The Influential Factors in IT Governance that Enable IT Innovation and Support Organizations in Sustainably Competing in the Marketplace

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Abstract

For companies to be competitive in the global market, innovation has to be seen as the primary source for growth and the foundation for economic development and competitiveness. As competitive threats increase through the introduction of new products and services, organizations are forced to respond with innovative products quickly. Having strong IT governance can aid in these processes and improve management and ensure the optimal alignment of IT with the company-specific organizational business strategy. Several frameworks designed to streamline strategic alignment between business and IT strategy exist today and can maximize the value of IT investments within an organization. Therefore, the purpose of this quantitative exploratory study is to identify the factors that influence the ability of IT governance in some organizations to consider IT innovations that will allow the organization to compete in the marketplace sustainably. The population of the study included IT personnel working in SME and large organizations, primarily in the UAE, where dedicated IT departments or divisions are typically found. The two main IT governance frameworks that formed the basis for the theoretical framework of this research were Control Objectives for Information and Related Technology (COBIT 5) and Information Technology Infrastructure Library (ITIL). The study found a relationship between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations. While most participants disagreed with the questions, they were asked about IT governance structures and innovation references in general, they also disagreed with those that focused on establishing whether innovation plays an important role in their organization or whether the IT department should be considered successful, thus suggesting that more research is needed to identify additional contributing factors or establish causation.

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Chapter 1: Introduction

For companies to be competitive in the global market, innovation has to be seen as the primary source for growth and the foundation for economic development and competitiveness. Most companies must compete in the market through their innovative products, services, and processes (Acemoglu, 2012). Moreover, the commercial environment is constantly changing, and therefore product development is considered a very important capability. As threats increase through competitors introducing new products and services, organizations need to respond quickly with their innovative products. Furthermore, process innovation has an important strategic role to play, offering to improve processes (Peterson, 2004).

Information technology (IT) governance provides the structure to create and implement decisions needed to manage, control, and monitor IT and innovation within the organization (Weill & Ross, 2004). When appropriately designed, it should facilitate business and IT to work effectively together to achieve organizational objectives. Therefore, having strong IT governance can improve management and ensure the optimal alignment of IT with the company-specific organizational business strategy (S. De Haes & Van Grembergen, 2006). Most organizations face issues transforming their business and realizing the value and benefits of IT in supporting their organizational strategy. Other issues that organizations have to overcome include an inability to be innovative to gain a competitive edge and underestimating IT risks. To reduce the potential impact of such issues, an IT governance framework is often considered to help define IT decision-making, structures, processes, and responsibilities to deliver effective overall IT governance (Héroux & Fortin, 2016).

As a result of applying such frameworks, strategic alignment between business and IT strategy gives an organization the ability to realize the value of an investment in IT. Strategic

alignment is considered a continuous process in order to reflect a positive change in the organization. Additionally, it is also important to increase IT's ability to support the organizational business strategy (Henderson & Venkatraman, 1993). Furthermore, using IT is now essential in most organizations, even if the work is not fully dependent on IT, as it simplifies processes by automating lots of manual activities, thus leading to more accurate results and adding more value to the organization. However, this has resulted in increased costs and risks, leading organizations to shift their focus to IT governance (Van Grembergen, 2006).

Moreover, IT helps organizations be more effective by creating a great change in the industry and increasing their competitive advantage (Bakos & Treacy, 1986). Chou, Hao-Chun Chuang, and Shao (2014) pointed out that some IT companies like McAfee and Brynjolffson were identified in 2008 as IT tools for triggering innovative ideas. Their applications supported organizations in producing new products and services (Chou et al., 2014; McAfee & Brynjolfsson, 2008).

Innovation is vital to IT, which is crucial to adopting innovation in other areas and advances the ability to identify innovation opportunities. IT governance affects innovation and the alignment of IT and business by supporting the development of the required strategy to enhance IT innovation (Héroux & Fortin, 2016). Insufficient governance processes result in misunderstanding the anticipated outcomes, roles, and responsibilities. These misunderstandings could prove risky and costly; organizations are required to think beyond IT governance, as most decisions are related to business more than technology (S. De Haes & Van Grembergen, 2006).

Statement of the Problem

The problem to be addressed by this study is the inability of IT governance in some organizations to enable innovations that will allow the organization to compete in the

marketplace sustainably (Arkhipova, Vaia, DeLone, & Braghin, 2016; Héroux & Fortin, 2016; Tonelli, de Souza Bermejo, Aparecida dos Santos, Zuppo, & Zambalde, 2017; Van Grembergen & De Haes, 2018). Many IT departments across the globe face issues with competing sustainably. Chief information officers (CIOs) highlighted in many different surveys that IT governance is very important to management (Van Grembergen & De Haes, 2018). For instance, the 2003 top 10 CIO management priorities were focused on improving IT governance; that was the first time it was included, ranking at number three, and management started to prioritize it (S. De Haes & Van Grembergen, 2006).

