey instrument.
**ROUND ONE OF THE MODIFIED DELPHI STUDY**

The Round I instrument (Appendix C) of the modified Delphi method was developed based on information gathered through the literature review. The components of IT governance for higher education were placed in a web-based survey instrument.

In order to provide better understanding of the study and to clarify the type of information needed, the Round I instrument included examples of IT governance components derived from the extensive research review conducted by the researcher. The major goal of Round I was to gather information on the components of IT governance, as stated in the research question. These components would be rated in Round II and ranked in Round III. Instrument I was sent to the review panel for the initial assessment. This instrument had been revised, based upon the review panel’s feedback. After their approval and feedback to the questions, the Round I instrument was sent to the expert panel through email and the web-based survey instrument. The questions were categorized into three groups: structures, processes, and relational mechanisms (Wim Van Grembergen & Steven De Haes, 2009). For clarification, a brief description of each component was also provided. There were 28 components: 11 within “structures”, 10 within “processes,” and 4 within “relational mechanisms” categories. Expert panel members could designate a given component as Keep, Reject, or Modify, according to the member’s assessment of the component’s applicability to the member’s institution. A text box also was provided underneath each component for specifying any modification. The researcher also encouraged the expert panel members to add to the list any components absent from the survey that reflect the actual or desired IT
governance of their institution. A text box was provided at the end of the questionnaire to add new components.

The expert panel initially had two weeks to respond to the Round I questionnaire. After 10 days passed, a reminder email was sent to any members who hadn’t responded (Appendix C). Once the responses from the entire expert panel were received, all answers were processed and the new suggestions/changes were incorporated in the instrument design for Round II by the researcher. There was a 100% response rate in Round I from both the review and expert panels. Table 7 summarizes the responses from expert panel members on the Round I questionnaire. Bold numbers show the most responses on each component.

Table 7

*Round I Components and Results – IT Governance*

<table>
<thead>
<tr>
<th>Components and Categories</th>
<th>Keep</th>
<th>Reject</th>
<th>Modify</th>
<th>No Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT Governance Structure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT expertise at the level of Executive Officers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definition: Members of the institutional Executive Officers (President, Provost, CFO, CIO, ...) have expertise and experience regarding the value and risk of IT</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>IT strategy committee or venue at the level of Executive Officers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definition: Committee at the level of Executive Officers (Provost, CFO, Chancellor/President, etc) to ensure IT is regular agenda item (e.g. once a year, once a quarter, ...) for planning and issue resolution</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>(IT) audit committee at level of Executive Officers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definition: Independent committee at level of Executive Officers oversight of IT audit activities</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Chief Information Officer (CIO) on the Executive Leadership Committee</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definition: CIO is the full member of the Executive Leadership Committee with voting right</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 7 (continued)

<table>
<thead>
<tr>
<th>Components and Categories</th>
<th>Keep</th>
<th>Reject</th>
<th>Modify</th>
<th>No Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief Information Officer (CIO) reporting to the Chancellor/President</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Definition: CIO has a direct reporting line to the Chancellor/President</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT steering committee</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Definition: Steering committee of Executive Officers and/or Senior Management levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>focused on determining business priorities in IT investments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT governance function / officer</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Definition: Function in the university responsible for promoting, driving and managing IT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT project steering committee</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Definition: Steering committee composed of business and IT people focusing on prioritizing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and managing IT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT security steering committee</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Definition: Steering committee composed of business and IT people focused on IT risks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and security issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Architecture steering committee</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Definition: Committee composed of business and IT people providing guidance and advise on</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>architecture and standards for software applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration of governance in roles &amp; responsibilities</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Definition: Documented roles and responsibilities include governance tasks for business</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and IT people</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please add new components of information technology governance for higher education.</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td><strong>IT Governance Processes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic information systems planning</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Definition: Formal process to define and update the IT strategy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT performance measurement (e.g. IT balanced scorecard, … )</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portfolio management (including business cases, information economics, ROI, payback)</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Definition: Prioritization process for IT investments and projects in which business and IT is involved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 7 (continued)

<table>
<thead>
<tr>
<th>Components and Categories</th>
<th>Keep</th>
<th>Reject</th>
<th>Modify</th>
<th>No Answer</th>
</tr>
</thead>
</table>
| Chargeback arrangements – total cost of ownership (e.g. activity based costing)  
Definition: Methodology to charge back IT costs to business units, to enable an understanding of the total cost of ownership                                                                                                     | 3    | 0      | 4      | 2         |
| Service level agreements  
Definition: Formal agreements between business and IT about IT development projects or IT operations                                                                                                                                                         | 6    | 0      | 1      | 2         |
| IT governance framework (e.g. COBIT, …)  
Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation                                                                                                       | 2    | 3      | 2      | 2         |
| IT governance assurance and self-assessment  
Definition: Regular self-assessments or independent assurance activities on the governance and control over IT  
Project governance / management methodologies  
Definition: Processes and methodologies to govern and manage IT projects                                                                                                                                                  | 5    | 1      | 1      | 2         |
| IT budget control and reporting  
Definition: Processes to control and report upon budgets of IT                                                                                                                                                                  | 5    | 1      | 1      | 2         |
| Benefits management and reporting  
Definition: Processes to monitor the planned business benefits during and after implementation of the investments / projects                                                                                                                                 | 4    | 3      | 0      | 2         |
| Please add new components of information technology governance for higher education.                                                                                                                                                                                                              | 0    | 0      | 4      | 5         |

**IT Governance Relational Mechanisms**

Knowledge management on IT governance  
Definition: Systems (intranet, …) to share and distribute knowledge about IT Governance framework, responsibilities, tasks, etc.                                                                                                                   | 7    | 0      | 0      | 2         |
| Business / IT portfolio and project management  
Definition: Bridging the gap between business and IT by means of portfolio and project managers who act as in between                                                                                                                                 | 6    | 1      | 0      | 2         |
| Informal meetings between business and IT executive / senior management  
Definition: Informal meetings, with no agenda, where business and IT senior management talk about general activities, directions                                                                                                                                 | 4    | 0      | 3      | 2         |
Table 7 (continued)

<table>
<thead>
<tr>
<th>Components and Categories</th>
<th>Keep</th>
<th>Reject</th>
<th>Modify</th>
<th>No Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT leadership</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Definition: Ability of CIO or similar role to articulate a vision for IT’s role and ensure that this vision is clearly understood by managers throughout the organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please add new components of information technology governance for higher education.

0 0 3 6

The expert panel modified 24 components and rejected 1 component. After the results of Round I were analyzed, the 42 components marked as kept or modified were carried forward to Round II. Table 8 explains how the original format of the eligible questions was modified to permit using a Likert scale in Round II. Column one, titled “Initial Component,” lists eligible questions in the format that have been presented in the Round I instrument. Column two, titled “Modified Component,” lists eligible questions after modifications suggested by review panel.
Table 8

**Revised Components for Round II**

<table>
<thead>
<tr>
<th>Initial Component</th>
<th>Modified Component</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT Governance Structure</strong></td>
<td>The institutional executive officers (President, Provost, CFO, CIO, ...) need to have a knowledge and understanding regarding the value and risk of IT</td>
</tr>
<tr>
<td>IT expertise at the level of Executive Officers</td>
<td>An IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc) ensures IT issues are dealt with appropriately from a planning perspective.</td>
</tr>
<tr>
<td>Definition: Members of the institutional Executive Officers (President, Provost, CFO, CIO, ...) have expertise and experience regarding the value and risk of IT</td>
<td></td>
</tr>
<tr>
<td>IT strategy committee or venue at the level of Executive Officers</td>
<td>An IT Audit Committee at the level of institutional executive officers needed to provide oversight IT audit activities.</td>
</tr>
<tr>
<td>Definition: Committee at the level of Executive Officers (Provost, CFO, Chancellor/President, etc) to ensure IT is regular agenda item (e.g. once a year, once a quarter, ...) for planning and issue resolution</td>
<td></td>
</tr>
<tr>
<td>(IT) audit committee at level of Executive Officers</td>
<td>Chief Information Officer (CIO) is a member of the IT strategy committee.</td>
</tr>
<tr>
<td>Definition: Independent committee at level of Executive Officers oversight of IT audit activities</td>
<td></td>
</tr>
<tr>
<td>Chief Information Officer (CIO) on the Executive Leadership Committee</td>
<td>Chief Information Officer (CIO) has a direct reporting line to the Chancellor/President.</td>
</tr>
<tr>
<td>Definition: CIO is the full member of the Executive Leadership Committee with voting right</td>
<td></td>
</tr>
<tr>
<td>Chief Information Officer (CIO) reporting to the Chancellor/President</td>
<td>IT Strategy Committee at senior management level is responsible for prioritizing and coordination of institution wide IT projects.</td>
</tr>
<tr>
<td>Definition: CIO has a direct reporting line to the Chancellor/President</td>
<td></td>
</tr>
<tr>
<td>IT steering committee</td>
<td>Chief Information Officer (CIO) is responsible for promoting and driving IT governance processes.</td>
</tr>
<tr>
<td>Definition: Steering committee of Executive Officers and/or Senior Management levels responsible for determining business priorities in IT investments</td>
<td></td>
</tr>
<tr>
<td>IT governance function / officer</td>
<td>IT Project Steering Committee composed of functional and IT experts should focus on prioritizing and managing IT projects.</td>
</tr>
<tr>
<td>Definition: Function in the university responsible for promoting, driving and managing IT</td>
<td></td>
</tr>
<tr>
<td>IT project steering committee</td>
<td></td>
</tr>
<tr>
<td>Definition: Steering committee composed of business and IT people focusing on prioritizing and managing IT projects</td>
<td></td>
</tr>
</tbody>
</table>
### Table 8 (continued)

<table>
<thead>
<tr>
<th><strong>Initial Component</strong></th>
<th><strong>Modified Component</strong></th>
</tr>
</thead>
</table>
| IT security steering committee  
Definition: Steering committee composed of business and IT people focused on IT related risks and security issues | IT Security does not require separate steering committee, but their function is important and should be addressed through general compliance and regulation committees/meetings. |
| Architecture steering committee  
Definition: Committee composed of business and IT people providing guidance and advise on architecture and standards for software applications | The IT Architecture Steering Committee should be part of the successful IT governance model for higher education institution to provide guidance and advice on IT architecture and standards. |
| Integration of governance in roles & responsibilities  
Definition: Documented roles and responsibilities include governance tasks for business and IT people | IT governance processes need to be part of the practice of IT and part of the job description for involved individuals. |

#### IT Governance Processes

<table>
<thead>
<tr>
<th><strong>Initial Component</strong></th>
<th><strong>Modified Component</strong></th>
</tr>
</thead>
</table>
| Strategic information systems planning  
Definition: Formal process to define and update the IT strategy | Strategic Information System Planning is a formal process to define and update the IT strategy institution wide. |
| IT performance measurement (e.g. IT balanced scorecard, …)  
Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation | IT performance measurement is important linkage to the higher education institution vision/mission and to the IT department effective engagement. |
| Portfolio management (including business cases, information economics, ROI, payback)  
Definition: Prioritization process for IT investments and projects in which business and IT is involved | Combined IT and administrative portfolio management and prioritization process for IT investments and institution wide projects is preferred to separate IT and administrative portfolio management. |
| Chargeback arrangements – total cost of ownership (e.g. activity based costing)  
Definition: Methodology to charge back IT costs to business units, to enable an understanding of the total cost of ownership | IT governance processes needs to differentiate chargeback services from general fund services. |
| Service level agreements  
Definition: Formal agreements between business and IT about IT development projects or IT operations | IT governance processes define the decision making process on formal agreements between higher education institution and IT department about IT operations and projects (e.g. SLAs, Contracts, MOUs, …). |
Table 8 (continued)

<table>
<thead>
<tr>
<th>Initial Component</th>
<th>Modified Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT governance framework (e.g. COBIT, …) Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation</td>
<td>Accepted IT governance framework is needed for higher education institutions.</td>
</tr>
<tr>
<td>IT governance assurance and self-assessment Definition: Regular self-assessments or independent assurance activities on the governance and control over IT</td>
<td>Regular self-assessments or independent assurance activities on the IT governance is necessary.</td>
</tr>
<tr>
<td>Project governance / management methodologies Definition: Processes and methodologies to govern and manage IT projects</td>
<td>Project governance / management are processes and methodologies are needed to govern and manage large IT projects.</td>
</tr>
<tr>
<td>IT budget control and reporting Definition: Processes to control and report upon budgets of IT</td>
<td>IT budget control and reporting processes are needed to control and report upon budgets of IT.</td>
</tr>
<tr>
<td>Benefits management and reporting Definition: Processes to monitor the planned business benefits during and after implementation of the investments / projects</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

**IT Governance Relational Mechanisms**

| Knowledge management on IT governance Definition: Systems (intranet, …) to share and distribute knowledge about IT Governance framework, responsibilities, tasks, etc. | Key higher education institution constituencies need to share an understanding of and knowledge about IT governance awareness, framework, responsibilities, tasks, etc. |
| Business / IT portfolio and project management Definition: Bridging the gap between business and IT by means of portfolio and project managers who act as in between Informal meetings between business and IT executive / senior management Definition: Informal meetings, with no agenda, where business and IT senior management talk about general activities, directions | Business / IT portfolio and project management is bridging the gap between business and IT by means of portfolio and project managers who act as intermediaries between two. There is a need for informal meetings between IT executives and other institutional executive officers with no agenda, where they talk about general activities and directions. |
| IT leadership Definition: Ability of CIO or similar role to articulate a vision for IT’s role and ensure that this vision is clearly understood by managers throughout the organization | IT leadership/CIO must have the ability to articulate a vision for IT department’s role and ensure that this vision is clearly understood by departments and units throughout the institutions. |
In Round I, the expert panel suggested 18 new components: 15 within “structure,” 1 within “processes,” and 2 within “relational mechanisms.” The Round I instrument also provided an additional text box for each category for expert panel to add any comments or additional components that they suggest to be included in Round II. Expert panel suggested nineteen new components to be considered in the next round. The new components are listed below (Table 9):
Table 9

New Components for Round II

<table>
<thead>
<tr>
<th>Category</th>
<th>New Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT Governance Structure</strong></td>
<td>If the institutional executive officers do not have a knowledge and understanding of IT, they need to seek knowledgeable advice from a valued and recognized resource rather than rely on personal IT knowledge.</td>
</tr>
<tr>
<td></td>
<td>Chief Information Officer credibility plays major role in implementing IT Governance for higher education institutions.</td>
</tr>
<tr>
<td></td>
<td>Chief Information and his/her team act in lieu of IT Strategy Committee (defined as in Question #4).</td>
</tr>
<tr>
<td></td>
<td>Internal audit and IT audit activities should be combined under the Audit Committee with the assurance of having IT as an item for discussion at each Audit Committee meeting.</td>
</tr>
<tr>
<td></td>
<td>Chief Information Officer (CIO) has voting right on the IT Strategy Committee.</td>
</tr>
<tr>
<td></td>
<td>Chief Information Officer (CIO) with direct reporting line to the individual who aligns academic and financial issues (e.g. Provost as both the Chief Academic Officer and Chief Budget Officer) has a great advantage for IT.</td>
</tr>
<tr>
<td></td>
<td>Chief Information Officer (CIO) reports directly to Chief Financial Officer.</td>
</tr>
<tr>
<td></td>
<td>IT Strategy Committee formed of institutional executive officers is responsible for IT strategy and policy decisions.</td>
</tr>
<tr>
<td></td>
<td>Chief Information Officer (CIO) is responsible for proposing IT governance processes and promoting IT governance institution wide.</td>
</tr>
</tbody>
</table>
Table 9 (continued)

<table>
<thead>
<tr>
<th>Category</th>
<th>New Components</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data Protection and Privacy Advisory Committee is part of the IT governance for higher education institutions at the level of institution executive officers.</td>
</tr>
<tr>
<td></td>
<td>Investment portfolio should follow specific directions that IT governance committee recommends.</td>
</tr>
<tr>
<td></td>
<td>IT governance committees should stay small in size, less than 10, ideally 6 - 8 people.</td>
</tr>
<tr>
<td></td>
<td>Committee of faculty is appointed by the Provost to advise on IT related matters and provide feedback on the IT department projects.</td>
</tr>
<tr>
<td></td>
<td>A two tier organizational structure is suggested, with the higher tier being the President's Executive Cabinet augmented with a representative from faculty council. The lower tier consists of IT professionals from around the institution, appointed by the Provost to whom the CIO reports. All policy matters are approved by the higher level committee, while elements of practice are handled at the lower level tier, unless they are contentious, in which case they are forwarded up the chain.</td>
</tr>
<tr>
<td></td>
<td>Use of word &quot;Board&quot; or &quot;Group&quot; instead of &quot;Committee&quot; when appropriate in IT governance processes and groups to convey stronger role.</td>
</tr>
</tbody>
</table>

**IT Governance Processes**

IT governance framework should be related to the education and research missions and vision of the institution.

**IT Governance Relational Mechanisms**

Formal relationship management processes need to be part of the IT governance for higher education institutions.