Some IT companies encounter obstacles as a result of not adopting IT governance; they might not be using IT governance and strategy principles, which will not facilitate the implementation of new innovative technologies to be used in their organization. Moreover, they have found that IT and business alignment will positively affect innovation, and the lack of a positive contribution of IT on accomplishing business objectives appears to be an important issue for management (Arkhipova et al., 2016). Understanding the influence of IT governance in organizational performance has been identified as necessary for the development of a comprehensive IT strategy to support organizational objectives (Ali & Green, 2012; Novotny, Bernroider, & Koch, 2012; Tonelli et al., 2017).

Purpose of the Study

The purpose of this quantitative exploratory study is to identify the factors that influence the ability of IT governance in some organizations to consider IT innovations that will allow the organization to compete in the marketplace sustainably. By addressing such factors, organizations will improve their ability to be innovative, increasing their competitiveness and growth. The population of the study is comprised of IT personnel working in SME and large

organizations, primarily in the UAE, where dedicated IT departments or divisions are typically found. Moreover, the variables in this research include the factors that influence IT governance to adopt innovations, such as the IT governance frameworks the organizations are using and the IT strategy they implement. The sampling method is convenience sampling, and a questionnaire was developed to capture the required information.

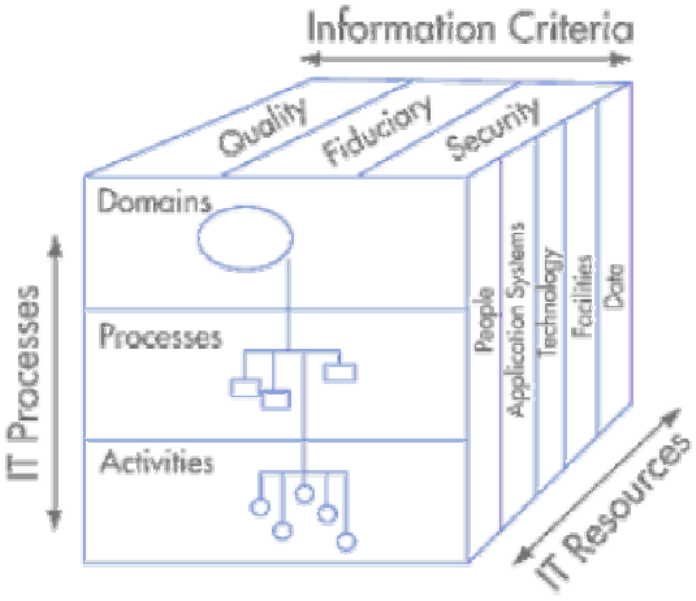
Theoretical Framework

The two main IT governance frameworks that will form the basis for the theoretical framework of this research are Control Objectives for Information and Related Technology (COBIT 5) and Information Technology Infrastructure Library (ITIL) (Ding, 2015). Published by the IT Governance Institute and ISACA (Information Systems Audit and Control Association), COBIT provides a common understanding for business executives to achieve their business success. It is based on five key principles for governance and management of enterprise IT that will help meet stakeholders' needs, cover the enterprise end-to-end, apply a single and integrated framework, enable a holistic approach, and separate governance from management (Brand & Boonen, 2007).

The COBIT 5 conceptual framework can be represented by three main areas/dimensions, as shown in Figure 1. In the COBIT cube, IT resources are managed by IT processes to achieve IT goals/information criteria that respond to the business's requirements (Salle, 2004). The framework has clear instructions on how to set up and maintain a governance implementation. Organizations could start with fragments of the framework to commence IT governance and extend at later stages to have the framework implemented (Khther & Othman, 2013).

Figure 1

Cobit Cube

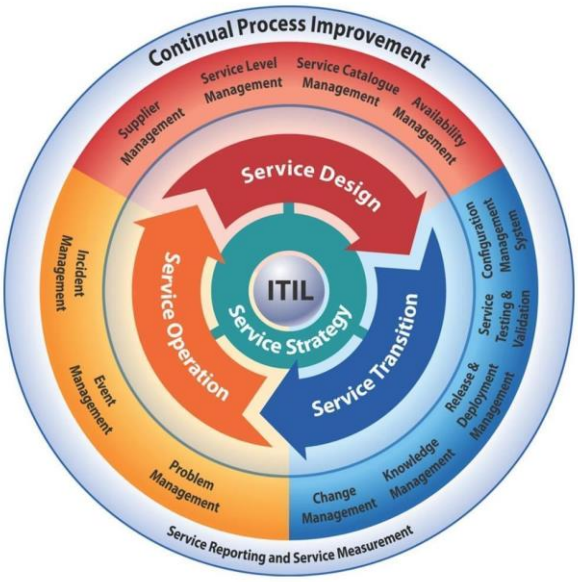


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The second framework that will be considered in this research is ITIL, the information technology infrastructure library that consists of a set of practices to govern and align IT service management with the business. Figure 2 shows ITIL components in version 3, consisting of five sections, including service strategy, service design, service transition, service operation, and continual service improvement (Suhairi & Gaol, 2013). ITIL consists mainly of a set of IT service management practices to align IT services with the business. The framework describes the organization's procedures, processes, and standards that should align with the business. ITIL focuses on delivering quality services with continual service improvement by the organization. It will always ensure that customer satisfaction is achieved (Itil Framework Is & Potgieter, 2005).

Figure 2

ITIL Life Cycle



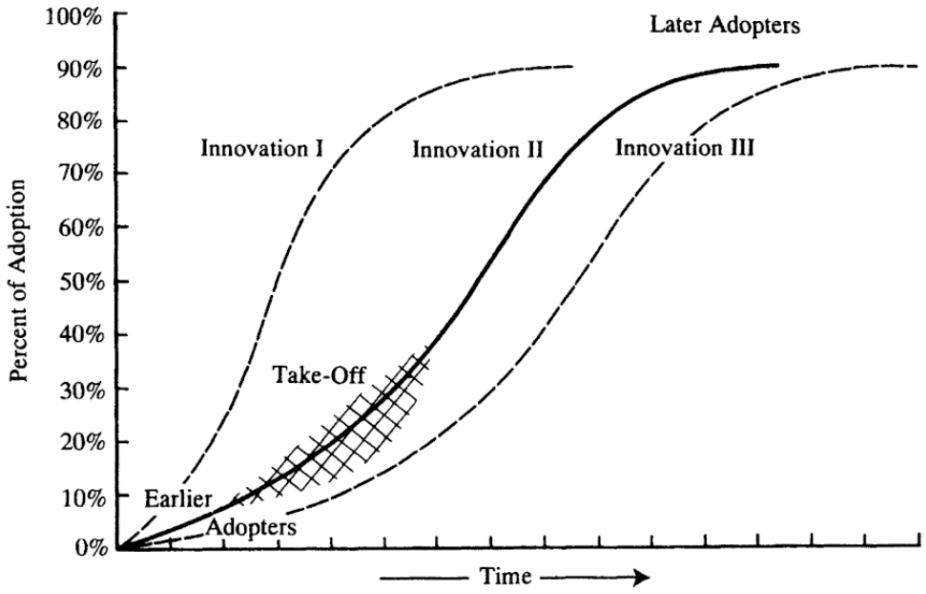
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Concerning IT innovation, the diffusion of innovation theory (DoI) will provide the theoretical foundation for this study (see Figure 3). DoI realizes innovations as being communicated through certain channels over time and within a particular social system (Rogers, 2010). Individuals are seen as possessing different degrees of willingness to adopt innovations, and thus it is generally observed that the portion of the population adopting innovation is approximately normally distributed over time. Breaking this normal distribution into segments leads to the segregation of individuals into the following five categories of individual innovativeness (from earliest to latest adopters): innovators, early adopters, early majority, late majority, laggards (Itil Framework Is & Potgieter, 2005; Rogers, 2010).

Members of each of the five categories typically possess certain distinguishing characteristics. First, are the innovators specified to be educated and venturesome, second are early adopters that seem to be social leaders and educated, third is the early majority that is deliberate and has many informal social contacts, fourth are the late majority who are mostly traditional and with low socioeconomic status. Last are the laggards that consider neighbors and friends are the main sources of information (Rogers, 2010).

Figure 3

Diffusion of Innovation



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This study used the frameworks mentioned above to evaluate the level of adaption of IT governance frameworks and IT innovation within the organization. Most organizations with IT governance would use the COBIT 5 framework or ITIL as they are considered the top IT governance frameworks used within organizations (Betz, 2011). The selected frameworks

provided the basic theoretical constructs to guide this research and upon which the findings of this research have been evaluated and provided recommendations for future practice and research.

Nature of the Study

This research relied on a quantitative methodology to study a population of IT decisions makers and identify the relationship between IT governance and IT innovation within an organization. Quantitative methods employ statistical tools to determine relationships among variables and, as such, are ideal for this study (Michie, Johnston, Francis, Hardeman, & Eccles, 2008). A qualitative methodology focuses particularly on human elements by collecting data on causes, phenomena, and consequences perceived by individuals; therefore, it would not have been appropriate for this specific study (Afful, 2017). Moreover, a mixed-methods approach will also be inappropriate as it will integrate quantitative and qualitative data during data collection, analysis and discussions while the purpose of this study is to evaluate and analyze the relationship between numeric data and not individual experiences (Yilmaz, 2013).