Institution involvement in IT governance implementation not only should be in the form of IT Boards and Committees, but initiatives such as "Restructuring Committee".
ROUND TWO OF THE MODIFIED DELPHI STUDY

The Round II instrument was based on the results of Round I of the modified Delphi study. All the components of Round II instrument including revised and new are the result of considering responses from expert panel in Round I. Data collected from Round I was analyzed by researcher and the new Round II instrument was developed and sent to the review panel. The Round II instrument contains a total of 19 new components in addition to the modified components. Sixteen of the new components belong to IT governance structures category, one to the IT governance processes category and two to IT governance relational mechanisms category. The review panel reviewed the questions for clarity, consistency, and jargon. The response rate from the review panel in Round II was 75%. After the review panel’s feedback was applied, the expert panel was sent the resulting Round II instrument (Appendix D), which used the following Likert scale definitions (Table 10):

Table 10

<table>
<thead>
<tr>
<th>Likert Scale</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Strongly Agree that this component should be considered as one of the components for the effective IT governance for higher education institutions</td>
</tr>
<tr>
<td>4</td>
<td>Agree that this component should be considered as one of the components for the effective IT governance for higher education institutions</td>
</tr>
<tr>
<td>3</td>
<td>Neutral position that this component should be considered as one of the effective components for the IT governance for higher education institutions</td>
</tr>
<tr>
<td>2</td>
<td>Disagree that this component should be considered as one of the components for the effective IT governance for higher education institutions</td>
</tr>
<tr>
<td>1</td>
<td>Strongly Disagree that this component should be considered as one of the effective components for the IT governance for higher education institutions</td>
</tr>
</tbody>
</table>
An additional text box for each category was provided to the expert panel to add any comments or additional components that they felt should be included in next round. The expert panel suggested no additional components for Round III.

The expert panel response rate for Round II was 100%. After the data collection was completed, the results of the Likert scale rating were organized in a table to calculate the statistical mean (Table 10). Any component with a statistical mean greater than 3.01 was eligible for Round III. Of the 42 components in Round II, two components had a statistical mean below 3.01 and were eliminated. Table 11 shows data gathered for Round II and calculated statistical means associated with it. E001 to E011 are the expert panel members who rated components. Questions that were rated by expert panel are shown by the number of the category they belong to followed by the number of the question. Q1-20 represents question number 20 in category 1. Components were categorized into three major categories: (1) IT governance structure, (2) IT governance processes and (3) IT governance relational mechanisms. Questions Q1-27, Q2-11 and Q3-7 were designed as a text box for additional comments. For such questions, “NC” means that expert panel member had no comments to add and “C” means that a comment has been posted. Comments field were not part of the statistical means calculation.
Table 11

Statistical Means for Round II

<table>
<thead>
<tr>
<th>Round-II Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question/Expert</td>
</tr>
<tr>
<td>Q1-1</td>
</tr>
<tr>
<td>Q1-2</td>
</tr>
<tr>
<td>Q1-3</td>
</tr>
<tr>
<td>Q1-4</td>
</tr>
<tr>
<td>Q1-5</td>
</tr>
<tr>
<td>Q1-6</td>
</tr>
<tr>
<td>Q1-7</td>
</tr>
<tr>
<td>Q1-8</td>
</tr>
<tr>
<td>Q1-9</td>
</tr>
<tr>
<td>Q1-10</td>
</tr>
<tr>
<td>Q1-11</td>
</tr>
<tr>
<td>Q1-12</td>
</tr>
<tr>
<td>Q1-13</td>
</tr>
<tr>
<td>Q1-14</td>
</tr>
<tr>
<td>Q1-15</td>
</tr>
<tr>
<td>Q1-16</td>
</tr>
<tr>
<td>Q1-17</td>
</tr>
<tr>
<td>Q1-18</td>
</tr>
<tr>
<td>Q1-19</td>
</tr>
<tr>
<td>Q1-20</td>
</tr>
<tr>
<td>Q1-21</td>
</tr>
<tr>
<td>Q1-22</td>
</tr>
<tr>
<td>Q1-23</td>
</tr>
<tr>
<td>Q1-24</td>
</tr>
<tr>
<td>Q1-25</td>
</tr>
<tr>
<td>Q1-26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q1-27</th>
<th>C</th>
<th>NC</th>
<th>C</th>
<th>C</th>
<th>NC</th>
<th>C</th>
<th>NC</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>C</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2-1</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>36</td>
<td>3.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2-2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>40</td>
<td>4.00</td>
<td></td>
</tr>
<tr>
<td>Q2-3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>39</td>
<td>3.90</td>
<td></td>
</tr>
<tr>
<td>Q2-4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>31</td>
<td>3.10</td>
<td></td>
</tr>
<tr>
<td>Q2-5</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>31</td>
<td>3.10</td>
<td></td>
</tr>
<tr>
<td>Q2-6</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>42</td>
<td>4.20</td>
<td></td>
</tr>
<tr>
<td>Q2-7</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>37</td>
<td>3.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2-8</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>43</td>
<td>4.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2-9</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>41</td>
<td>4.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2-10</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>43</td>
<td>4.30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Q2-11 | C     | NC    | NC    | C     | NC    | C     | NC    | C     | C     | NC    | C     |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Q3-1  | 5     | 3     | 3     | 4     | 4     | 4     | 4     | 5     | 5     | 41    | 4.10 |
| Q3-2  | 5     | 2     | 3     | 2     | 3     | 4     | 4     | 3     | 3     | 31    | 3.10 |
| Q3-3  | 4     | 5     | 2     | 4     | 4     | 4     | 4     | 5     | 3     | 4     | 39    | 3.90 |
| Q3-4  | 5     | 4     | 5     | 4     | 4     | 4     | 5     | 5     | 4     | 5     | 45    | 4.50 |
| Q3-5  | 3     | 3     | 3     | 4     | 2     | 3     | 4     | 2     | 4     | 5     | 33    | 3.30 |
| Q3-6  | 5     | 3     | 3     | 4     | 4     | 2     | 3     | 1     | 3     | 3     | 31    | 3.10 |

| Q3-7  | C     | NC    | C     | NC    | NC    | NC    | C     | C     | C     | C     | C     |

NC= NoComment  C= Comment  E = Eliminated  M>=3.01
Table 12 shows the eliminated components from Round II, both from the “structure” category.

Table 12

**Eliminated Components of Round II**

<table>
<thead>
<tr>
<th>Category</th>
<th>Eliminated Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT Governance Structure</td>
<td>An IT Audit Committee at the level of institutional executive officers needed to provide oversight IT audit activities.</td>
</tr>
<tr>
<td>IT Governance Structure</td>
<td>Chief Information Officer (CIO) reports directly to Chief Financial Officer.</td>
</tr>
</tbody>
</table>

**ROUND THREE OF THE MODIFIED DELPHI STUDY**

Round III was the final round of the modified Delphi study. One of the major goals was to rank the 41 components that survived Round II. The forty questions corresponded to categories as follows:

1. IT Governance Structure
   a. CIO Roles (13 questions)
   b. CIO Responsibilities (12 questions)
2. IT Governance Processes (10 questions)
3. IT Governance Relational Mechanisms (6 questions)

The Round III instrument development was based on the results of the Round II and was sent to the review panel for final revision and approval. The review panel response rate for Round III was 75%. After the review panel’s feedback was applied, the final Round III instrument (Appendix E) was sent to the expert panel for ranking. The expert panel response rate for Round III was 73%.
The second goal of Round III was to determine if there was consensus. The final step after collecting ranked data was to determine the degree of expert consensus concerning the ranked components of IT governance in higher education among the members of Research University CIO Conclave (RUCC). This was measured using Kendall’s Coefficient of Concordance ($\tilde{W}$). After receiving responses from expert panel, a list of the components of the IT governance for higher education was formed which reflects expert panels’ ranking for each component. The next step was to make sure that there had been an agreement on the list and the expert panel could be judged to have reached consensus. One way to measure consensus is to determine the degree of agreement among expert panel in their judgment. The Kendall’s Coefficient of Concordance is a measure which provides such an index.

The hypothesis for this test was:

$$H_0: \text{There is no agreement among the expert panel members from the Research University CIO Conclave in the recognition of the components of IT governance for higher education.}$$

The alternative hypothesis for this test was:

$$H_a: \text{There is an agreement among the expert panel members from the Research University CIO Conclave in the recognition of the components of IT governance for higher education.}$$

Kendall’s Coefficient of Concordance, $\tilde{W}$ evaluates the degree of agreement between $m$ sets of ranks for $n$ subjects. Computing $\tilde{W}$ was a way to determine whether the value of $\tilde{W}$ was large enough to conclude that the correlation coefficient between $m$ sets of ranks is some value other than zero.
$H_0$: $\tilde{W} = 0$

$H_0$ states that the correlation between the $m$ sets of ranks equals 0. It means that $m$ sets of ranks are independent of one another.

$H_a$: $\tilde{W} \neq 0$

$H_a$ states that the correlation between the $m$ sets of ranks equals some value other than 0. It means that $m$ sets of ranks are not independent of one another.

To calculate $\tilde{W}$ data needed to be arranged into a table with $n$ columns representing the components of information technology governance that has been passed form Round II to Round III and $m$ rows, representing the number of expert panel members who responded/ranked (Round III). Next, was to calculate the sum of the ranks ($T$) for each row of the table and then to calculate the variance of the $\sum (R)$ values, called $S$. The next step was to feed the sum of the ranks and the variance to the following formulas to calculate $S$ and $\tilde{W}$ the Kendall’s Coefficient of Concordance (Sheskin, 2003). Table 13 provides definition for formulas:

$$U = \sum (R)^2$$

$$S = \frac{(nU - T^2)}{n}$$

$$\tilde{W} = \frac{S}{\sqrt{2}m^2n(n^2 - 1)}$$
Table 13

**Kendall’s Coefficient of Concordance Formula Definition**

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>number of expert panel members who responded/ranked (Round III)</td>
</tr>
<tr>
<td>N</td>
<td>components that ranked by expert panel in Round III</td>
</tr>
<tr>
<td>R</td>
<td>Sum of the ranks for each component</td>
</tr>
<tr>
<td>T</td>
<td>Sum of the ranks, ( \sum (R) )</td>
</tr>
<tr>
<td>U</td>
<td>( U = \sum (R)^2 )</td>
</tr>
<tr>
<td>S</td>
<td>The variance of the ( \sum (R) ) values, ( S = \frac{(nU - T^2)}{n} )</td>
</tr>
<tr>
<td>( \tilde{W} )</td>
<td>Kendall’s Coefficient of Concordance, ( \tilde{W} = \frac{S}{\chi^2 m^2 n(n^2 - 1)} )</td>
</tr>
</tbody>
</table>

After the completion of the Kendall’s Coefficient of Concordance, \( \tilde{W} \), a final form with the components of information technology governance for higher education was created and a final copy was sent to the review and expert panels.

In the calculation of the Kendall’s Coefficient of Concordance, data was grouped in four tables based on four IT governance categories, structures/roles with 13 components, structures/responsibilities with 12 components, processes with 10 components and relational mechanisms with 6 components. Tables 14 to Table 17 show the components at each category with its related ranking. E001 to E011 represents the expert panel members (rankers) and C1 to C13 shows IT governance components.
In the calculation of the Kendall’s Coefficient of Concordance, following formula was used:

\[
T = \sum (R) = 728
\]

\[
n = 13
\]

\[
m = 8
\]

\[
T = \sum (R) = 728
\]

\[
U = \sum (R)^2 = 48,406
\]

\[
S = \frac{(nU - T^2)}{n} = \frac{(13)(48406) - 728^2}{13} = 7,638
\]

\[
\tilde{W} = \frac{S}{\sqrt{\frac{1}{2} m^2 n (n^2 - 1)}} = \frac{7638}{\sqrt{\frac{1}{2} (64)^2 (13)(13^2 - 1)}} = 0.656
\]

In the calculation of the Kendall’s Coefficient of Concordance, following formula was used:
\[ \chi^2 = m(n-1)\tilde{W} \]

Where \( \tilde{W} \) is the Kendall’s Coefficient of Concordance Coefficient and must be between 0 and 1. For \( n=13 \) and \( m=8 \), \( \tilde{W} = 0.656 \):

\[ \chi^2 = m(n-1)\tilde{W} = 8(13-1)(0.656) = 62.976 \]

By consulting the \( \chi^2 \) table, \( \chi^2_{12} = \chi^2_{0.05} = 21.026 \)

Since \( \chi^2 = 62.976 \) was greater than the table value, the alternative hypothesis is supported at 0.05 level. It means that there was an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance in the category of structure/roles.

Table 15 shows the results of ranking of the IT governance structure/responsibilities components. Kendall’s Coefficient of Concordance was applied to this category.

Table 15

<table>
<thead>
<tr>
<th>Components</th>
<th>Expert Panel</th>
<th>E001</th>
<th>E003</th>
<th>E005</th>
<th>E006</th>
<th>E007</th>
<th>E008</th>
<th>E010</th>
<th>E011</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td></td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>10</td>
<td>42</td>
</tr>
<tr>
<td>C2</td>
<td></td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>C3</td>
<td></td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>C4</td>
<td></td>
<td>6</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>11</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>70</td>
</tr>
<tr>
<td>C5</td>
<td></td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>44</td>
</tr>
<tr>
<td>C6</td>
<td></td>
<td>10</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>10</td>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td>C7</td>
<td></td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>C8</td>
<td></td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>C9</td>
<td></td>
<td>5</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>61</td>
</tr>
</tbody>
</table>
Table 15 (Continued)

<table>
<thead>
<tr>
<th>Components</th>
<th>Expert Panel</th>
<th>E001</th>
<th>E003</th>
<th>E005</th>
<th>E006</th>
<th>E007</th>
<th>E008</th>
<th>E010</th>
<th>E011</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>C10</td>
<td></td>
<td>4</td>
<td>11</td>
<td>9</td>
<td>12</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>3</td>
<td>65</td>
</tr>
<tr>
<td>C11</td>
<td></td>
<td>11</td>
<td>3</td>
<td>12</td>
<td>7</td>
<td>2</td>
<td>12</td>
<td>3</td>
<td>9</td>
<td>59</td>
</tr>
<tr>
<td>C12</td>
<td></td>
<td>12</td>
<td>9</td>
<td>8</td>
<td>11</td>
<td>12</td>
<td>11</td>
<td>8</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

\[ T = \sum (R) = 624 \]

\[ n = 12 \]
\[ m = 8 \]

\[ T = \sum (R) = 624 \]
\[ U = \sum (R)^2 = 35,396 \]

\[ S = \frac{nU - T^2}{n} = \frac{(12)(35396) - 624^2}{12} = 2948 \]

\[ \tilde{W} = \frac{S}{\sqrt{\frac{1}{2}m^2n(n^2 - 1)}} = \frac{2948}{\sqrt{\frac{1}{2}(8)^2(12)(12^2 - 1)}} = 0.322 \]

In the calculation of the Kendall’s Coefficient of Concordance, following formula was used:

\[ \chi^2 = m(n-1)\tilde{W} \]

Where \( \tilde{W} \) is the Kendall’s Coefficient of Concordance Coefficient and must be between 0 and 1. For \( n=12 \) and \( m=8 \), \( \tilde{W} = 0.322 \):

\[ \chi^2 = m(n-1)\tilde{W} = 8(12-1)(0.322) = 28.336 \]

By consulting the \( \chi^2 \) table, \( \chi^2_{0.05} = 19.675 \).
Since $\chi^2 = 28.336$ was greater than the table value, the alternative hypothesis is supported at 0.05 level. It means that there was an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance in the category of structure/responsibilities.

Table 16 shows the results of ranking of the IT governance processes components. Kendall’s Coefficient of Concordance was applied to this category.

Table 16

*Round III Ranking Results – IT Governance Processes Components*

<table>
<thead>
<tr>
<th>Components</th>
<th>E001</th>
<th>E003</th>
<th>E005</th>
<th>E006</th>
<th>E007</th>
<th>E008</th>
<th>E010</th>
<th>E011</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>E001</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>E002</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>E003</td>
<td>8</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>7</td>
<td>53</td>
</tr>
<tr>
<td>E004</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>39</td>
</tr>
<tr>
<td>E005</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>44</td>
<td>5</td>
<td>1</td>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>E006</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>62</td>
</tr>
<tr>
<td>E007</td>
<td>10</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>9</td>
<td>6</td>
<td>58</td>
</tr>
<tr>
<td>E008</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>2</td>
<td>56</td>
</tr>
<tr>
<td>E009</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>E010</td>
<td>6</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>10</td>
<td>2</td>
<td>3</td>
<td>53</td>
</tr>
</tbody>
</table>

$\chi^2 = \sum(R) = 480$

$n = 10$

$m = 8$

$T = \sum(R) = 480$
In the calculation of the Kendall’s Coefficient of Concordance, following formula was used:

\[ U = \sum (R)^2 = 25,926 \]

\[ S = \frac{(nU - T^2)}{n} = \frac{(10)(25926) - 480^2}{10} = 2886 \]

\[ \tilde{W} = \frac{S}{\frac{1}{2}m^2n(n^2 - 1)} = \frac{2886}{\frac{1}{2}(8)^2(10)(10^2 - 1)} = 0.547 \]

In the calculation of the Kendall’s Coefficient of Concordance, following formula was used:

\[ \chi^2 = m(n-1)\tilde{W} \]

Where \( \tilde{W} \) is the Kendall’s Coefficient of Concordance Coefficient and must be between 0 and 1. For \( n=10 \) and \( m=8 \), \( \tilde{W} = 0.547 \):

\[ \chi^2 = m(n-1)\tilde{W} = 8(10-1)(0.547) = 39.384 \]

By consulting the \( \chi^2 \) table, \( \chi^2_{0.05} = 16.919 \)

Since \( \chi^2 = 39.384 \) was greater than the table value, the alternative hypothesis is supported at 0.05 level. It means that there was an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance in the category of processes.