This research applied a correlation research design to determine the relationship between the independent variable of IT governance and the dependent variable of IT innovation. It is a descriptive and explanatory study that will use purposive sampling to survey IT personnel and determine the extent of the phenomenon based on the studied parameters and variables (Harkiolakis, 2017). A minimum sample size of 176 was calculated using G*Power 3.1(Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007) with $\alpha = .05$; effect size $p = 0.2$; power $(1-\beta) = .95$; and two tail significance with correlation point biserial model statistical test (Faul et al., 2007).

It focused mainly on the relationship between variables understanding them and assessing the statistical relationship between them. A quasi-experimental design lacks control over the variables and involves manipulating an independent variable without random assignment of participants to conditions (Shadish & Galindo, 2010). Also, in the experimental study, the researcher introduces a change and monitor its effect. Therefore, an experimental or quasi-experimental design would not suit this study (Kirk, 2015).

The research gathered data across gender, age, geographic, and economic sections. The results helped to address the defined research questions. A questionnaire was developed to serve as the instrument of data collection for the study. After it was validated by a panel of experts and pilot tested, the questionnaire was posted online using Google Forms, and a call for participation was distributed (purposive sampling) in professional social media platforms like LinkedIn.

The type of descriptive statistics used in this study included measurements of dispersion where range, variance, and standard deviation were calculated, identifying the spread of scores by stating intervals and other measurements, including frequency, central tendency, and position measures. Furthermore, the type of inferential statistics applied in this study is hypothesis testing, and it is used to determine whether the differences between means are random error or a real effect. Correlation is used for testing hypotheses with their p as the criterion for accepting or rejecting the hypotheses. The correlation helped in analyzing the questions raised for each of the hypotheses (Wasserman, 2013).

Research Questions

In alignment with the purpose of this study, the following central research question (CRQ) was established:

CRQ: What factors influence the ability of IT governance in some organizations to enable IT innovations that will allow the organization to sustainably compete in the marketplace.

In support of the CRQ the following research questions were established:

RQ1: Is there a statistically significant association between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations?

RQ2: Is there a statistically significant association between IT innovation references in IT governance strategy and the IT department's success in organizations?

RQ3: Is there a statistically significant association between IT governance commitment to innovation and the adoption of innovation strategies by the IT department in an organization?

RQ4: Is there a statistically significant association between IT governance commitment to innovation and the IT department's success in organizations?

Hypotheses

In alignment with the research questions of this study, the following set of hypotheses are adopted:

$H1_0$. There is no statistically significant association between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations

$H1_a$. There is a statistically significant association between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations

$H2_0$. There is no statistically significant association between IT innovation references in IT governance strategy and the IT department's success in organizations

$H2_a$. There is a statistically significant association between IT innovation references in IT governance strategy and the IT department's success in organizations

$H3_0$. There is no statistically significant association between IT governance commitment to innovation and the adoption of innovation strategies by the IT department in an organization

$H3_a$. There is a statistically significant association between IT governance commitment to innovation and the adoption of innovation strategies by the IT department in an organization

$H4_0$. There is no statistically significant association between IT governance commitment to innovation and the IT department's success in organizations

$H4_a$. There is a statistically significant association between IT governance commitment to innovation and the IT department's success in organizations

Significance of the Study

This study is important because of the role that IT governance will play in technology within organizations and how IT decision-makers can direct their organizations to adopt IT innovation effectively. It will provide related insights for IT decision-makers to enable them to reflect on IT governance in a way that will allow them to contribute to IT innovation. It will guide them to use or form the IT governance techniques that will contribute to adopting IT innovation strategies to be competitive in the market. Besides, it will also trigger IT decision-makers to explore IT governance techniques and leverage them to be used effectively in their organizations. Moreover, the study will inform IT organizations as technology is an environment

where extreme changes influence how organizations are operating their business; IT decision-makers should be able to ask relevant questions and have the competency to make related decisions to move their organizations forward.

This study will contribute to a better understanding of IT governance frameworks and the methods to be used within an organization to produce better products and services to move forward in the market by selecting the best-fit methods to be used within the organization. Additionally, it will offer insights into IT innovation techniques that will help organizations and allow them to move forward. This research will also contribute to IT innovation studies through quantitative research to understand how organizations can compete in the market using IT innovation. It will analyze the features of the IT innovation frameworks to determine how to use them to result in a positive change within an organization.

Definitions of Key Terms

IT Governance: IT governance is defined here as the strategic alignment of IT with the business such that maximum business value is achieved through the development and maintenance of effective IT control and accountability, performance management, and risk management (Webb, Pollard, & Ridley, 2006, p. 7).

IT Innovation: IT innovation is the use of technology in a new way that will make the organization more efficient and will align technology with business (Jiménez-Jiménez & Sanz-Valle, 2011).

Summary

This study aims at investigating the relationship between the use of IT governance and IT innovation. It appeared that highly aligned organizations do leverage more mature IT governance to poorly aligned organizations. IT governance will help in the strategic alignment of IT and the

business. Innovation is important for organizations to create new products and services that will allow them to be competitive in the market; this would be important as IT products and services are constantly evolving, and being innovative will give the company a more competitive edge. On the other hand, companies must require IT governance to ensure that IT departments are working within the required set of standards and processes. It will also help organizations to align their strategic directions and their IT units.

The alignment to IT governance will affect the IT innovation in a way due to focusing more on the standards without including the innovation strategies since using the frameworks directly will not help the organization to be innovative; therefore, they should allow customizing the IT governance frameworks to be used in the way to help the organizations. When an organization is implementing IT governance practices, they need to make sure that it will positively impact IT innovation. They have to consider innovational strategies, theories, and frameworks to allow IT organizations to be more innovative in their work.

The practical approach is that organizations need to identify the hot business components in their IT departments to improve their IT governance and enable them to be innovative. They can smartly apply IT governance frameworks by merging their adoption to innovation framework and ensuring that innovation is taking place in their organization to compete in the market.

Chapter 2: Literature Review

The main purpose of this research was to identify the factors that influence the inability of IT governance in some organizations to consider IT innovations that will allow the organization to sustainably compete in the marketplace. Consequently, this section of the research will review and evaluate the existing scholarly work and literature in the mentioned fields. The literature review search strategy started by categorizing the search items required into primary and secondary areas to be used as search keywords. The search was initially conducted using Google Scholar (scholar.google.com) and subsequently through several databases, including jstor.org, researchgate.net, and Ebsco. The top-level search terms included "IT Governance," "Corporate Governance," "IT Innovation," "COBIT," "IT strategy," and their combinations. With respect to the latest frameworks and IT innovation, the search was restricted to the year 2000 onwards, using adding keywords like "theory," "framework," "methodologies," "implementation," and "methods." These secondary searches enabled more understanding of research in different areas and produced results that would show studies that challenged previous work. The literature review provides a preview of the origin and history of IT governance and how it differs from corporate governance. What follows is a discussion of IT governance and IT innovation frameworks with a focus on COBIT. Finally, an overview of IT strategy, as well as IT innovation types, was provided.

Origin and History of IT Governance

IT has become crucial for most businesses as it is required for their sustainability and growth. Using and accessing technologies worldwide created a significant dependency on IT that would require a focus on IT governance (Van Grembergen & De Haes, 2008). IT governance frameworks considered the structure, processes, and leadership required to ensure that IT can

sustain an organization's strategy and objectives. In the past decades, executives could ignore and avoid making IT decisions, but this is now considered impossible to do in most organizations as IT is considered an important part of most organizations (Cummings & Janicki, 2019).

The origin of IT governance dates back to the late 20th century (Grönlund & Horan, 2005). Also known as digital governance, from its birth, it was deemed significant by various journals and was a topic of many scientific conferences. More recently, it has become more common as a topic in scientific conferences (Chang, 2012). The main purpose of these conferences is directed toward discussions about the position and content of the considerable size of IT and digitalization in research fields and associated disciplines (Grönlund & Horan, 2005).

Nowadays, IT has become a wide-ranging term and evolved as one of the most used and essential tools in management (Turban, Leidner, McLean, Wetherbe, & Cheung, 2006). It has played an important role in the economy of most countries and has been proven important for improving economic and financial conditions. Oliveira and Martins (2011) suggested that IT has an extreme impact on the development and progress of organizations. As the world becomes more and more technologically innovative, the concept of IT is taking on various shapes and several forms, with important recent developments in support of IT-based governance. IT governance can be defined as the usage of IT to help and provide support for the improvement of public policies and for engaging the general public, as well as to develop government operations along with the on-time provision of governmental services for people (Oliveira & Martins, 2011; Schnoll, 2015).

IT governance is a multidisciplinary topic, a combination of various subjects (Van Grembergen, 2006, p. 41). IT governance is an integration of various fields to deliver an idea on a new field of study. It has been regarded as a union of computer science (study and usage of

computers and principles behind computing), traditional information systems research, known as IS research (the study of conventional methods of holding, controlling, storing, and sharing information), psychology (a behavioral science in which the behaviors and minds of human beings are studied in detail), sociology (the science and study of human evolution, how human society has developed and been structured), administrative sciences (the study of public administration, management, and governance), organizational sciences (the study of how people behave and respond toward different organizations), and political science (Schnoll, 2015).

Van Grembergen, De Haes, and Guldentops (2004) stated clearly in 'Strategies for Information Technology Governance' that the usage of IT has over time improved and transformed all aspects of governing and brought about significant changes in academics, medicine, engineering, law-making, legal studies, business, marketing, strategic development, foreign policy, politics and, in short, all aspects and domains of study. The relationship of IT with the current state and future of business management is very important. Without introducing IT into the business, essential developments would not be achieved. The authors stated that it is a concept of critical importance with a significant position in enterprise governance. Enterprise governance is the study of relationships and rules that are used to regulate and control the performance and activity of an enterprise or any other business. The enterprise may be infrastructure, a project, or any portfolios on which a company might be working (Van Grembergen, 2006).