Table 17 shows the results of ranking of the IT governance relational mechanisms components. Kendall’s Coefficient of Concordance was applied to this category.
Table 17

Round III Ranking Results – IT Governance Relational Mechanisms Components

<table>
<thead>
<tr>
<th>Components</th>
<th>Expert Panel</th>
<th>E001</th>
<th>E003</th>
<th>E005</th>
<th>E006</th>
<th>E007</th>
<th>E008</th>
<th>E010</th>
<th>E011</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>C2</td>
<td></td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>C3</td>
<td></td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>35</td>
</tr>
<tr>
<td>C4</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>C5</td>
<td></td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>29</td>
</tr>
<tr>
<td>C6</td>
<td></td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>41</td>
</tr>
</tbody>
</table>

\[ T = \sum (R) = 168 \]

\[ n = 6 \]

\[ m = 8 \]

\[ U = \sum (R)^2 = 5.324 \]

\[ S = \frac{(nU - T^2)}{n} = \frac{(6(5324) - 168^2)}{6} = 620 \]

\[ \tilde{W} = \frac{S}{\sqrt{\frac{1}{12}m^2n(n^2 - 1)}} = \frac{620}{\sqrt{\frac{1}{12}(8)^2(6)(6^2 - 1)}} = 0.554 \]

In the calculation of the Kendall’s Coefficient of Concordance, following formula was used:

\[ \chi^2 = m(n - 1)\tilde{W} \]

Where \( \tilde{W} \) is the Kendall’s Coefficient of Concordance Coefficient and must be between 0 and 1. For \( n=6 \) and \( m=8 \), \( \tilde{W} = 0.554 \):
\[ \chi^2 = m(n-1)W = 8(6-1)(0.554) = 22.16 \]

By consulting the \( \chi^2 \) table, \( \chi^2_{0.05} = \chi^2_{0.05} = 11.070 \)

Since \( \chi^2 = 22.16 \) was greater than the table value, the alternative hypothesis is supported at 0.05 level. It means that there was an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance in the category of relational mechanisms.

Following tables represents the results of the three rounds of the modified Delphi method. Tables 18, 19, 20 and 21 represent the initial IT governance components, added components, eliminated components and final components for the first major category of structure (roles and responsibilities).
Table 18

*Initial Components of IT Governance for Higher Education Institutions – Structure*

<table>
<thead>
<tr>
<th>IT Governance Structure (Roles &amp; Responsibilities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. IT expertise at the level of Executive Officers</td>
</tr>
<tr>
<td>Definition: Members of the institutional Executive Officers (President, Provost, CFO, CIO, ...) have expertise and experience regarding the value and risk of IT</td>
</tr>
<tr>
<td>2. IT strategy committee or venue at the level of Executive Officers</td>
</tr>
<tr>
<td>Definition: Committee at the level of Executive Officers (Provost, CFO, Chancellor/President, etc) to ensure IT is regular agenda item (e.g. once a year, once a quarter, ...) for planning and issue resolution</td>
</tr>
<tr>
<td>3. (IT) audit committee at level of Executive Officers</td>
</tr>
<tr>
<td>Definition: Independent committee at level of Executive Officers oversight of IT audit activities</td>
</tr>
<tr>
<td>4. Chief Information Officer (CIO) on the Executive Leadership Committee</td>
</tr>
<tr>
<td>Definition: CIO is the full member of the Executive Leadership Committee with voting right</td>
</tr>
<tr>
<td>5. Chief Information Officer (CIO) reporting to the Chancellor/President</td>
</tr>
<tr>
<td>Definition: CIO has a direct reporting line to the Chancellor/President</td>
</tr>
<tr>
<td>6. IT steering committee</td>
</tr>
<tr>
<td>Definition: Steering committee of Executive Officers and/or Senior Management levels responsible for determining business priorities in IT investments</td>
</tr>
<tr>
<td>7. IT governance function / officer</td>
</tr>
<tr>
<td>Definition: Function in the university responsible for promoting, driving and managing IT</td>
</tr>
<tr>
<td>8. IT project steering committee</td>
</tr>
<tr>
<td>Definition: Steering committee composed of business and IT people focusing on prioritizing and managing IT projects</td>
</tr>
<tr>
<td>9. IT security steering committee</td>
</tr>
<tr>
<td>Definition: Steering committee composed of business and IT people focused on IT related risks and security issues</td>
</tr>
<tr>
<td>10. Architecture steering committee</td>
</tr>
<tr>
<td>Definition: Committee composed of business and IT people providing guidance and advise on architecture and standards for software applications</td>
</tr>
<tr>
<td>11. Integration of governance in roles &amp; responsibilities</td>
</tr>
<tr>
<td>Definition: Documented roles and responsibilities include governance tasks for business and IT people</td>
</tr>
</tbody>
</table>
Table 19

*Added Components of IT Governance for Higher Education Institutions – Structure*

<table>
<thead>
<tr>
<th><strong>Added IT Governance Components – Structure (Roles &amp; Responsibilities)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
</tr>
<tr>
<td>9.</td>
</tr>
<tr>
<td>10.</td>
</tr>
<tr>
<td>11.</td>
</tr>
<tr>
<td>12.</td>
</tr>
<tr>
<td>13.</td>
</tr>
<tr>
<td>14.</td>
</tr>
<tr>
<td>15.</td>
</tr>
</tbody>
</table>
Table 20

*Eliminated Components of IT Governance for Higher Education Institutions – Structure*

<table>
<thead>
<tr>
<th>Eliminated IT Governance Components – Structure (Roles &amp; Responsibilities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. An IT Audit Committee at the level of institutional executive officers needed to provide oversight IT audit activities.</td>
</tr>
<tr>
<td>2. Chief Information Officer (CIO) reports directly to Chief Financial Officer.</td>
</tr>
</tbody>
</table>
Table 21

*Final Components of IT Governance for Higher Education Institutions - Structure*

<table>
<thead>
<tr>
<th>IT Governance Structure/Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CIO credibility plays a major role in implementing IT governance</td>
</tr>
<tr>
<td>2. CIO and his/her team act outside of the IT Strategy Committee</td>
</tr>
<tr>
<td>3. CIO is a member of the IT Strategy Committee</td>
</tr>
<tr>
<td>4. CIO has voting rights on the IT Strategy Committee</td>
</tr>
<tr>
<td>5. CIO has a direct reporting line to the Chancellor/President</td>
</tr>
<tr>
<td>6. CIO has direct reporting line to the individual who aligns academic and financial issues (e.g., Provost as both the Chief Academic Officer and Chief Budget Officer)</td>
</tr>
<tr>
<td>7. The IT Architecture Steering Committee should be part of the successful IT governance model to provide guidance and advise on IT architecture and standards</td>
</tr>
<tr>
<td>8. IT governance processes need to be part of the practice of IT and part of the job description for involved individuals</td>
</tr>
<tr>
<td>9. Data Protection and Privacy Advisory Committee should be part of a successful IT governance model</td>
</tr>
<tr>
<td>10. Data Protection and Privacy Advisory Committee should be made up of institution’s executive officers</td>
</tr>
<tr>
<td>11. IT governance committees should stay small, fewer than 10, ideally 6–8 people</td>
</tr>
<tr>
<td>12. A two-tier organizational structure is suggested, with the higher tier being the President’s Executive Cabinet augmented with a representative from the faculty council. The lower tier consists of IT professionals from around the institution, appointed by the Provost to whom the CIO reports. All policy matters are approved by the higher-level committee, while elements of practice are handled at the lower-level tier, unless they are contentious, in which case they are forwarded up the chain.</td>
</tr>
<tr>
<td>13. Use of the word &quot;Board&quot; or &quot;Group&quot; instead of &quot;Committee&quot; when appropriate in IT governance processes, and groups to convey stronger role.</td>
</tr>
<tr>
<td>IT Governance Structures/Responsibilities</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>1. The institutional executive officers (President, Provost, CFO, etc.) need to have knowledge and understanding regarding the value and risk of IT</td>
</tr>
<tr>
<td>2. If the institutional executive officers do not have a knowledge and understanding of IT, they need to seek knowledgeable advice from a valued and recognized resource rather than rely on personal IT knowledge</td>
</tr>
<tr>
<td>3. An IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc.) ensures IT issues are dealt with appropriately from a planning perspective</td>
</tr>
<tr>
<td>4. Internal audit and IT audit activities should be combined under the Audit Committee with the assurance of having IT as an item for discussion at each Audit Committee meeting</td>
</tr>
<tr>
<td>5. IT Strategy Committee is responsible for IT strategy and policy decisions</td>
</tr>
<tr>
<td>6. IT Strategy Committee is responsible for prioritizing and coordination of institution-wide IT projects</td>
</tr>
<tr>
<td>7. CIO is responsible for promoting and driving IT governance processes</td>
</tr>
<tr>
<td>8. CIO is responsible for proposing IT governance processes and promoting IT governance institution-wide</td>
</tr>
<tr>
<td>9. IT Project Steering Committee composed of functional and IT experts should focus on prioritizing and managing IT projects</td>
</tr>
<tr>
<td>10. IT Security does not require separate steering committee, but its function is important and should be addressed through general compliance and regulation committees/meetings</td>
</tr>
<tr>
<td>11. Investment portfolio should follow the strategic directions that the IT Governance Committee recommends</td>
</tr>
<tr>
<td>12. Committee of faculty is appointed by the Provost to advise on IT-related matters and provide feedback on IT department projects</td>
</tr>
</tbody>
</table>
Tables 22, 23, 24 and 25 represent the initial IT governance components, added components, eliminated components and final components for the first major category of processes.

Table 22

*Initial Components of IT Governance for Higher Education Institutions – Processes*

<table>
<thead>
<tr>
<th>IT Governance Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strategic information systems planning</td>
</tr>
<tr>
<td>Definition: Formal process to define and update the IT strategy</td>
</tr>
<tr>
<td>2. IT performance measurement (e.g. IT balanced scorecard, …)</td>
</tr>
<tr>
<td>Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation</td>
</tr>
<tr>
<td>3. Portfolio management (including business cases, information economics, ROI, payback)</td>
</tr>
<tr>
<td>Definition: Prioritization process for IT investments and projects in which business and IT is involved</td>
</tr>
<tr>
<td>4. Chargeback arrangements – total cost of ownership (e.g. activity based costing)</td>
</tr>
<tr>
<td>Definition: Methodology to charge back IT costs to business units, to enable an understanding of the total cost of ownership</td>
</tr>
<tr>
<td>5. Service level agreements</td>
</tr>
<tr>
<td>Definition: Formal agreements between business and IT about IT development projects or IT operations</td>
</tr>
<tr>
<td>6. IT governance framework (e.g. COBIT, …)</td>
</tr>
<tr>
<td>Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation</td>
</tr>
<tr>
<td>7. IT governance assurance and self-assessment</td>
</tr>
<tr>
<td>Definition: Regular self-assessments or independent assurance activities on the governance and control over IT</td>
</tr>
<tr>
<td>8. Project governance / management methodologies</td>
</tr>
<tr>
<td>Definition: Processes and methodologies to govern and manage IT projects</td>
</tr>
<tr>
<td>9. IT budget control and reporting</td>
</tr>
<tr>
<td>Definition: Processes to control and report upon budgets of IT</td>
</tr>
<tr>
<td>10. Benefits management and reporting</td>
</tr>
<tr>
<td>Definition: Processes to monitor the planned business benefits during and after implementation of the investments / projects</td>
</tr>
</tbody>
</table>
Table 23

*Added Components of IT Governance for Higher Education Institutions – Processes*

<table>
<thead>
<tr>
<th>Added IT Governance Components - Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT governance framework should be related to the education and research missions and vision of the institution.</td>
</tr>
</tbody>
</table>

Table 24

*Eliminated Components of IT Governance for Higher Education Institutions – Processes*

<table>
<thead>
<tr>
<th>Eliminated IT Governance Components - Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processes to monitor the planned business benefits during and after implementation of the investments / projects</td>
</tr>
</tbody>
</table>

Table 25

*Final Components of IT Governance for Higher Education Institutions - Processes*

<table>
<thead>
<tr>
<th>IT Governance Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Accepted IT governance framework is needed for higher education institutions</td>
</tr>
<tr>
<td>2. IT governance framework should be related to the education and research missions and vision of the institution</td>
</tr>
<tr>
<td>3. Strategic Information System Planning is a formal process to define and update the IT strategy institution-wide</td>
</tr>
<tr>
<td>4. IT performance measurement is important linkage to the higher education institution’s vision/mission and to the IT department’s effective engagement</td>
</tr>
<tr>
<td>5. Combined IT and administrative portfolio management and prioritization process for IT investments and institution-wide projects is preferred to separate IT and administrative portfolio management</td>
</tr>
<tr>
<td>6. IT governance processes need to differentiate chargeback services from general fund services</td>
</tr>
<tr>
<td>7. IT governance processes define the decision making process on formal agreements between higher education institution and IT department about IT operations and projects (SLAs, Contracts, MOUs, etc.)</td>
</tr>
<tr>
<td>8. Regular self-assessments or independent assurance activities on IT governance is necessary</td>
</tr>
<tr>
<td>9. Project governance / management processes and methodologies are needed to govern and manage large IT projects</td>
</tr>
<tr>
<td>10. IT budget control and reporting processes are needed to control and report upon budgets of IT</td>
</tr>
</tbody>
</table>
Tables 26, 27 and 28 represent the initial IT governance components, added components and final components for the first major category of relational mechanisms. No component was eliminated in this category.

Table 26

*Initial Components of IT Governance for Higher Education Institutions – Relational Mechanisms*

<table>
<thead>
<tr>
<th>Initial IT Governance Components - Relational Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge management on IT governance</td>
</tr>
<tr>
<td>Definition: Systems (intranet, …) to share and distribute knowledge about IT Governance framework, responsibilities, tasks, etc.</td>
</tr>
<tr>
<td>2. Business / IT portfolio and project management</td>
</tr>
<tr>
<td>Definition: Bridging the gap between business and IT by means of portfolio and project managers who act as in between</td>
</tr>
<tr>
<td>3. Informal meetings between business and IT executive / senior management</td>
</tr>
<tr>
<td>Definition: Informal meetings, with no agenda, where business and IT senior management talk about general activities, directions</td>
</tr>
<tr>
<td>4. IT leadership</td>
</tr>
<tr>
<td>Definition: Ability of CIO or similar role to articulate a vision for IT’s role and ensure that this vision is clearly understood by managers throughout the organization</td>
</tr>
</tbody>
</table>

Table 27

*Added Components of IT Governance for Higher Education Institutions – Relational Mechanisms*

<table>
<thead>
<tr>
<th>Added IT Governance Components - Relational Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal relationship management processes need to be part of the IT governance for higher education institutions.</td>
</tr>
<tr>
<td>Institution involvement in IT governance implementation not only should be in the form of IT Boards and Committees, but initiatives such as &quot;Restructuring Committee&quot;.</td>
</tr>
</tbody>
</table>
Table 28

Final Components of IT Governance for Higher Education Institutions – Relational Mechanisms

<table>
<thead>
<tr>
<th>IT Governance Relational Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Key higher education institution constituencies need to share an understanding of and knowledge about IT governance awareness, framework, responsibilities, tasks, etc.</td>
</tr>
<tr>
<td>2. Business / IT portfolio and project management are bridging the gap between business and IT by means of portfolio and project managers who act as intermediaries between the two</td>
</tr>
<tr>
<td>3. There is a need for informal meetings between IT executives and other institutional executive officers with no agenda, where they talk about general activities and directions</td>
</tr>
<tr>
<td>4. IT leadership / CIO must have the ability to articulate a vision for IT department’s role and ensure that this vision is clearly understood by departments and units throughout the institutions</td>
</tr>
<tr>
<td>5. Formal relationship management processes need to be part of IT governance for higher education institutions</td>
</tr>
<tr>
<td>6. Institution involvement in IT governance implementation should be in the form of not only IT Boards and Committees, but initiatives such as a &quot;Restructuring Committee&quot; to propose restructuring for the IT governance processes as needed</td>
</tr>
</tbody>
</table>
Final IT governance components for higher education institutions as one comprehensive list are listed in Table 29.

Table 29

*Final Components of IT Governance for Higher Education Institutions*

<table>
<thead>
<tr>
<th>IT Governance Structure/Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CIO credibility plays major role in implementing IT governance</td>
</tr>
<tr>
<td>2. CIO and his/her team act outside of IT Strategy Committee</td>
</tr>
<tr>
<td>3. CIO is a member of the IT Strategy Committee</td>
</tr>
<tr>
<td>4. CIO has voting rights on the IT Strategy Committee</td>
</tr>
<tr>
<td>5. CIO has a direct reporting line to the Chancellor/President</td>
</tr>
<tr>
<td>6. CIO has direct reporting line to the individual who aligns academic and financial issues (e.g. Provost as both the Chief Academic Officer and Chief Budget Officer)</td>
</tr>
<tr>
<td>7. The IT Architecture Steering Committee should be part of the successful IT governance model to provide guidance and advise on IT architecture and standards</td>
</tr>
<tr>
<td>8. IT governance processes need to be part of the practice of IT and part of the job description for involved individuals</td>
</tr>
<tr>
<td>9. Data Protection and Privacy Advisory Committee should be part of a successful IT governance model</td>
</tr>
<tr>
<td>10. Data Protection and Privacy Advisory Committee should be made of institution executive officers</td>
</tr>
<tr>
<td>11. IT governance committees should stay small in size, less than 10, ideally 6-8 people</td>
</tr>
<tr>
<td>12. A two-tier organizational structure is suggested, with the higher tier being the President's Executive Cabinet augmented with a representative from faculty council. The lower tier consists of IT professionals from around the institution, appointed by the Provost to whom the CIO reports. All policy matters are approved by the higher level committee, while elements of practice are handled at the lower level tier, unless they are contentious, in which case they are forwarded up the chain.</td>
</tr>
<tr>
<td>13. Use of word &quot;Board&quot; or &quot;Group&quot; instead of &quot;Committee&quot; when appropriate in IT governance processes and groups to convey stronger role.</td>
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</table>
Table 29 (continued)

**IT Governance Structures/Responsibilities**

1. The institutional executive officers (President, Provost, CFO, ...) need to have a knowledge and understanding regarding the value and risk of IT.