Most scholars have suggested that the origin of IT governance can be traced back to the late 1990s, but government offices have been using the computer from the time it was invented, with computing since its inception constituting the basic working principles behind discoveries and inventions. The term e-government is an outcome of the internet. From the time the internet

emerged, and everything became just a click away, the concept of IT-based governance became well known (Grönlund & Horan, 2005).

Moreover, the origin of IT governance has been extensively explained by Dawes (2008), who stated that early in the 1990s, there was a period of revolution referred to as the 'reinventing government' movement. The movement was launched and organized to transform the administrative government into an entrepreneurial government that is enterprising and customer-driven. It was seen that despite considerable usage of computer technology in government institutions, many offices still used memorandums, letters, and telephones for one-to-one communication and correspondence, which means that the usage of IT or digital technology for the transmission of messages was still not used properly. Where IT was being used in offices, it was limited to only a few operations (Dawes, 2008).

Dawes (2008) discussed that technology was used to develop data on spreadsheets, as well as reports and forms on Microsoft Word and presentations on PowerPoint. Moreover, emails were used for internal communication purposes to send messages within the organization (Sillince, Macdonald, Lefang, & Frost, 1998). From intra-building to inter-building communication and national to international communication, letters, faxes, and telephone calls were still used. Nowadays, in the 21st century, the internet has become essential, and the whole world is using this technology. In-early 1999, the term 'information technology governance' was adopted by the National Science Foundation, and since then, the use of technology became common. Dawes (2008) noted that emails, mobile phones, and laptops became a part of most people's lives. Communication through the internet became widely used in everyone's life, and government officials in offices are also using the technology. Usage of this technology in

government institutions became important and brought out the risk associated with innovations (Dawes, 2008).

The emergence of IT governance

IT governance emerged in 1993 as corporate governance that connected an organization's strategy, goals, and IT management. It highlighted the value creation for IT use and established the responsibility of the governing body along with that of the CIO, and defined the primary goals of IT to ensure its use adds value to the system, as direct management performance, and mitigating the risks of using IT (Van Grembergen, 2006).

Following a failure of corporate governance in the 1980s and other countries establishing codes for corporate governance in the 1990s, the United States (US) established the Committee of Sponsoring Organizations of the Treadway Commission (COSO), the United Kingdom (UK) introduced the Cadbury Report, and South Africa published the King Report (Martin, Sanders, & Scalan, 2014). Using corporate governance to govern the leverage of corporate resources, and considerations of the role of information and supporting technology to support corporate governance (Davies, 2016), it was soon known that IT is not just an enabler but also adds value to the organization. In January 2005, the AS81015 Corporate governance of ICT was established in Australia. Through ISO/IEC 38500, which emerged in May 2008, IT governance applies a connection of IT resources and processes to be aligned with the organization's strategy. The maturity curve of IT governance and the overall effectiveness of IT has a definite strong correlation (Harmer, 2014).

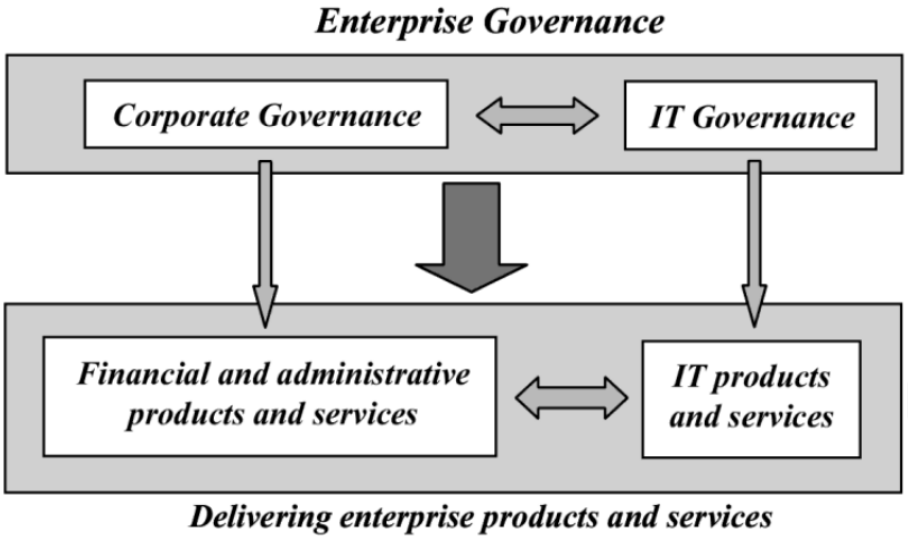
IT Governance and Corporate Governance

According to Ghildyal, Defence, Chang, and Parvin (2017), IT governance is a structure of operations that aligns IT strategies within the business organization (see Figure 4). The

scholars also highlighted that IT governance supports IT people and businesses in fulfilling their responsibilities and supporting each other. Moreover, they claimed that IT governance is not only applicable in private entities but also helpful in running public entities; however, the efficiency of IT governance is largely dependent on the structure of the firm and on the authority responsible for making the decisions (Ghildyal et al., 2017).