2. If the institutional executive officers do not have a knowledge and understanding of IT, they need to seek knowledgeable advice from a valued and recognized resource rather than rely on personal IT knowledge.

3. An IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc) ensures IT issues are dealt with appropriately from a planning perspective.

4. Internal audit and IT audit activities should be combined under the Audit Committee with the assurance of having IT as an item for discussion at each Audit Committee meeting.

5. IT Strategy Committee is responsible for IT strategy and policy decisions.

6. IT Strategy Committee is responsible for prioritizing and coordination of institution wide IT projects.

7. CIO is responsible for promoting and driving IT governance processes.

8. CIO is responsible for proposing IT governance processes and promoting IT governance institution wide.

9. IT Project Steering Committee composed of functional and IT experts should focus on prioritizing and managing IT projects.

10. IT Security does not require separate steering committee, but their function is important and should be addressed through general compliance and regulation committees/meetings.

11. Investment portfolio should follow the strategic directions that IT governance committee recommends.

12. Committee of faculty is appointed by the Provost to advise on IT related matters and provide feedback on the IT department projects.
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<td>6. Institution involvement in IT governance implementation not only should be in the form of IT Boards and Committees, but initiatives such as &quot;Restructuring Committee&quot; to propose Restructuring for the IT governance processes as needed</td>
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</tbody>
</table>
CHAPTER SUMMARY

This chapter identifies the findings from three rounds of modified Delphi methodology applied to obtain consensus among members of the Research University CIO Conclave, to recognize the components of IT governance in higher education institutions. Out of 62 members of the RUCC that were invited to participate in this study, 17 CIOs agreed and filled out the informed consent form. Fifteen were randomly selected and categorized into two panels: review and expert.

Initial demographic information was gathered from all participants via a general questionnaire. The Round I instrument was created with a total of 28 components derived from a literature review and presented to the review panel. After applying the review panel’s feedback to the Round I instrument, it was sent to the expert panel, each of whose members was asked to keep, reject, or modify each component. The expert panel modified 24 components and rejected 1 component. After analyzing the results of Round I, the total of 42 components (marked as kept or modified) earned consensus and were thus eligible for Round II. The Round II instrument was sent to the review panel, and the revised instrument was then sent to the expert panel to rate each component based on a five-point Likert Scale. Any component with a statistical mean of greater than 3.01 was eligible for Round III. Of the 42 components in Round II, 2 were eliminated.

Round III, the final round, involved ranking the 40 components that survived Round II. After collecting ranking data, the last step was to determine whether there was a
consensus about the ranked components among the experts. This was measured using Kendall’s Coefficient of Concordance. The statistical calculation confirmed agreement.
CHAPTER FIVE: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This study conducted a modified Delphi methodology to draw consensus on the components of information technology (IT) governance in higher education institutions. The participating experts were Chief Information Officers (CIOs) of research-intensive universities and were members of the Research University CIO Conclave. This chapter reviews the statement of the problem and the purpose of the study. It also describes the research methodology, research findings of the study, conclusions, implications, and recommendations for future research.

This study addressed the research question: What are the components of IT governance in higher education institutions according to members of the Research University CIO Conclave?

SUMMARY OF RESULTS

Three-round modified Delphi methodology was conducted to draw consensus and answer the primary research question. At the end of Round III, the degree of consensus among the experts was measured by applying Kendall’s Coefficient Concordance to each category of the components. The results of this set of calculations (see Chapter 4 for more details) provide assurance that there is an agreement on following four categories: IT governance structure/roles with 13 components, IT governance structure/responsibilities with 12 components, IT governance processes with 10 components and IT governance relational mechanisms with 6 components.

The result is a total of 41 final IT governance components for higher education institutions, which are listed in table 20.
IMPLICATIONS OF THE RESEARCH

Tables 18, 22 and 26 show the IT governance components that were found in the literature. Those components were used to design Round I instrument because the literature lacks components specific to educational institutions and were sent to the review and expert panels to begin the modified Delphi study.

Comparing the initial components with the final components indicates that sixteen components were added by the experts. The majority of the added components were within the “structure” category, whose set of components grew from 11 to 25. Tables 19 and 20 show the added and eliminated components for the IT governance structure category. Having the majority of changes in this category is the confirmation to the fact that the CIO position within higher education institutions is a new position comparing to other executive officer roles within industries and CIOs roles and responsibilities definition is still in progress.

The component under “structure” that referred to the CIO’s directly reporting to Chief Financial Officer (CFO) was added by one of the experts but failed to gain consensus and was eliminated from the list. This elimination along with the results of Round I that addresses CIO’s reporting line confirms that most research universities have the CIO reporting to the Chancellor/President rather than a different executive officer such as the CFO.

The IT Audit Committee does not necessarily need to consist of institutional executive officers. Instead, such a committee’s findings could be reported to the executive officers in another format.

Tables 23 and 24 show the added and eliminated components for the IT governance processes category. Components in this category did not deviate much from the initial list,
which indicates that IT governance for higher education institutions generally applies the same major processes as do industries. The only added component to IT governance, processes category (Table 23) focuses on the fact that IT governance framework should be related to the education and research missions and vision of the institution. This indicates that an IT governance model for higher education institutions must recognize the differences between such institutions and businesses. The only component that was eliminated from IT governance processes category was establishing IT governance processes to monitor the planned business benefits during and after implementation of the investments/projects. This indicates that there is preference on not getting involved in the detailed of the project management efforts and that information regarding the benefits or losses would be reported by another route rather than through IT governance processes. It also could be that the experts viewed the concept of “business benefit” as being in conflict with an educational institution.

Table 27 shows the added components for the IT governance relational mechanisms category. No components were eliminated from this category. Two components were added by experts, which confirm that higher education institutions need more support in the areas of relationship management and restructuring initiatives from executive officers.

**Recommendations for Future Research**

This study’s final components can be used as a basic platform and a baseline to define an effective IT governance framework or model for higher education institutions. The list of components also can be used as an invaluable resource to CIOs of the universities to choose elements from in order to form their specific IT governance model and practices as this
research confirms that the list of the IT governance components provided by previous researchers for industry, has missed out number of important components that specifically addresses higher education institutions’ concerns.

The primary goal of the three-round modified Delphi research study that was conducted to draw consensus in recognition of the components of information technology governance in higher education institutions was to create the final list (see Table 18) of the components of IT governance in higher education institutions to serve as a baseline. The outcome of this study can be very beneficial to the CIOs of higher education institutions and also researchers who are interested in broadening this spectrum. This work could be extended as follows:

1. Analyzing above results show that structure (roles and responsibility) category had most changes in the components. This is an indication that Chief Information Officer’s roles and responsibilities in higher education institutions are not necessarily the same as industry. This is evidence to the fact that there is an absolute need for an IT governance framework specific to higher education institutions to reflect such differences.

2. Major differences in the IT governance structure verify the differences in CIO’s reporting line for higher education institutions in comparison with the industry. This can be a focal point in further researches.

3. Students and faculties are two major stakeholders that are not part of the industry’s structure. This adds a new facet to differences between higher education institutions and industry and their IT governance framework.
4. This research was on research-intensive universities located in the US. Further research can be conducted on
   a. Research-intensive universities outside the US.
   b. Universities that are not research-intensive and are either within or outside the US.
   c. Comparison of results involving the above types of universities.

5. The outcome of this study can serve as an invaluable baseline to build an IT governance framework or model specific to higher education institutions.

6. The results of this research in the form of final components can be used as a base platform to conduct a study on how to measure the success of the IT governance in higher education institutions.

7. More research will be needed to understand the perceived ease of implementation of the components of IT governance in higher education institutions.

**CHAPTER SUMMARY**

As information technology (IT) occupies a more pivotal role in the sustainability and growth of higher education institutions, it is becoming exceedingly difficult for IT departments to enhance instruction and improve education and research initiatives at the same rate at which technology expands. The primary challenge is to engage in an IT decision-making process that ensures involvement of the appropriate individuals throughout the entire organization.

IT governance is “the decision rights and accountability framework for encouraging desirable behaviors in the use of IT” (Weill & Ross, 2004). Effective IT governance is a
result of thoughtful procedural design and not the consequence of isolated implementations applied at diverse times in order to address the challenge of the moment. Recognizing the decisions that need to be addressed is one of the facets of governance. The next challenge is to determine the combination of decisions and people who have either decision authority or input to IT decisions.

The components of IT governance can be defined as recognition of major IT decisions related to leadership, other stakeholders and individuals who have decision authority or are capable of providing input to IT decisions. The main research question that has been answered through this research study is stated as: What are the components of information technology governance in higher education institutions according to the members of Research University CIO Conclave? Three-round modified Delphi methodology was conducted to draw consensus and answer the primary research question. At the end of the third round, to achieve greater consensus among the participants, the degree of consensus between the experts was measured by applying Kendall’s W coefficient. The results of this calculation provide assurance that there is an agreement among participants on the final list of the 41 components and the expert panel can be judged to have reached consensus. This body of work can be used as a basic platform to develop an IT governance model for higher education institutions.
REFERENCES


[www.educause.edu](http://www.educause.edu), About EDUCAUSE. from [http://www.educause.edu/about](http://www.educause.edu/about)

Appendix A

Institutional Review Board Application
Institutional Review Board Approval – Initial
Institutional Review Board Approval - Amendment I
Institutional Review Board Approval – Amendment II
North Carolina State University  
Institutional Review Board for the Use of Human Subjects in Research  
REQUEST FOR EXEMPTION (Administrative Review) 

1. Date Submitted: 05/13/2011  
2. Title of Project: What is a baseline for effective information technology governance for higher education institutions member of Research University CIO Conclave in United States  
3. Principal Investigator: Maryam Mohseni  
4. Department: Department of Science, Technology, Engineering & Mathematics Education  
5. Campus Box Number: Box 7109  
6. Email: samila_mohseni@ncsu.edu  
7. Phone Number: 919-539-1676  
8. Fax Number: NA  
9. Faculty Sponsor Name and Email Address if Student Submission: Dr. Aaron Clark, aaron_clark@ncsu.edu  
10. Source of Funding? (required information): Student  
11. Is this research receiving federal funding? No  
12. If Externally funded, include sponsor name and university account number: N/A  
13. RANK:  
   Faculty:  
   Student: Undergraduate; □ Masters; or □ PhD  
   Other (specify):  

As the principal investigator, my signature testifies that I have read and understood the University Policy and Procedures for the Use of Human Subjects in Research. I assure the Committee that all procedures performed under this project will be conducted exactly as outlined in the Proposal Narrative and that any modification to this protocol will be submitted to the Committee in the form of an amendment for its approval prior to implementation.  

Principal Investigator:  
Maryam Mohseni  
(typed/printed name)    *  
(signature)    (date)  

As the faculty sponsor, my signature testifies that I have reviewed this application thoroughly and will oversee the research in its entirety. I hereby acknowledge my role as the principal investigator of record.  

Faculty Sponsor:  
Dr. Aaron Clark  
(typed/printed name)    *  
(signature)    (date)  

*Electronic submissions to the IRB are considered signed via an electronic signature  
PLEASE COMPLETE AND DELIVER TO:  
(carol_mickelson@ncsu.edu) or Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III, Room 245)  
*****************************************************************************  
For SPARCS office use only  

Regulatory Compliance Office Disposition  
□ Exemption Granted  □ Not Exempt, Submit a full protocol  
Exempt Under: □ b.1 □ b.2 □ b.3 □ b.4 □ b.6  

_________________________  __________________________  
IRB Office Representative  Date
Project Description: Describe your project by providing a summary and answering the requests for information below.

1. Project Summary. Please make sure to include the purpose and rationale for your study as well as a brief overview of your study.

   As information technology (IT) occupies a more pivotal role in the sustainability and growth of higher education institutions, it is becoming exceedingly difficult for IT departments to provide the service of enhancing instruction and improving education and research initiatives at the same rate in which technology expands. The consequence is that managers (from executives to supervisors) have to do more with less in order to accommodate the ever increasing technological demands in their business (Agee, 2005). The primary challenge is to engage in an IT decision-making process that ensures involvement of the appropriate individuals throughout the entire organization.

   Weill and Ross (2004) indicate that there is a need for an alignment between information technology (IT) related decisions and organizational performance goals. Many of the decisions being made throughout an organization will influence the importance of information technology. Unfortunately, the decision makers will only occasionally involve IT in this process. “IT governance is the process by which firms align IT actions with their performance goals and assign accountability for those actions and their outcomes” (Weill, 2004). Effective IT governance is a result of a thoughtful design procedures and not the consequence of isolated implementation applied at diverse times in order to address the challenge of the moment. Recognizing the decisions that needs to be addressed is one of the facets of the governance. The next challenge is to determine the combination of decisions and people who have either decisions rights or input to IT decisions.

   The components of IT governance can be defined as recognition of major IT decisions related to leadership, other stake holders and individuals who have decision rights or are capable of providing input to IT decisions. From the IT governance perspective, universities have many characteristics that make the decision-making process more complicated. Faculty, administration, heads of departments and other major stakeholders have “shared” responsibilities. Administrative staff, students, and adjunct faculties often have a stake in institutional governance decisions. Higher education institutions have more complexity in the area of IT governance compared to other organizations. Healthy governance structure needs to be understood by its constituents. Yanosky research shows that there is no single, determined framework claimed by Chief Information Officers of higher education to be used in IT governance processes and structures for higher education institutes. Therefore, to design and implement a practical IT governance, they had to choose elements from frameworks available to organizations in general (and not specific to higher education), such as COBIT, ITIL, ISO 17799 and ISO 9000 (Yanosky, 2008). Haes and Grembergen (2008) believe that IT governance best practices are divergent in all types of industries. They also believe that IT governance best practices can change, depending on the geographical area. Haes and Grembergen conducted a Delphi research in the subject of designing an IT governance baseline for a Belgian financial services sector in Europe. Researchers conclude their study that further investigation is needed to focus on other sectors (e.g. educational, human resource, etc.), which are operating in other countries and if applicable, in United States.

Research identified in this dissertation is designed to recognize the components of information technology governance in higher education according to the members of Research University CIO
Conclave. The primary objective of this study is to define an IT governance framework for Higher Education based on its identified components. It is expected that the components identified by this study would be beneficial to Chief Information Officers of higher education institutes and also can serve as a resource and guide for further materials.

2. Description of participant population, including age range, inclusion/exclusion criteria, and any vulnerable populations that will be targeted for enrollment.

Selection of appropriate experts qualified in the subject area is critical for a successful study using modified Delphi methodology. An effective panel selection increases the credibility and therefore the quality of the results. As the top management decision makers are one of the three groups that Delbecq, Van de Ven and Gustafson (1975) recommend as qualified to be subjects of Delphi study, it is certain that the members of Research University CIO Conclave are a perfect match for this study, as they are experts holding Chief Information Officers in Research 1 universities across United States. The age range will be over 18 years old and adults. No vulnerable population will be the target for this study. This study uses email as a tool for panel selection over a traditional approach of mailing via a postal service. Time and cost are two primary advantages of this tool (Andrews & Allen, 2002). According to Lang (1998), in order to select participants, qualifications of desirable respondents should be recognized. For this study based on a modified Delphi method, the selection of the expert panel will be done purposefully and emails will be sent to all potential panelists simultaneously (Introduction/consent letter is attached). Compared to sending individual mailings, response time will increase, and the cost of postage will be eliminated. The size of the expert panel is one of the key factors for achieving a successful modified Delphi study. Hsu (2007) states that if the size of the panel is too small, it may not provide sufficient representation of the target research area. Furthermore, if the size of the panel is too large, an extended amount of time would be required to process the ideas, which can result in a low response rate. To avoid difficulty in summarizing and processing ideas and items generated by expert panel, Delbecq, Van de Ven and Gustafson (1975) highly recommends 15 to 20 respondents. If the background of the Delphi subject is homogenous; the number of respondents can be reduced by 5 to 10 individuals. Ludwig (1997) also suggests that the majority of the Delphi studies have used between 15 and 20 respondents.

Regarding the criteria used to guide the selection of the modified Delphi panels, Hsu (2007) recommends that in order to be eligible for an invitation to participate in the modified Delphi study, each individual must have experience related to the target issue, be capable of providing knowledgeable inputs, and be willing to compromise in order to achieve a consensus. For the purpose of this study, the following eligibility requirements apply in order to serve as a member of the expert or the review panel. The panel member should hold the position of Chief Information Officer (CIO) or equivalent in one of the American Universities and be a member of Association of American Universities (AAU) and Research University CIO Conclave (RUCC).

To select potential participants, an email will be sent to all the members (currently 62) of the Research University CIO Conclave (RUCC). The email will describe the purpose of the study and inquire about interest in participation. The eligibility of the every respondent will be verified. 23 participants out of those who agree upon participation will be randomly chosen (using a scientific calculator). They will form the initial group, which is a combination of the expert and review panels. They will be contacted through email to explain the study and process. The email will contain an invitation/consent letter and the Research Study Overview and Participation (Attached).

As Meyer (2001) indicates, the next step is to identify members of the review panel to pilot test all instruments of the modified Delphi study before delivery to the expert panel. The expert
panel will be selected randomly from the initial group of 23 respondents. This selection process is done by placing all names in a box and choosing 20 of them at random. These 20 will serve on the expert panel and the three names not picked will form the review panel.