Figure 4

Enterprise Governance



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Corporate or enterprise governance is the system where entities are directed and controlled (Hoogervorst, 2009). This came about due to the business dependency on IT, so that an enterprise's governance issues could not be solved without IT consideration. In corporate governance, employees are directed by the board of directors (BODs), who are responsible for the governance of their respective companies. Similarly, shareholders play an important role in appointing directors and auditors and forming a proper governance structure to be adopted by the

organization. The BODs will ensure the proper implementation of the structure, which will ensure a successful business (Davies, 2016).

IT governance and corporate governance cannot be considered as separate disciplines, and IT governance is required to be integrated with the corporate governance structure (Van Grembergen et al., 2004). These authors discussed the comparison between IT governance and corporate governance using very distinctive terminologies regarding the concept. They stated that IT governance is a method, a process through which all entities are directed toward steps that need to be taken and controlled in order for there to be awareness of the company's policy, laws, and regulations (Van Grembergen et al., 2004).

Control objectives for information and related technology (COBIT) – IT governance framework

Mangalaraj, Singh, and Taneja (2014) stated that information is very important in forming strategic business plans and making crucial business decisions. It has been stated that enterprises work very hard to minimize the cost and expenditure of IT, and enterprises also try to ensure that laws and regulations are completely followed by the organization (Mangalaraj et al., 2014). This has evolved through combining business and IT to unify the functioning of businesses in a more secure and organized way. During the late 1990s, COBIT 1 was introduced as an IT governance framework. COBIT stands for control objectives for information and related technology and is a governance framework introduced by the Information Systems Audit and Control Association (ISACA) (Topi & Tucker, 2014).

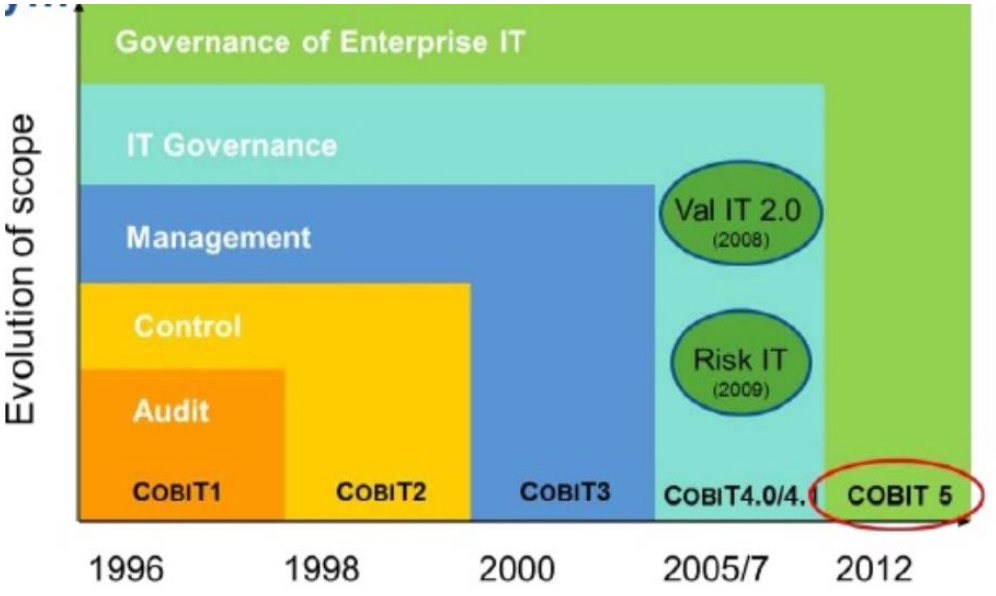
The COBIT framework was established to enable business and management to manage data efficiently, considering data and information as an important factor for any organization. Technology plays a vital role when collecting, processing, and storing information. The

information includes data of all kinds and is collected by organizations that cannot risk compromising data security and safety. COBIT 1 was developed to meet the needs of changing business and technology dynamics. COBIT 2 and COBIT 3 were introduced in the years 1998 and 2000, respectively, providing additional enhancements (Mangalaraj et al., 2014).