Following is the list of assumptions considered throughout the study:

1. There is a need to establish a standard framework for information technology governance for higher education.
2. Chief Information Officers (CIOs) of higher education institutions that are members of Research University CIO Conclave will respond to the data-collecting instrument in a non-biased manner.
3. CIOs of higher education institutions that are members of Research University CIO Conclave are knowledgeable of information technology governance concepts.
4. CIOs of higher education institutions that are members of Research University CIO Conclave and all participants will comprehend and follow directions in order to respond to data-collecting instrument.
5. CIOs of higher education institutions that are members of Research University CIO Conclave and all participants have access to computer with internet connection.
6. CIOs of higher education institutions that are members of Research University CIO Conclave and all participants have email accounts.
7. All information gathered will be current and precise to the information technology governance concept.
8. A panel of experts in the field of information technology leadership and governance in higher education in conjunction with three rounds of modified Delphi will validate the components of information technology governance.

Following is the list of limitations throughout the study:

1. This study will use the web-based modified Delphi method to collect information and participation is limited to whom with internet access.
2. Due to geographical spread of the participants, three data-collecting instruments and three follow-up emails will be used to conduct the modified Delphi method.

Respondents to this study are limited to Chief Information Officers (CIO) of higher education institutions in United States of America, who will be identified based on a predetermined criteria.

3. Description of how potential participants will be approached about the research and how informed consent will be obtained. Alternatively, provide an explanation of why informed consent will not be obtained. Include a copy of recruitment materials, such as, scripts, letters of introduction, emails, etc. with your submission.

This study uses email as a tool for panel selection over a traditional approach of mailing via a postal service. Time and cost are two primary advantages of this tool (Andrews & Allen, 2002). According to Lang (1998), in order to select participants, qualifications of desirable respondents should be recognized. For this study based on a modified Delphi method, the selection of the expert panel will be done purposefully and emails will be sent to all potential panelists simultaneously (Introduction/consent letter is attached). Compared to sending individual mailings, response time will increase, and the cost of postage will be eliminated.

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Attached are the Introduction letter, which also serves as informed consent letter; Surveymonkey snapshots (General Questionnaire and Round I instrument), Study Overview and Participation documents.

4. Description of how identifying information will be recorded and associated with data (e.g. code numbers used that are linked via a master list to subjects’ names). Alternatively, provide details on how study data will be collected and stored anonymously (“anonymously” means that there is no link whatsoever between participant identities and data). Describe management of data: security, storage, access, and final disposition.

Surveymonkey.com will be used as the major resource to create instruments (questionnaires). It will automatically generate a link that can be embedded to an email and sent to the participants to answer questions. Participants will be anonymous to each other. Researcher will receive just the statistics/results and there is no link between participants and their responses. The data will be shared in an anonymous/confidential manner. The nature of the data in this study exposes no risk to the participants’ jobs and personal life in any form. Round I, II & III instruments are in the format of questionnaires and will be prepared through Surveymonkey.com. Only data gathered will be stored temporarily on their data storage center which only researcher can have access through the secure user id and password. Data will be recorded and stored on the desktop that is only available to the researcher and is highly secured with password protection. Data will be stored for the duration of the research and after statistical analysis; it will be disposed/deleted from SurveyMonkey. Researcher will save raw/analyzed data after the research is over. It is important to acknowledge that stored data has no link/identifier to participants and researcher will inform participants on how data will be used.

5. Provide a detailed (step-by-step) description of all study procedures, including descriptions of what the participants will experience. Include topics, materials, procedures, for use of assessments (interviews, surveys, questionnaires, testing methods, observations, etc.).

This research study began with an extensive literature review as it combines major fields of governance and information technology. Based on what has been learned the subject for research narrowed down to identifying components of IT governance in higher education. The targeted group is the chief information officers of research intensive universities in United States that are members of Research University CIO Conclave (RUCC). The study uses the modified Delphi method to conduct the research. Modified Delphi method will be implemented using web-based instruments to collect consensus data. This research will focus on three rounds to obtain consensus among expert panels that are CIOs (chief information technology) of higher education institutions and member of Research University CIO Conclave (RUCC).

Linstone (1975) recommends using three or four round process in Delphi research methodology in order to achieve maximum input and reflection from their panel members. Research has shown that modified Delphi method using more than three rounds does not add major value to the study.
A review panel with three members will be chosen randomly from the chief information officers of the American research intensive universities that are members of RUCC to review materials and advise suggestions before any material being sent to expert panel in any given round throughout the research. The review panel also tests the instrument before each round. It is important to mention that participants will remain anonymous to each other to avoid the effects of dominant individuals (Hsu, 2007).

Selection of appropriate experts qualified in the subject area is critical for a successful study using modified Delphi methodology. An effective panel selection increases the credibility and therefore the quality of the results. As the top management decision makers are one of the three groups that Delbecq, Van de Ven and Gustafson (1975) recommend as qualified to be subjects of modified Delphi study, it is certain that the members of Research University CIO Conclave are a perfect match for this study, as they are experts holding Chief Information Officers in Research 1 universities across United States. The age range will be above 30 years old. No vulnerable population will be the target for this study.

This study uses email as a tool for panel selection over a traditional approach of mailing via a postal service. Time and cost are two primary advantages of this tool (Andrews & Allen, 2002). According to Lang (1998), in order to select participants, qualifications of desirable respondents should be recognized. For this study based on a modified Delphi method, the selection of the expert panel will be done purposefully and emails will be sent to all potential panelists simultaneously (Introduction/consent letter is attached). Compared to sending individual mailings, response time will increase, and the cost of postage will be eliminated.

The size of the expert panel is one of the key factors for achieving a successful modified Delphi study. Hsu (2007) states that if the size of the panel is too small, it may not provide sufficient representation of the target research area. Furthermore, if the size of the panel is too large, an extended amount of time would be required to process the ideas, which can result in a low response rate. To avoid difficulty in summarizing and processing ideas and items generated by expert panel, Delbecq, Van de Ven and Gustafson (1975) highly recommends 15 to 20 respondents. If the background of the Delphi subject is homogenous; the number of respondents can be reduced by 5 to 10 individuals. Ludwig (1997) also suggests that the majority of the Delphi studies have used between 15 and 20 respondents.

Regarding the criteria used to guide the selection of the modified Delphi panels, Hsu (2007) recommends that in order to be eligible for an invitation to participate in the modified Delphi study, each individual must have experience related to the target issue, be capable of providing knowledgeable inputs, and be willing to compromise in order to achieve a consensus. For the purpose of this study, the following eligibility requirements apply in order to serve as a member of the expert or the review panel. The panel member should hold the position of Chief Information Officer (CIO) or equivalent in one of the American Universities and be a member of Association of American Universities (AAU) and Research University CIO Conclave (RUCC).

To select potential participants, an email will be sent to all the members (currently 62) of the Research University CIO Conclave (RUCC). The email will describe the purpose of the study and inquire about interest in participation. The eligibility of the every respondent will be verified. 23 participants out of those who agree upon participation will be randomly chosen (using a scientific calculator). They will form the initial group, which is a combination of the expert and review panels. They will be contacted through email to explain the study and process. The email will contain an invitation/consent letter and the Research Study Overview and Participation (Attached).
As Meyer (2001) indicates, the next step is to identify members of the review panel to pilot test all instruments of the modified Delphi study before delivery to the expert panel. The expert panel will be selected randomly from the initial group of 23 respondents. This selection process is done by placing all names in a box and choosing 20 of them at random. These 20 will serve on the expert panel and the three names not picked will form the review panel. This research will focus on three rounds to obtain consensus among expert panels that are CIOs (chief information technology) of higher education institutions and member of Research University CIO Conclave (RUCC).

Round I instrument (Attached) of the modified Delphi method was developed based on information gathered through literature review. The components of IT governance for higher education will be placed in a web-based survey instrument.

In order to provide better understanding of the study and clarifying the type of information needed, the Round I instrument includes examples of information technology governance components derived from the extensive research review conducted by the researcher. The major goal of Round I is to gather information on the components of information technology governance. These components will be rated in Round II and ranked in Round III.

Instrument one will be sent to the review panel for the initial assessment. This instrument will be revised based upon the review panel’s feedback. After their approval, Round I instrument will be sent to the expert panel through email and the web-based survey instrument. A reminder email will be scheduled for two weeks after the initial email for Round I (Attached). Once the responses from the expert panel are received, all answers will be processed and the new suggestions/changes will be incorporated in the instrument design for Round II.

The design of the Round II instrument of the modified Delphi method is based on rating of the information technology governance components that have been gathered and processed through Round I. Researcher develops the instrument two by putting together all the information technology governance components that have been gathered in Round I and creates a comprehensive list. After developing instrument two, it will be sent to the review panel for their review and feedback on instrument two. The approved and final version of the instrument will be sent to the expert panel. The major goal of this round is to rate the responses given in Round I. Linstone and Turoff (1975), believe that a rating system must be established for such items as the relative importance, desirability, confidence, and feasibility of various policies and issues.

In the second instrument, expert panel members will be asked to accept or reject only the comprehensive list of information technology governance components. The Likert Scale will be utilized to rate the outcome of Round I. It has been over three decades that researchers have been using the Likert Scale which was developed by Rensis Likert. He explains it as “A technique for the measurement of attitudes” (Arnold, 1967, Page 31). Arnold also recommends four research areas that can benefit from using Likert Scale which are, measuring the credibility of an expert, an expert’s attitude towards a statement, evaluating speeches and a course by students. The Likert Scale works with a series of declarative statements. An expert will be asked to provide their opinion on a statement using five options. This scale uses an opinion range of one to five, with one being “strongly disagree” and five being “strongly agree”. The rating system will be incorporated into the web-based survey poll. The mean, median, and standard deviation will be calculated for each component.

The purpose of the Round III is to develop final consensus among expert panel, but the first step in Round III is to rank in the order of importance. Meaning that expert panel members rank the comprehensive list of IT governance components that has been accepted and rated by expert panel in Round II. Each expert panel member will evaluate the list based on the level of importance of that specific component. Ranking the outcome from Round II will take place in Round III. Participants
will rank each component in order of importance. To process the ranking of the components that are the result of Round II, components will be listed randomly. A number will be assigned to each component. All numbers will be placed in a box and one number will be picked at the time which will represent the order of the components on the list. A drop down list will be provided for each of the components to rank from most to least important. Drop down list consists of the numbers, starting from one. The last number on the drop down list equals to the total number of components on the list. To rank the components, each expert panel member assigns one number to one component.

Haes and Grembergen have conducted a modified Delphi research to gather consensus on the initial list of IT governance practices for the Belgian financial organizations (Haes, 2009). According to them, modified Delphi method is very suitable technique for complex and interdisciplinary issues that often involves a member of new or future trends. The goal of Round III of their 3-round Delphi research was to achieve greater consensus in the group. For that reason, at the end of the third round, they measured the degree of consensus between the experts by leveraging Kendall’s W coefficient (Siegel, 1998).

In this modified Delphi methodology, researcher also uses the Kendall Coefficient of Concordance W in Round III to analyze data. After receiving responds, a list of the components of the IT governance for higher education will be formed which reflects expert panels’ ranking. The next step is to make sure that there has been an agreement on the list and the expert panel can be judged to have reached consensus. One way to measure consensus is to determine the degree of agreement among expert panel in their judgment. The Kendall coefficient of concordance is a measure which would provide such an index (Siegel, 1988).

The hypothesis for this test is:
\[ H_0: \text{There is an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education.} \]

The alternative hypothesis for this test is:
\[ H_1: \text{There is no agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education.} \]

In order to compute W (Kendall coefficient of concordance), data needs to be arranged into \( k \times N \) table with each row \( (k) \) representing the ranks assigned by a member of expert panel to the \( N \) components of information technology governance that has been passed from Round II to Round III. Next, is to calculate the sum of ranks \( R_i \), in each column of the table and divide each by \( k \) to find the average rank \( \bar{R}_i \). Next is to sum \( \bar{R}_i \) and divide that sum by \( k \) to obtain the mean value of the \( \bar{R}_i \)'s. Each of the \( \bar{R}_i \) may then be expressed as a deviation from the grand mean. The bigger these deviations, the greater the degree of association among the \( k \) sets of ranks. So the sum of squares of these deviations is found. Now the value of W will be computed as:

\[
W = \frac{\sum_{i=1}^{N}(\bar{R}_i - \bar{R})^2}{N(N^2 - 1)/12}
\]

Where \( k \) represents the number of sets of rankings, e.g., the number of experts, \( N \) represents the number of objects (or individuals) being ranked, \( \bar{R}_i \) shows the average of ranks assigned to the \( i \)th object or subject and \( \bar{R} \) is the average (grand mean) of the ranks assigned across all objects or subjects. The total of \( N(N^2 - 1)/12 \) is the maximum possible sum of the squared deviations, i.e., the numerator which would occur if there were perfect agreement among the \( k \) rankings, and the
average rankings were 1,2,…,N and finally W represents the degree of agreement among the expert panel.

After the completion of the Kendall Coefficient of Concordance W, a final form with the components of information technology governance for higher education will be created and a final copy will be sent to review and expert panels.

6. Will minors (participants under the age of 18) be recruited for this study:

   No

7. Is this study funded? No If yes, please provide the grant proposal or any other supporting documents.

8. Is this study receiving federal funding? No

9. Do you have a significant financial interest or other conflict of interest in the sponsor of this project? No

10. Does your current conflicts of interest management plan include this relationship and is it being properly followed? N/A

11. HUMAN SUBJECT ETHICS TRAINING

   *Please consider taking the Collaborative Institutional Training Initiative (CITI), a free, comprehensive ethics training program for researchers conducting research with human subjects. Just click on the underlined link.

12. ADDITIONAL INFORMATION:

   a) If a questionnaire, survey or interview instrument is to be used, attach a copy to this proposal.

   b) Attach a copy of the informed consent form to this proposal. See the IRB website for a Sample Consent Form and Informed Consent Checklist http://www.ncsu.edu/sparcs/irb/forms.html

   c) Please provide any additional materials (i.e., recruitment materials, such as “flyers”, recruitment scripts, etc.) that may aid the IRB in making its decision.

   *If a survey instrument or other documents such as a consent form that will be used in the study are available, attach them to this request. If informed consent is not necessary, an information or fact sheet should be considered in order to provide subjects with information about the study. The informed consent form template on the IRB website could be modified into an information or fact sheet.

The Following are categories the IRB office uses to determine if your project qualifies for exemption (a review of the categories below may provide guidance about what sort of information is necessary for the IRB office to verify that your research is exempt):

Exemption Category: (Choose only one of the following that specifically matches the characteristics of your study that make this project exempt)
1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation. *Please Note- this exemption for research involving survey or interview procedures or observations of public behavior does not apply to research conducted with minors, except for research that involves observation of public behavior when the investigator(s) do not participate in the activities being observed.*

3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

4. Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

5. Not applicable

6. Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration, or approved by the Environmental Protection Agency, or the Food Safety and Inspection Service of the U.S. Department of Agriculture.
References:

From: Carol Mickelson, IRB Coordinator  
North Carolina State University  
Institutional Review Board  
Title: What is a baseline for effective information technology governance for higher education institutions member of Research University CIO Conclave in United States  
IRB#: 2048

Dear Ms. Mohseni,

The research proposal named above has received administrative review and up to Round I of your study activities is being approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101. b.2). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review.

NOTE:
1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU projects, the Assurance Number is: FWA00003429.

2. Any changes to the research must be submitted and approved by the IRB prior to implementation. Since this approval is limited to Round I of your study activities, you will need to submit an amendment request before you implement Round II and III.

3. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days.

Please forward a copy of this letter to your faculty sponsor, if applicable. Thank you.

Sincerely,

Carol Mickelson  
NC State IRB
North Carolina State Institutional Review Board
STUDY MODIFICATION/ADDITION REQUEST FORM

Please note: this form is not for annual continuing review. If it’s time for your protocol’s annual review, please use a “Protocol Renewal Form.”

IRB #: 2048  Most recent IRB Approval Date: May 19, 2011

Principal Investigator: Maryam Mohseni

Project Title: What is the baseline for effective information technology governance for higher education institutions member of research University CIO Conclave in United States

I. Summarize / Itemize requested changes and justification for each.

DO NOT attach a complete revised protocol, only pertinent changes.

I would like to track respondents with a unique ID by appending that number to the end of a Web Link collector. In Survey monkey web site, each email address of participants will be associated with a unique ID and the ID will be appended to the web link. Web link will be sent to participants. Changes that participants will observe is just and added ID to the end of the link.

Researcher does not need to know for the purpose of the results who is associated to the unique ID, but unique ID will extremely be helpful to researcher to group the results based on the participants (but not “the actual name of the participants). Following is an example:

I have the exact, fixed number of participants. Let’s say 3 and I will send Survey 1, after collecting the results, researcher will analyze the results and based on that create Survey 2 and ...

Right now researcher can retrieve the results as:

Survey 1 results: Q1-A, D, A, Q2-D, D, Q3-C, C, C, Q4-B, A, B, Q5-A, A, B
Survey 2 results: Q1-A, A, A, Q2-D, B, D, Q3-C, C, C, Q4-B, B, B
Survey 3 results: Q1-A, A, D, Q2-D, C, D, Q3-C, A, C, Q4-D, B, B

Using unique ID will help the researcher to organize data as follows. It is basically finding out how Participant A has responded. Researcher absolutely does not need to know "who" is Participant A (although there is a way to find that link through survey monkey web site, but that information is not needed for the purpose of this research and will not be shared with the participants):

Participant A: Survey 1 results: Q1-A, Q2-D, Q3-C, Q4-B, Q5-A, Survey 2: Q1-A, Q2-D, Q3-C, Q4-B, Survey 3: Q1-A, Q2-D, Q3-C, Q4-D
Participant B: Survey 1 results: Q1-D, Q2-D, Q3-C, Q4-A, Q5-A, Survey 2: Q1-A, Q2-B, Q3-C, Q4-B, Survey 3: Q1-A, Q2-C, Q3-A, Q4-B
Participant C: Survey 1 results: Q1-A, Q2-D, Q3-C, Q4-B, Q5-B, Survey 2: Q1-A, Q2-D, Q3-C, Q4-B, Survey 3: Q1-D, Q2-D, Q3-C, Q4-B

II. Do changes require a REVISED CONSENT statement or procedure?
If so, attach revised form and procedures. No

III. Do changes affect the risks or benefits expected from participating in the study?
IV. Do changes require revisions to the methods of ensuring anonymity or confidentiality? If so, explain. Please refer to details provided in Questions I

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Signature of Investigator

Signature of Faculty Sponsor (if applicable)

Please complete and email to: carol_mickelson@ncsu.edu. You can also mail your submission to: Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III).

(For IRB office use only)

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Review Notes:

Reviewer__________ Signature________________ Date _________
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North Carolina State University  
Institutional Review Board  

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IRB#: 2048  

Dear Ms. Mohseni,  

Your addendum to the study named above has been reviewed and approved by the IRB office. The addendum does not change the original IRB exemption status of this project and you are free to proceed with your study.  

If you have any questions please do not hesitate to contact the IRB office at 919.515.4514.  

Sincerely,  

Carol Mickelson  
NC State IRB
North Carolina State Institutional Review Board
STUDY MODIFICATION/ADDENDUM REQUEST FORM

Please note: this form is not for annual continuing review. If it’s time for your protocol’s annual review, please use a “Protocol Renewal Form.”

IRB #: 2048 Most recent IRB Approval Date: May 27th, 2011

Principal Investigator: Maryam Mohseni

Project Title: What is the baseline for effective information technology governance for higher education institutions member of research University CIO Conclave in United States

I. Summarize / Itemize requested changes and justification for each.

   DO NOT attach a complete revised protocol, only pertinent changes.

   As it was stated in the initial IRB Approval Letter dated May 19th 2011, researcher needs to submit an amendment request before implementing Round II and III. Please find as an attachment a PDF file that includes Round II Questionnaire which will be sent out through Survey Monkey upon approval.

II. Do changes require a REVISED CONSENT statement or procedure? No

   If so, attach revised form and procedures.

III. Do changes affect the risks or benefits expected from participating in the study? No

IV. Do changes require revisions to the methods of ensuring anonymity or confidentiality? No

   If so, explain.

______________________________  __9/25/2011________
Signature of Investigator              Date

______________________________
Signature of Faculty Sponsor (if applicable) Date

Please complete and email to: carol_mickelson@ncsu.edu. You can also mail your submission to: Institutional Review Board, Box 7514, NCSU Campus (Administrative Services III).

(For IRB office use only)

Review Received:    ☐ Administrative    ☐ Expedited    ☐ Full Board

Review Decision:    ☐ Approve    ☐ Approve with Modifications    ☐ Table    ☐ Disapprove

Review Notes:

Reviewer____________Signature___________________Date ___________
From: Carol Mickelson, IRB Coordinator

DATE: 09/26/11

North Carolina State University
Institutional Review Board

Title: What is a baseline for effective information technology governance for higher education institutions member of Research University CIO Conclave in United States

IRB#: 2048

Dear Ms. Mohseni:

Your addendum to the study named above has been reviewed and approved by the IRB office. The addendum does not change the original IRB exemption status of this project and you are free to proceed with your study.

If you have any questions please do not hesitate to contact the IRB office at 919.515.4514.

Sincerely,

Carol Mickelson
NC State IRB
APPENDIX B

Email Invitation to participate to all RUCC members
Research Study Overview and Participation
Email notification to Reserved Group
Initial Email Notification to the Expert Panel
General Questionnaire
Dear member of Research University CIO Conclave / Potential Panelist:

This is Maryam “Samila” Mohseni and I am a Technology Education Ph.D. student working on my dissertation in the Department of Science, Technology, Engineering & Mathematics Education at North Carolina State University. With my Master’s and Bachelor’s degree in Computer Science and 14 years of experience in the field of IT, I am delighted to have the opportunity to conduct a research study on IT governance framework that focuses on higher education needs rather than industry, under the supervision of Dr. Aaron Clark and Dr. Marc Hoit.

This research study began with an extensive literature review as it combines major fields of governance and information technology. Based on what has been learned the subject for research narrowed down to identifying components of IT governance in higher education. The targeted group is the chief information officers of research intensive universities in United States that are members of Research University CIO Conclave (RUCC). You have been contacted as you can be qualified to be a potential participant in this research study. The study uses the modified Delphi method to conduct the research. Modified Delphi method will be implemented using web-based instruments (Survey Monkey) to collect consensus data. This research will focus on three rounds to obtain consensus among expert panels that are CIOs (chief information technology) of higher education institutions and member of Research University CIO Conclave (RUCC).

I am asking you to participate in this research. After the initial email including consent form, an instrument in the format of a web-based questionnaire will be sent to the qualified participants. Each questionnaire will take approximately 20 minutes to respond. Participants have two to three weeks to respond. Researcher needs one to two week to analyze received data and prepare Round II instrument/questionnaire to send to participants. The same time frame will apply for Round II & III. Participant dedicated time to this
research will be around 60 minutes spread in 6-8 weeks time frame. Questions will be all around practicing IT governance and its components. Please review the attachment for more information on this research study.

Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. Your answers to the questions are confidential and your name will not be shared with other participants. The results of the research study may be published, but your name will not be used. If you have any questions concerning the research study, please contact me at samila_mohseni AT ncsu.edu.

Note: Please respond to this email if you choose to participate. Responding to this email will be considered your informed consent to participate in this study.

Looking forward to hearing from you,

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu
Research Study Overview and Participation

Research identified in this dissertation is designed to recognize the components of information technology governance in higher education according to the members of Research University CIO Conclave. The primary objective of this study is to define an IT governance framework for Higher Education based on its identified elements.

Peter Weill and Jeanne Ross (2004) as a result of their extensive research found out that there is a large group of IT leaders that are searching for a tool or a guideline that can define components of IT governance. This will help to design the IT governance of the specific organization and also help to learn how others represent and analyze decision rights.

Yanosky provides extensive research to CIOs, whom are members of EDUCAUSE Center for Applied Research, with information about the state of higher education IT governance. In addition, Yanosky’s research identifies practices that are associated with good IT governance. His research shows that there is no single, determined framework claimed by CIOs of higher education to be used in IT governance processes and structures for higher education institutes. Therefore, to design and implement a practical IT governance, they had to choose elements from frameworks available to organizations in general (and not specific to higher education), such as COBIT, ITIL, ISO 17799 and ISO 9000 (Yanosky, 2008).

Haes and Grembergen (2008) believe that IT governance best practices are divergent in all types of industries. They also believe that IT governance best practices can change, depending on the geographical area. Haes and Grembergen conducted a Delphi research in the subject of designing an IT governance baseline for a Belgian financial services sector in Europe. An expert panel of twenty-nine consultants, senior IT, and senior business professionals in financial services sector participated in the research. The research reveals a list of thirty-three IT governance practices at the level of strategic and executive business leaders. It also prioritizes the list based upon the ease of implementation and effectiveness. The final element of the research specifies a minimum baseline for IT governance for the
Belgian financial sector. Researchers conclude their study that further investigation is needed to focus on other sectors (e.g. educational, human resource, etc.), which are operating in other countries and if applicable, in United States.

RESEARCH METHODOLOGY

This research study began with an extensive literature review as it combines major fields of governance and information technology. Based on what has been learned the subject for research narrowed down to identifying components of IT governance in higher education. The targeted group is the chief information officers of research intensive universities in United States that are members of Research University CIO Conclave (RUCC). The study uses the modified Delphi method to conduct the research. Modified Delphi method will be implemented using web-based instruments to collect consensus data. This research will focus on three rounds to obtain consensus among expert panels that are CIOs (chief information technology) of higher education institutions and member of Research University CIO Conclave (RUCC). Each participant will spend approximately 20 minute to respond to each round/questionnaire. Participants have two to three weeks to respond. Researcher needs one to two week to analyze received data and prepare Round II instrument/questionnaire to send to participants. The same time frame will apply for Round II & III. Participant dedicated time to this research will be around 60 minutes spread in 6-8 weeks time frame.

A review panel with three members will be chosen randomly from the chief information officers of the American research intensive universities that are members of RUCC to review materials and advise suggestions before any material being sent to expert panel in any given round throughout the research. The review panel also tests the instrument before each round. It is important to mention that participants will remain anonymous to each other to avoid the effects of dominant individuals (Hsu, 2007).

Selection of appropriate experts qualified in the subject area is critical for a successful study using modified Delphi methodology. An effective panel selection increases the
credibility and therefore the quality of the results. As the top management decision makers are one of the three groups that Delbecq, Van de Ven and Gustafson (1975) recommend as qualified to be subjects of modified Delphi study, it is certain that the members of Research University CIO Conclave are a perfect match for this study, as they are experts holding Chief Information Officers in Research 1 universities across United States. The age range will be above 30 years old. No vulnerable population will be the target for this study.

For the purpose of this study, the following eligibility requirements apply in order to serve as a member of the expert or the review panel. The panel member should hold the position of Chief Information Officer (CIO) or equivalent in one of the American Universities and be a member of Association of American Universities (AAU) and Research University CIO Conclave (RUCC).

To select potential participants, an email will be sent to all the members (currently 62) of the Research University CIO Conclave (RUCC). The email will describe the purpose of the study and inquire about interest in participation. The eligibility of the every respondent will be verified. 23 participants out of those who agree upon participation will be randomly chosen (using a scientific calculator). They will form the initial group, which is a combination of the expert and review panels. They will be contacted through email to explain the study and process. The email will contain an invitation letter, the Study Overview and Participation.

The next step is to identify members of the review panel to pilot test all instruments of the modified Delphi study before delivery to the expert panel. The expert panel will be selected randomly from the initial group of 23 respondents. This selection process is done by placing all names in a box and choosing 20 of them at random. These 20 will serve on the expert panel and the three names not picked will form the review panel.

This research will focus on three rounds to obtain consensus among expert panels that are CIOs (chief information technology) of higher education institutions and member of Research University CIO Conclave (RUCC).
Round I instrument of the modified Delphi method was developed based on information gathered through literature review. The components of IT governance for higher education will be placed in a web-based survey instrument.

In order to provide better understanding of the study and clarifying the type of information needed, the Round I instrument includes examples of information technology governance components derived from the extensive research review conducted by the researcher. The major goal of Round I is to gather information on the components of information technology governance.

Instrument one will be sent to the review panel for the initial assessment. This instrument will be revised based upon the review panel’s feedback. After their approval, Round I instrument will be sent to the expert panel through email and the web-based survey instrument. A reminder email will be scheduled for two weeks after the initial email for Round I. Once the responses from the expert panel are received, all answers will be processed and the new suggestions/changes will be incorporated in the instrument design for Round II.

The design of the Round II instrument of the modified Delphi method is based on rating of the information technology governance components that have been gathered and processed through Round I. Researcher develops the instrument two by putting together all the information technology governance components that have been gathered in Round I and creates a comprehensive list. After developing instrument two, it will be sent to the review panel for their review and feedback on instrument two. The approved and final version of the instrument will be sent to the expert panel. The major goal of this round is to rate the responses given in Round I.

In the second instrument, expert panel members will be asked to accept or reject only the comprehensive list of information technology governance components. The Likert Scale will be utilized to rate the outcome of Round I. It has been over three decades that researchers have been using the Likert Scale which was developed by Rensis Likert. He explains it as “A technique for the measurement of attitudes”. The Likert Scale works with a series of declarative statements. An expert will be asked to provide their opinion on a statement using five options. This scale uses an opinion range of one to five, with one being
“strongly disagree” and five being “strongly agree”. The rating system will be incorporated into the web-based survey poll. The mean, median, and standard deviation will be calculated for each component.

The purpose of the Round III is to develop final consensus among expert panel, but the first step in Round III is to rank in the order of importance. Meaning that expert panel members rank the comprehensive list of IT governance components that has been accepted and rated by expert panel in Round II. Each expert panel member will evaluate the list based on the level of importance of that specific component. Ranking the outcome from Round II will take place in Round III. Participants will rank each component in order of importance. To process the ranking of the components that are the result of Round II, components will be listed randomly. A number will be assigned to each component. All numbers will be placed in a box and one number will be picked at the time which will represent the order of the components on the list. A drop down list will be provided for each of the components to rank from most to least important. Drop down list consists of the numbers, starting from one. The last number on the drop down list equals to the total number of components on the list. To rank the components, each expert panel member assigns one number to one component.

The goal of Round III of 3-round Delphi research is to achieve greater consensus in the group. For that reason, at the end of the third round, the degree of consensus between the experts by leveraging Kendall’s W coefficient will be measured. After receiving responds, a list of the components of the IT governance for higher education will be formed which reflects expert panels’ ranking. The next step is to make sure that there has been an agreement on the list and the expert panel can be judged to have reached consensus. One way to measure consensus is to determine the degree of agreement among expert panel in their judgment. The Kendall coefficient of concordance is a measure which would provide such an index.

The hypothesis for this test is:

\[ H_0: \text{There is an agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education.} \]

The alternative hypothesis for this test is:
H₁: There is no agreement among the members of Research University CIO Conclave in the recognition of the components of information technology governance for higher education.

In order to compute W (Kendall coefficient of concordance), data needs to be arranged into $k \times N$ table with each row ($k$) representing the ranks assigned by a member of expert panel to the $N$ components of information technology governance that has been passed from Round II to Round III. Next, is to calculate the sum of ranks $R_i$ in each column of the table and divide each by $k$ to find the average rank $\bar{R_i}$. Next is to sum $\bar{R_i}$ and divide that sum by $k$ to obtain the mean value of the $\bar{R_i}s$. Each of the $\bar{R_i}$ may then be expressed as a deviation from the grand mean. The bigger these deviations, the greater the degree of association among the $k$ sets of ranks. So the sum of squares of these deviations is found. Now the value of $W$ will be computed as:

$$W = \frac{\sum_{i=1}^{N} (\bar{R_i} - \bar{R})^2}{\frac{N(N^2-1)}{12}}$$

Where $k$ represents the number of sets of rankings, e.g., the number of experts, $N$ represents the number of objects (or individuals) being ranked, $\bar{R_i}$ shows the average of ranks assigned to the $i$th object or subject and $\bar{R}$ is the average (grand mean) of the ranks assigned across all objects or subjects. The total of $\frac{N(N^2-1)}{12}$ is the maximum possible sum of the squared deviations, i.e., the numerator which would occur if there were perfect agreement among the $k$ rankings, and the average rankings were 1,2,..,$N$ and finally $W$ represents the degree of agreement among the expert panel.

After the completion of the Kendall Coefficient of Concordance $W$, a final form with the components of information technology governance for higher education will be created and a final copy will be sent to review and expert panels.
EMAIL NOTIFICATION TO THE RESERVED GROUP

Dear ______,

First of all thank you so much for your participation. The research process starts with randomly selecting the final participants out of the potential participants (all volunteers who have already accepted to participate). The random selection is a very important step in the Modified Delphi Methodology. Next step is to randomly divide the final participants into two groups; review panel and expert panel. You have been randomly selected to be in the reserved group. In the case of any Review or Expert Panel members drop from the research, you will be added to the panels.

All of my communications going forward will include NCSU-ITG in the subject line. Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.

Your time and attention is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu
INITIAL EMAIL NOTIFICATION TO THE EXPERT PANEL

Dear final participants/Expert panel members;

First of all thank you so much for your participation. The research process starts with randomly selecting the final participants out of the potential participants (all volunteers who have already accepted to participate). The random selection is a very important step in the Modified Delphi Methodology. Next step is to randomly divide the final participants into two groups; review panel and expert panel. You all receive same set of surveys but the way the expert panel members and review panel members respond will be different. You have been randomly selected as a member of the “Expert Panel”. Expert panel receives & responds to the Round-I survey after Review Panel gets a chance to review the questions. I have already sent Round-I survey to the Review Panel and after their review (2-3 weeks) you will receive the Round-I survey. Following is just a general demographic questionnaire which includes only three questions. Responding to it is absolutely voluntarily and should not take more than 3 minutes.

http://www.surveymonkey.com/s/GeneralQuestionnaire?c=E003

All of my communications going forward will include NCSU-ITG in the subject line. I have also included a summary of the study as an attachment. Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.

Your time and attention is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu
GENERAL QUESTIONNAIRE

Please answer following questions:

1. How long have you been in Chief Information Officer position at your current higher education institution or throughout your career?

2. What is the status of your institution current IT Governance?
   - O Non-existent: The institution has not even recognized that there is an issue to be addressed
   - O Initial: The institution has recognized that there the issue exist and need to be addressed but there is no standardized processes in place.
   - O Repeatable: Processes have developed to the stage where similar procedures are followed by different people undertaking the same task.
   - O Defined Process: Procedures have been standardized and documented and communicated.
   - O Managed and Measurable: Management monitors and measures compliance with procedures and to take action where processes appear not to be working effectively.
   - O Optimized: Processes have been refined to a level of good practices

3. Is your institution current IT Governance successful?
   - O Strongly Disagree
   - O Disagree
   - O Neutral
   - O Agree
   - O Strongly Agree
APPENDIX C

Initial Email to the Review Panel and Notification for Round I
Email Reminder Notification to the Review Panel for Round I
Thank You Email to the Review Panel for Round I
Initial Email to the Expert Panel and Notification for Round I
Email Reminder Notification to the Expert Panel for Round I
Email Extended Reminder Notification to the Expert Panel for Round I
Email Final Reminder Notification to the Expert Panel for Round I
Thank You Email to the Expert Panel for Round I
Round I Instrument and Instructions
INITIAL EMAIL TO THE REVIEW PANEL AND NOTIFICATION FOR ROUND I

Dear ____________,

First of all thank you so much for your participation. The research process starts with randomly selecting the final participants out of the potential participants (all volunteers who have already accepted to participate). The random selection is a very important step in the Modified Delphi Methodology. Next step is to randomly divide the final participants into two groups; review panel and expert panel. You all receive same set of surveys but the way the expert panel members and review panel members respond will be different. You have been randomly selected as a member of the “Review Panel”. You will receive the survey before rest of the participants (Expert Panel). You may review each question and advise suggestions in the "content of the question" and NOT necessarily answering the questions. Each question has three choices: Keep, Reject and Modify. As your role as a reviewer please just review the content of the questions and judge its relevance. You may choose the text box under “Modify” to express your ideas regarding the question and not the Keep and Reject choices. Questions are all short and related to the IT Governance in Higher Education. It should not take more than 20 minutes in total for you to respond. Following is the link to the Round-I survey:


The description that is at the beginning of the survey is targeted for the "Expert Panel". Throughout the survey, keep in mind that you are part of the "Review Panel" and look at the questions from the perspective of a reviewer. After submitting the survey, I will collect the results from the review panel and after reviewing all modifications/recommendations I will apply them to the survey and send the final version to the expert panel to respond.

All of my communications going forward will include NCSU-ITG in the subject line. Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.

Your time and attention is greatly appreciated and thanks again for your participation. I am looking forward to receiving answers by August 8, 2011 (two weeks from now).

P.S. Please find the study review as an attachment. It has informational value for those who would like to know more about this research.

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu
EMAIL REMINDER NOTIFICATION TO THE REVIEW PANEL FOR ROUND 1

Dear __________,

Thank you so much for serving as a reviewer for this doctoral study. If you have not had the chance to review the Round I questionnaire and submit your feedback please do so by August 8, 2011.

Thank you again for your time, expertise, and participation in this study. If you have any questions please feel free to contact me by email.

Kindest Regards,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Committee member
North Carolina State University
THANK YOU EMAIL TO THE REVIEW PANEL FOR ROUND 1

Dear members of the Review Panel,

Thank you so much for reviewing the Round I Questionnaire. After reviewing all received feedbacks, now Round I questionnaire is ready to send out to the Expert Panel members. After reviewing the results of the Round I Questionnaire, Round II Questionnaire will be developed and sent to you for review.

I truly appreciate your time, expertise, and participation in this study. If you have any questions please feel free to contact me by email.

Kindest Regards,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Committee member
North Carolina State University
INITIAL EMAIL TO THE EXPERT PANEL AND NOTIFICATION FOR ROUND I

Dear __________,

The Round-I questionnaire has been reviewed by the review panel and is ready for you to respond. As a member of the “Expert Panel” in IT Governance for Higher Education research (NCSU), please visit the link below to access the questionnaire with instructions included. Responses must be submitted by Wednesday September 7, 2011. The questionnaire only requires 20-30 minutes of your time.

http://www.surveymonkey.com/s/Round-I?c=005

All of my communications going forward will include NCSU-ITG in the subject line. I have also included a summary of the study as an attachment. Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.

Your time and expertise is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Committee member
North Carolina State University
Dear __________,

This is a gentle reminder to review and respond to the IT Governance for Higher education Round I questionnaire that was made accessible on August 23, 2011. As you have volunteered to participate in this survey and have been selected as an expert panelist, your response is absolutely vital for the success of this research. Please review and submit your response by Wednesday September 7, 2011. The questionnaire only requires 20-30 minutes of your time.

http://www.surveymonkey.com/s/Round-I?c=010

I have also included a summary of the study as an attachment. Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676. Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
**EMAIL EXTENDED REMINDER NOTIFICATION TO THE EXPERT PANEL FOR ROUND I**

Dear ___________,

Final day to respond the Round I of the NCSU IT Governance for Higher Education Survey was September 7th, 2011 and due to the low response rate, I decided to extend the time for two more days. Your response is **absolutely vital** for the success of this research.

Please review and submit your response by **Wednesday September 14, 2011**. The questionnaire should not take more than 20 minutes of your time.

http://www.surveymonkey.com/s/Round-I?c=010

Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni  
ISO, Office of Information Technology  
North Carolina State University, P.O.Box 7109  
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair  
Dr. Marc Hoit, Co-Chair  
North Carolina State University
EMAIL FINAL REMINDER NOTIFICATION TO THE EXPERT PANEL FOR ROUND I

Dear ______________,

Today is the FINAL DAY to respond to review and respond to the IT Governance for Higher education Round I questionnaire that was made accessible on August 23, 2011. As you have volunteered to participate in this survey and have been selected as an expert panelist, your response is absolutely vital for the success of this research. Please review and submit your response by end of today Wednesday September 7, 2011. The questionnaire only requires 20-30 minutes of your time.

http://www.surveymonkey.com/s/Round-I?c=010

    Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
THANK YOU EMAIL TO THE EXPERT PANEL FOR ROUND 1

Dear __________,

Thank you so much for responding to the Round I Questionnaire. After receiving and analyzing feedbacks, I will develop Round II questionnaire based on your responses and send it to Review Panel for final review. After their approval, Round II Questionnaire will be sent to you for review (approximately in next two weeks).

I truly appreciate your time, expertise, and participation in this study. If you have any questions please feel free to contact me by email.

Kindest Regards,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
**ROUND I INSTRUMENT AND INSTRUCTIONS**

The major goal of Round I is to gather information on the components of Information Technology Governance for higher education. Future rounds will refine the components to add details and different sub-options within the components. In order to provide better understanding of the format of the data gathering, the following examples of the components of information technology governance for higher education have been gathered through extensive literature review are listed below. The list provided has been categorized to three different major groups: Structures, Processes and Relational Mechanisms (De Haes & Van Grembergen, 2009). There is also a brief description for each component. Please review the following list. You may keep, reject or modify each of the components. Please check KEEP to keep the component, REJECT if you believe the component is not appropriate, or MODIFY to rephrase the component. A text box is provided underneath each component for any modification. I encourage you to add NEW components to the list as needed. A text box has been provided at the end of the questionnaire and you may add as many as you need by typing inside the provided text box for new components.

**IT Governance Structures**

1. IT strategy committee at level of Executive Officers

   Definition: Committee at level of executive officers (Provost, CFO, Chancellor/President, etc) to ensure IT is regular agenda item and reporting issue for the executive officers.

   O Keep  O Reject  O Modify (*Write in the box below*)

2. IT expertise at level of executive officers

   Definition: Members of the executive officers have expertise and experience regarding the value and risk of IT

   O Keep  O Reject  O Modify (*Write in the box below*)
3. (IT) audit committee at level of executive officers

Definition: Independent committee at level of executive officers overviewing (IT) assurance activities

O Keep  O Reject  O Modify (Write in the box below)

4. Chief Information Officer (CIO) on executive committee

Definition: CIO is the full member of the executive committee

O Keep  O Reject  O Modify (Write in the box below)

5. Chief Information Officer (CIO) reporting to Chancellor/President

Definition: CIO has a direct reporting line to the Chancellor/President

O Keep  O Reject  O Modify (Write in the box below)

6. IT steering committee

Definition: Steering committee at executive or senior management level responsible for determining business priorities in IT investments

O Keep  O Reject  O Modify (Write in the box below)

7. IT governance function / officer

Definition: Function in the university responsible for promoting, driving and managing IT

O Keep  O Reject  O Modify (Write in the box below)
8. IT project steering committee

Definition: Steering committee composed of business and IT people focusing on prioritizing and managing IT projects

  O Keep   O Reject   O Modify (Write in the box below)

9. IT security steering committee

Definition: Steering committee composed of business and IT people focusing on IT related risks and security issues

  O Keep   O Reject   O Modify (Write in the box below)

10. Architecture steering committee

Definition: Committee composed of business and IT people providing architecture guidelines and advise on their applications

  O Keep   O Reject   O Modify (Write in the box below)

11. Integration of governance / alignment tasks in roles & responsibilities

Definition: Documented roles and responsibilities include governance / alignment tasks for business and IT people

  O Keep   O Reject   O Modify (Write in the box below)

12. Please **add** new components of information technology governance for higher education in the text-box below. You may add as many as you need, just keep typing:

13.
**IT Governance Processes**

1. Strategic information systems planning
   Definition: Formal process to define and update the IT strategy
   
   O Keep  O Reject  O Modify *(Write in the box below)*

2. IT performance measurement (e.g. IT balanced scorecard, …)
   Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation
   
   O Keep  O Reject  O Modify *(Write in the box below)*

3. Portfolio management (including business cases, information economics, ROI, payback)
   Definition: Prioritization process for IT investments and projects in which business and IT is involved
   
   O Keep  O Reject  O Modify *(Write in the box below)*

4. Chargeback arrangements – total cost of ownership (e.g. activity based costing)
   Definition: Methodology to charge back IT costs to business units, to enable an understanding of the total cost of ownership
   
   O Keep  O Reject  O Modify *(Write in the box below)*

5. Service level agreements
   Definition: Formal agreements between business and IT about IT development projects or IT operations
   
   O Keep  O Reject  O Modify *(Write in the box below)*
6. IT governance framework (e.g. COBIT, …)
Definition: IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation

O Keep  O Reject  O Modify (Write in the box below)

7. IT governance assurance and self-assessment
Definition: Regular self-assessments or independent assurance activities on the governance and control over IT

O Keep  O Reject  O Modify (Write in the box below)

8. Project governance / management methodologies
Definition: Processes and methodologies to govern and manage IT projects

O Keep  O Reject  O Modify (Write in the box below)

9. IT budget control and reporting
Definition: Processes to control and report upon budgets of IT

O Keep  O Reject  O Modify (Write in the box below)

10. Benefits management and reporting
Definition: Processes to monitor the planned business benefits during and after implementation of the investments / projects

O Keep  O Reject  O Modify (Write in the box below)

11. Please add new components of information technology governance for higher education in the text-box below. You may add as many as you need, just keep typing:
**IT Governance Relational Mechanisms**

1. Knowledge management on IT governance  
Definition: Systems (intranet, …) to share and distribute knowledge about IT Governance framework, responsibilities, tasks, etc.  
O Keep  O Reject  O Modify (Write in the box below)

2. Business / IT account management  
Definition: Bridging the gap between business and IT by means of account managers who act as in-between  
O Keep  O Reject  O Modify (Write in the box below)

3. Informal meetings between business and IT executive / senior management  
Definition: Informal meetings, with no agenda, where business and IT senior management talk about general activities, directions  
O Keep  O Reject  O Modify (Write in the box below)

4. IT leadership  
Definition: Ability of CIO or similar role to articulate a vision for IT’s role and ensure that this vision is clearly understood by managers throughout the organization  
O Keep  O Reject  O Modify (Write in the box below)

5. Please add new components of information technology governance for higher education in the text-box below. You may add as many as you need, just keep typing:
APPENDIX D

Initial Email Notification to the Review Panel for Round II
Thank you Email to The Review Panel for Round II
Email Notification to the Expert Panel for Round II
Email Reminder Notification to the Expert Panel for Round II
Thank you Email to The Expert Panel for Round II
Round II Instrument and Instructions – Sent to the Expert Panel
Statistical Means for Round II
INITIAL EMAIL NOTIFICATION TO THE REVIEW PANEL FOR ROUND II

Dear ____________,

Based on the results of Round I of the modified Delphi study (thank you for your participation), Round II has been developed and is ready for the review panel. As a reminder, this is a NCSU doctoral research study to define baseline for effective IT governance for higher education institutions that are member of RUCC.

As a review panel member, all you need to do is to review each round survey instrument for clarity, consistency and jargon. After your review I will send the survey to expert panel who are your peers from other universities that are members of RUCC to answer the survey.

Please visit the following link and provide any modification or suggestion on the clarity and consistency of each question in the text box provided below each question. Answering to the questions is not a requirement and if you believe that the survey instrument does not require modification, you may choose not to answer. Please review and respond by Sept 30, 2011.


Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,
Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
**THANK YOU EMAIL TO THE REVIEW PANEL FOR ROUND II**

Dear ______________,

Thank you so much! I sincerely appreciate taking time out of your busy schedule and responding to the survey. I have applied your feedback and survey is ready to be sent to Expert Panel. I will have another (last) round for you to review which will be ready in approximately one month.

Kindest regards,

Maryam “Samila” Mohseni
ISO Project Manager, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
EMAIL NOTIFICATION TO THE EXPERT PANEL FOR ROUND II

Dear __________,

With so much appreciation that you have volunteered to participate in IT Governance for Higher Education doctoral research (co-chaired by Dr. Marc Hoit), I would like to inform you that the Round-II questionnaire has been reviewed by the review panel and is ready for you to respond. As a member of the “Expert Panel”, please visit the link below to access the questionnaire with instructions included. Responses must be submitted by Tuesday October 18, 2011. The questionnaire only requires 20-30 minutes of your time.

Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.
Your time and expertise is greatly appreciated and thanks again for your participation.
Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
**EMAIL REMINDER NOTIFICATION TO THE EXPERT PANEL FOR ROUND II**

Dear ___________,

This is a gentle reminder to respond to the IT Governance for Higher education Round II questionnaire (doctoral research co-chaired by Dr. Marc Hoit), that was made accessible on October 11, 2011. As a member of the “Expert Panel”, please visit the link below to access the questionnaire with instructions included. Responses must be submitted by **Tuesday October 18, 2011**. The questionnaire only requires 20-30 minutes of your time.

Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.
Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
THANK YOU EMAIL TO THE EXPERT PANEL FOR ROUND II

Dear __________,

Thank you so much for responding to the Round II Questionnaire. After receiving and analyzing feedbacks, I will develop Round III (last one) questionnaire based on your responses and send it to Review Panel for final review. After their approval, Round III Questionnaire will be sent to you for review (approximately in next two weeks).

I truly appreciate your time, expertise, and participation in this study. If you have any questions please feel free to contact me by email.

Kindest Regards,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
ROUND II INSTRUMENT AND INSTRUCTIONS – SENT TO THE EXPERT PANEL

Rating IT Governance components for Higher Education Institution:

Please rate following IT Governance components for Higher Education Institution using the Likert scale below. All the components including revised and new are the result of analyzing your responses from the RoundI Questionnaire. Ratings for this round are based on appropriateness when developing components for effective IT governance for higher education institutions. The Likert scale to be used for rating the components is as follows:

5: Strongly Agree that this component should be considered as one of the components for the effective IT governance for higher education institutions.

4: Agree that this component should be considered as one of the components for the effective IT governance for higher education institutions.

3: Neutral position that this component should be considered as one of the effective components for the IT governance for higher education institutions.

2: Disagree that this component should be considered as one of the components for the effective IT governance for higher education institutions.

1: Strongly Disagree that this component should be considered as one of the effective components for the IT governance for higher education institutions.

Note:

For the purpose of consistency, an IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc) is defined as the highest tier of the IT governance structure.

Additional Components:

I strongly encourage you to include additional components for effective IT governance for higher education to the list. Your expert insight to this field is greatly appreciated. A text box has been provided at the end of each page/category for this purpose.

IT Governance structure

1. The institutional executive officers (President, Provost, CFO, ...) need to have a knowledge and understanding regarding the value and risk of IT

Strongly disagree  Disagree  Neutral  Agree  Strongly agree
2. If the institutional executive officers do not have a knowledge and understanding of IT, they need to seek knowledgeable advise from a valued and recognized resource rather than rely on personal IT knowledge.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

3. Chief Information Officer credibility play major role in implementing IT Governance for higher education institutions.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

4. An IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc) ensures IT issues are dealt with appropriately from a planning perspective.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

5. Chief Information and his/her team act in lieu of IT Strategy Committee (defined as in Question #4).

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

6. An IT Audit Committee at the level of institutional executive officers needed to provide oversight IT audit activities.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

7. Internal audit and IT audit activities should be combined under the Audit Committee with the assurance of having IT as an item for discussion at each Audit Committee meeting.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

8. Chief Information Officer (CIO) is a member of the IT strategy committee.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

9. Chief Information Officer (CIO) has voting right on the IT Strategy Committee.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

10. Chief Information Officer (CIO) has a direct reporting line to the Chancellor/President.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree
11. Chief Information Officer (CIO) with direct reporting line to the individual who aligns academic and financial issues (e.g. Provost as both the Chief Academic Officer and Chief Budget Officer) has a great advantage for IT.

Strongly disagree Disagree Neutral Agree Strongly agree

12. Chief Information Officer (CIO) reports directly to Chief Financial Officer.

Strongly disagree Disagree Neutral Agree Strongly agree

13. IT Strategy Committee formed of institutional executive officers is responsible for IT strategy and policy decisions.

Strongly disagree Disagree Neutral Agree Strongly agree

14. IT Strategy Committee at senior management level is responsible for prioritizing and coordination of institution wide IT projects.

Strongly disagree Disagree Neutral Agree Strongly agree

15. Chief Information Officer (CIO) is responsible for promoting and driving IT governance processes.

Strongly disagree Disagree Neutral Agree Strongly agree

16. Chief Information Officer (CIO) is responsible for proposing IT governance processes and promoting IT governance institution wide.

Strongly disagree Disagree Neutral Agree Strongly agree

17. IT Project Steering Committee composed of functional and IT experts should focus on prioritizing and managing IT projects.

Strongly disagree Disagree Neutral Agree Strongly agree

18. IT Security does not require separate steering committee, but their function is important and should be addressed through general compliance and regulation committees/meetings.

Strongly disagree Disagree Neutral Agree Strongly agree

19. The IT Architecture Steering Committee should be part of the successful IT governance model for higher education institution to provide guidance and advise on IT architecture and standards.
20. IT governance processes need to be part of the practice of IT and part of the job description for involved individuals.

21. Data Protection and Privacy Advisory Committee is part of the IT governance for higher education institutions at the level of institution executive officers.

22. Investment portfolio should follow specific directions that IT governance committee recommends.

23. IT governance committees should stay small in size, less than 10, ideally 6 people.

24. Committee of faculty is appointed by the Provost to advise on IT related matters and provide feedback on the IT department projects.

25. A two-tier organizational structure is suggested, with the higher tier being the President's Executive Cabinet augmented with a representative from faculty council. The lower tier consists of IT professionals from around the institution, appointed by the Provost to whom the CIO reports. All policy matters are approved by the higher level committee, while elements of practice are handled at the lower level tier, unless they are contentious, in which case they are forwarded up the chain.

26. Use of word "Board" or "Group" instead of "Committee" when appropriate in IT governance processes and groups to convey stronger role.

27. Please add new components of information technology governance for higher education institutions in the IT Governance Structure category:
IT Governance Processes

1. Strategic Information System Planning is a formal process to define and update the IT strategy institution wide.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

2. IT performance measurement is important linkage to the higher education institution vision/mission and to the IT department effective engagement.
   3. Combined IT and administrative portfolio management and prioritization process for IT investments and institution wide projects is preferred to separate IT and administrative portfolio management.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

4. IT governance processes needs to differentiate chargeback services from general fund services.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

5. IT governance processes define the decision making process on formal agreements between higher education institution and IT department about IT operations and projects (e.g. SLAs, Contracts, MOUs, ...).

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

6. Accepted IT governance framework is needed for higher education institutions.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

7. Regular self assessments or independent assurance activities on the IT governance is necessary.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

8. Project governance / management are processes and methodologies are needed to govern and manage large IT projects.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

9. IT budget control and reporting processes are needed to control and report upon budgets of IT.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree
10. IT governance framework should be related to the education and research missions and vision of the institution.

Strongly disagree  Disagree  Neutral  Agree  Strongly agree

11. Please add new components of information technology governance for higher education in the IT Governance Processes category:

Strongly disagree  Disagree  Neutral  Agree  Strongly agree
IT Governance Relational Mechanisms:

1. Key higher education institution constituencies need to share an understanding of and knowledge about IT governance awareness, framework, responsibilities, tasks, etc.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

2. Business / IT portfolio and project management is bridging the gap between business and IT by means of portfolio and project managers who act as intermediaries between two.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

3. There is a need for informal meetings between IT executives and other institutional executive officers with no agenda, where they talk about general activities and directions.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

4. IT leadership/CIO must have the ability to articulate a vision for IT department’s role and ensure that this vision is clearly understood by departments and units throughout the institutions.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

5. Formal relationship management processes need to be part of the IT governance for higher education institutions.

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

6. Institution involvement in IT governance implementation not only should be in the form of IT Boards and Committees, but initiatives such as "Restructuring Committee".

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree

7. Please add new components of information technology governance for higher education in the IT Governance Relational Mechanism category:

   Strongly disagree  Disagree  Neutral  Agree  Strongly agree
APPENDIX E

Initial Email to the Review Panel for Round III
Thank you Email to the Review Panel for Round III
Initial Email to the Expert Panel for Round III
Email Reminder Notification to the Expert Panel for Round III
Thank you Email to the Expert Panel for Round III
Round III Instrument and Instructions
Final Components of IT Governance for Higher Education Institutions
INITIAL EMAIL TO THE REVIEW PANEL FOR ROUND III

Dear ____________,

Based on the results of Round II of the modified Delphi study (thank you for your participation), Round III has been developed and is ready for the review panel. As a reminder, this is a NCSU doctoral research study to define baseline for effective IT governance for higher education institutions that are members of RUCC.

As a review panel member, all you need to do is to review each round survey instrument for clarity, consistency and jargon. After your review I will send the survey to expert panel who are your peers from other universities that are members of RUCC to answer the survey.

Please visit the following link and provide any modification or suggestion on the clarity and consistency of each question in the text box provided below each question. Answering to the questions is not a requirement and it should not take more than 15 minutes of your time. If you believe that the survey instrument does not require modification, you may choose not to answer. Please review and respond by November 29, 2011.


Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
THANK YOU EMAIL TO THE REVIEW PANEL FOR ROUND III

Dear __________,

Thank you so much! I sincerely appreciate taking time out of your busy schedule and responding to the survey. I have applied your feedback and survey is ready to be sent to Expert Panel. I will have another (last) round for you to review which will be ready in approximately one month.

Kindest regards,

Maryam “Samila” Mohseni
ISO Project Manager, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni@ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
INITIAL EMAIL TO THE EXPERT PANEL FOR ROUND III

Dear __________,

With so much appreciation for participating in IT Governance for Higher Education doctoral research (co-chaired by Dr. Marc Hoit), I would like to inform you that Round-III questionnaire has been reviewed by the review panel and is ready for you to respond. The components for this round are the result of the Round II responses, compiled and analyzed by the researcher.

As a member of the “Expert Panel”, please visit the link below (or copy and paste the URL to a fresh browser) to access the questionnaire with instructions included. Responses must be submitted by Friday December 9, 2011. The questionnaire only requires 20-30 minutes of your time.


Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.

Your time and expertise is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
EMAIL REMINDER NOTIFICATION TO THE EXPERT PANEL FOR ROUND III

Dear ____________.

This is a gentle reminder to respond to the IT Governance for Higher education Round III questionnaire (doctoral research co-chaired by Dr. Marc Hoit), that was made accessible on December 3, 2011. As a member of the “Expert Panel”, please visit the link below (or copy and paste the URL to a fresh browser) to access the questionnaire with instructions included. Due date was Friday December 9, 2011 but i have extended it until **Monday December 12, 2011**. The questionnaire only requires 20-30 minutes of your time.


Please feel free to contact me if there is any question. You may reach me at samila_mohseni AT ncsu.edu or 919-539-1676.

Your contribution to the field of IT Governance for Higher Education is greatly appreciated and thanks again for your participation.

Sincerely,

Maryam “Samila” Mohseni
ISO, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
THANK YOU EMAIL TO THE EXPERT PANEL FOR ROUND III

Dear ___________,

I would like to thank you for your participation in IT governance for higher education institutions doctoral research. This study could not have moved forward without the sharing of your knowledge, experience and your time dedication. The results of this research study will be shared with all participants in early 2012, and hope you find it beneficial to the improvement of the IT governance processes at your institution. Completion of this research study is not the end of this journey for me and there will be more research on the way in coming year. If you are interested in any specific area in IT governance, please contact me and we can discuss further shared research planning.

It has been such an honor working with you within past couple months. Wish you a very happy holidays and New Year,

Kindest Regards,

Maryam “Samila” Mohseni
ISO Project Manager, Office of Information Technology
North Carolina State University, P.O.Box 7109
Email: samila_mohseni AT ncsu.edu

Dr. Aaron C. Clark, Chair
Dr. Marc Hoit, Co-Chair
North Carolina State University
ROUND III INSTRUMENT AND INSTRUCTIONS

Ranking IT governance components for Higher Education Institution:

Please rank following IT governance components for Higher Education Institution categorized in four sections: IT governance structure, processes and relational mechanisms.

All the components are the result of analyzing your responses from the RoundII Questionnaire. Rated components with the statistical mean value of 3.01 or above were retained for this round to be ranked.

Rankings for this round are based on appropriateness when developing components for effective IT governance for higher education institutions.

Note:

For the purpose of consistency, an IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc) is defined as the highest tier of the IT governance structure.

IT Governance Structures

1. Please rank following IT governance components. The following focuses on CIO roles that need to be considered in an IT governance model for higher education institutions (1: highest, 13: lowest).

- CIO credibility plays major role in implementing IT governance
- CIO and his/her team act outside of IT Strategy Committee
- CIO is a member of the IT Strategy Committee
- CIO has voting rights on the IT Strategy Committee
- CIO has a direct reporting line to the Chancellor/President
• CIO has direct reporting line to the individual who aligns academic and financial issues (e.g. Provost as both the Chief Academic Officer and Chief Budget Officer)

• The IT Architecture Steering Committee should be part of the successful IT governance model to provide guidance and advise on IT architecture and standards

• IT governance processes need to be part of the practice of IT and part of the job description for involved individuals

• Data Protection and Privacy Advisory Committee should be part of a successful IT governance model

• Data Protection and Privacy Advisory Committee should be made of institution executive officers

• IT governance committees should stay small in size, less than 10, ideally 6-8 people

• A two-tier organizational structure is suggested, with the higher tier being the President's Executive Cabinet augmented with a representative from faculty council. The lower tier consists of IT professionals from around the institution, appointed by the Provost to whom the CIO reports. All policy matters are approved by the higher level committee, while elements of practice are handled at the lower level tier, unless they are contentious, in which case they are forwarded up the chain.

• Use of word "Board" or "Group" instead of "Committee" when appropriate in IT governance processes and groups to convey stronger role.
2. Please rank following IT governance components. The following focuses on responsibilities that need to be considered in an IT governance model for higher education institutions (1: highest, 12: lowest).

- The institutional executive officers (President, Provost, CFO, ...) need to have a knowledge and understanding regarding the value and risk of IT.
- If the institutional executive officers do not have a knowledge and understanding of IT, they need to seek knowledgeable advice from a valued and recognized resource rather than rely on personal IT knowledge.
- An IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc) ensures IT issues are dealt with appropriately from a planning perspective.
- Internal audit and IT audit activities should be combined under the Audit Committee with the assurance of having IT as an item for discussion at each Audit Committee meeting.
- IT Strategy Committee is responsible for IT strategy and policy decisions.
- IT Strategy Committee is responsible for prioritizing and coordination of institution wide IT projects.
- CIO is responsible for promoting and driving IT governance processes.
- CIO is responsible for proposing IT governance processes and promoting IT governance institution wide.
- IT Project Steering Committee composed of functional and IT experts should focus on prioritizing and managing IT projects.
• IT Security does not require separate steering committee, but their function is important and should be addressed through general compliance and regulation committees/meetings

• Investment portfolio should follow the strategic directions that IT governance committee recommends

• Committee of faculty is appointed by the Provost to advise on IT related matters and provide feedback on the IT department projects

**IT Governance Processes**

1. Please rank following IT governance components. The following focuses processes that need to be considered in an IT governance model for higher education institutions (1: highest, 10: lowest).

   • Accepted IT governance framework is needed for higher education institutions

   • IT governance framework should be related to the education and research missions and vision of the institution

   • Strategic Information System Planning is a formal process to define and update the IT strategy institution wide

   • IT performance measurement is important linkage to the higher education institution vision/mission and to the IT department effective engagement

   • Combined IT and administrative portfolio management and prioritization process for IT investments and institution wide projects is preferred to separate IT and administrative portfolio management
• IT governance processes need to differentiate chargeback services from general fund services

• IT governance processes define the decision making process on formal agreements between higher education institution and IT department about IT operations and projects (e.g. SLAs, Contracts, MOUs, ...)

• Regular self-assessments or independent assurance activities on the IT governance is necessary

• Project governance / management processes and methodologies are needed to govern and manage large IT projects

• IT budget control and reporting processes are needed to control and report upon budgets of IT

**IT Governance Relational Mechanisms**

1. Please rank following IT governance components. The following focuses on relational mechanisms that need to be considered in an IT governance model for higher education institutions (1: highest, 6: lowest).

• Key higher education institution constituencies need to share an understanding of and knowledge about IT governance awareness, framework, responsibilities, tasks, etc

• Business / IT portfolio and project management is bridging the gap between business and IT by means of portfolio and project managers who act as intermediaries between the two
• There is a need for informal meetings between IT executives and other institutional executive officers with no agenda, where they talk about general activities and directions

• IT leadership/CIO must have the ability to articulate a vision for IT department’s role and ensure that this vision is clearly understood by departments and units throughout the institutions

• Formal relationship management processes need to be part of the IT governance for higher education institutions

• Institution involvement in IT governance implementation not only should be in the form of IT Boards and Committees, but initiatives such as "Restructuring Committee" to propose Restructuring for the IT governance processes as needed
**Final Components of IT Governance for Higher Education Institutions**

Table A

*Final Components of IT Governance for Higher Education Institutions*

<table>
<thead>
<tr>
<th>IT Governance Structure/Roles</th>
</tr>
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<tbody>
<tr>
<td>14. CIO credibility plays a major role in implementing IT governance</td>
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<tr>
<td>15. CIO and his/her team act outside of the IT Strategy Committee</td>
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<tr>
<td>16. CIO is a member of the IT Strategy Committee</td>
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<tr>
<td>17. CIO has voting rights on the IT Strategy Committee</td>
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<tr>
<td>18. CIO has a direct reporting line to the Chancellor/President</td>
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<tr>
<td>19. CIO has direct reporting line to the individual who aligns academic and financial issues</td>
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<tr>
<td>(e.g., Provost as both the Chief Academic Officer and Chief Budget Officer)</td>
</tr>
<tr>
<td>20. The IT Architecture Steering Committee should be part of the successful IT governance</td>
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<tr>
<td>21. IT governance processes need to be part of the practice of IT and part of the job</td>
</tr>
<tr>
<td>22. Data Protection and Privacy Advisory Committee should be part of a successful IT</td>
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<tr>
<td>23. Data Protection and Privacy Advisory Committee should be made up of institution’s</td>
</tr>
<tr>
<td>24. IT governance committees should stay small, fewer than 10, ideally 6–8 people</td>
</tr>
<tr>
<td>25. A two-tier organizational structure is suggested, with the higher tier being the</td>
</tr>
<tr>
<td>26. Use of the word &quot;Board&quot; or &quot;Group&quot; instead of &quot;Committee&quot; when appropriate in IT</td>
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<tr>
<td>President’s Executive Cabinet augmented with a representative from the faculty council.</td>
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<tr>
<td>lower tier consists of IT professionals from around the institution, appointed by the</td>
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<tr>
<td>All policy matters are approved by the higher-level committee, while elements of practice</td>
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<td>in which case they are forwarded up the chain.</td>
</tr>
<tr>
<td>reported to the Provost to whom the CIO reports. All policy matters are approved by the</td>
</tr>
<tr>
<td>handled at the lower-level tier, unless they are contentious, in which case they are</td>
</tr>
<tr>
<td>Use of the word &quot;Board&quot; or &quot;Group&quot; instead of &quot;Committee&quot; when appropriate in IT governance</td>
</tr>
<tr>
<td>governance processes, and groups to convey stronger role.</td>
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Table A

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**IT Governance Structures/Responsibilities**

13. The institutional executive officers (President, Provost, CFO, etc.) need to have knowledge and understanding regarding the value and risk of IT.

14. If the institutional executive officers do not have a knowledge and understanding of IT, they need to seek knowledgeable advice from a valued and recognized resource rather than rely on personal IT knowledge.

15. An IT Strategy Committee at the level of institutional executive officers (Chancellor/President, Provost, CIO, CFO, etc.) ensures IT issues are dealt with appropriately from a planning perspective.

16. Internal audit and IT audit activities should be combined under the Audit Committee with the assurance of having IT as an item for discussion at each Audit Committee meeting.

17. IT Strategy Committee is responsible for IT strategy and policy decisions.

18. IT Strategy Committee is responsible for prioritizing and coordination of institution-wide IT projects.

19. CIO is responsible for promoting and driving IT governance processes.

20. CIO is responsible for proposing IT governance processes and promoting IT governance institution-wide.

21. IT Project Steering Committee composed of functional and IT experts should focus on prioritizing and managing IT projects.

22. IT Security does not require separate steering committee, but its function is important and should be addressed through general compliance and regulation committees/meetings.

23. Investment portfolio should follow the strategic directions that the IT Governance Committee recommends.

24. Committee of faculty is appointed by the Provost to advise on IT-related matters and provide feedback on IT department projects.
Table A

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**IT Governance Processes**

11. Accepted IT governance framework is needed for higher education institutions

12. IT governance framework should be related to the education and research missions and vision of the institution

13. Strategic Information System Planning is a formal process to define and update the IT strategy institution-wide

14. IT performance measurement is important linkage to the higher education institution’s vision/mission and to the IT department’s effective engagement

15. Combined IT and administrative portfolio management and prioritization process for IT investments and institution-wide projects is preferred to separate IT and administrative portfolio management

16. IT governance processes need to differentiate chargeback services from general fund services

17. IT governance processes define the decision making process on formal agreements between higher education institution and IT department about IT operations and projects (SLAs, Contracts, MOUs, etc.)

18. Regular self-assessments or independent assurance activities on IT governance is necessary

19. Project governance / management processes and methodologies are needed to govern and manage large IT projects

20. IT budget control and reporting processes are needed to control and report upon budgets of IT
Table A

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<tr>
<th>IT Governance Relational Mechanisms</th>
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<tr>
<td>7. Key higher education institution constituencies need to share an understanding of and knowledge about IT governance awareness, framework, responsibilities, tasks, etc.</td>
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<td>8. Business / IT portfolio and project management are bridging the gap between business and IT by means of portfolio and project managers who act as intermediaries between the two</td>
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<td>9. There is a need for informal meetings between IT executives and other institutional executive officers with no agenda, where they talk about general activities and directions</td>
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<td>10. IT leadership / CIO must have the ability to articulate a vision for IT department’s role and ensure that this vision is clearly understood by departments and units throughout the institutions</td>
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<td>11. Formal relationship management processes need to be part of IT governance for higher education institutions</td>
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<td>12. Institution involvement in IT governance implementation should be in the form of not only IT Boards and Committees, but initiatives such as a &quot;Restructuring Committee&quot; to propose restructuring for the IT governance processes as needed</td>
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