Furthermore, with the rapid global adoption of IT by firms, COBIT 4.0/4.1 came about in 2005/2007. The enterprise value 2.0 framework (Val IT 2.0) was upgraded in 2008, and the Risk IT framework was added in 2009 to upgrade COBIT 4.0/4.1 to meet business needs (Information Systems Audit and Control Association, 2012). COBIT 5 was finally launched in 2012. ISACA designed the renewed IT governance framework to benefit enterprises and stakeholders by adopting COBIT 5, a holistic framework for organizations (See Figure 5). A detailed overview of COBIT 5 as an IT governance framework is provided in a later section of this paper.

Figure 5

COBIT Framework



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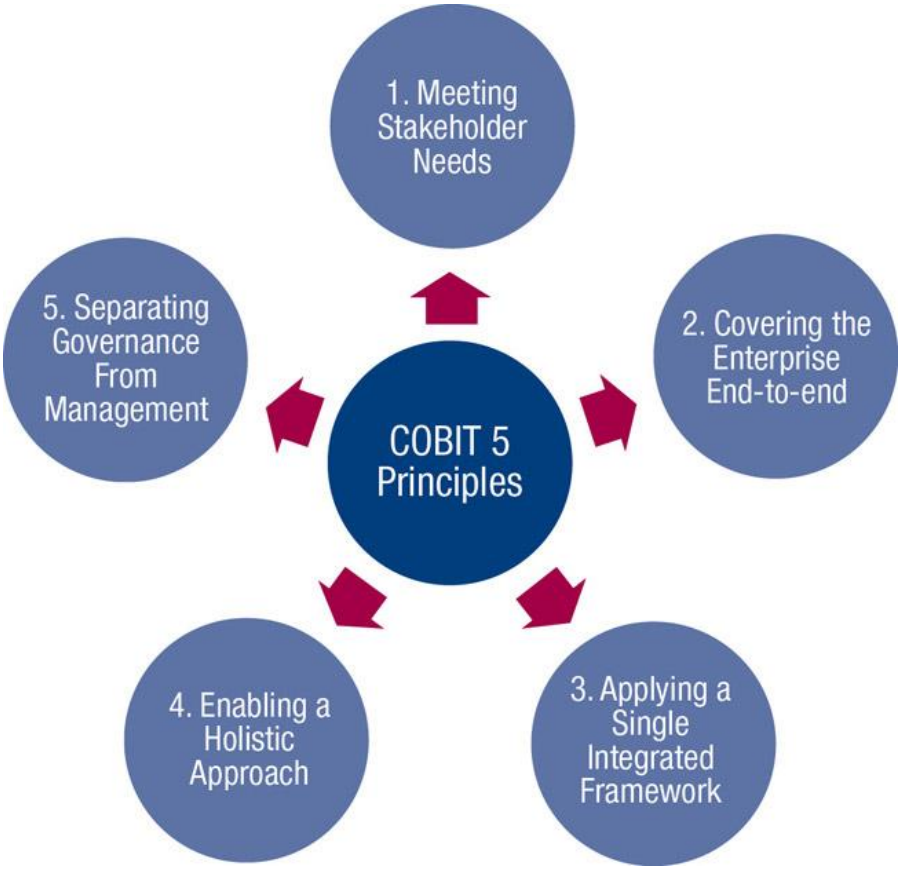
A comparison could be drawn between the conventional governance way and the new IT/digitalized governance based on COBIT 5. The expectations from the governance concept are to realize and identify the stakeholders' needs and to arrive at a common and agreeable enterprise to be achieved. A further objective toward good governance is the continuous monitoring and compliance with agreed goals, objectives, and targets. The definition of the tasks that the government is supposed to perform and the work that is supposed to be taken from good governance did not exist before the introduction of COBIT 1. The definition is unique and different from the definitions presented by COBIT, from COBIT 1 to COBIT 4. COBIT 5 has been comprehensive as it focuses on multi-stakeholders and so balances resources and power. It has put in place five principles, covering the needs of stakeholders, end-to-end coverage of the enterprise, applying an integrated and single framework that is strong, application of a complete approach, and distinguishing between governance and management

Principles of COBIT 5

Information Systems Audit and Control Association (2012) and Mangalaraj et al. (2014) have explained the five principles of COBIT 5 (see Figure 6), which are considered generic and applicable to all sizes and kinds of organizations. The key principles and aspects involved in COBIT 5 are: (1) coming across and standing by the needs and requirements of stakeholders; (2) provision of end-to-end coverage for the enterprise; (3) applying integrated frameworks; (4) imparting whole and complete knowledge of the subject; and (5) clear distinction and separation between management and governance (Information Systems Audit and Control Association, 2012; Mangalaraj et al., 2014).

Figure 6

COBIT 5 Principles



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Stakeholder needs or requirements. Mangalaraj et al. (2014) that the most important entity in an organization is the stakeholders involved. They could be individuals or a group of people working within the organization. In a government organization, the stakeholders could be people receiving or giving value to the government (Mangalaraj et al., 2014). According to Information Systems Audit and Control Association (2012), there should be a high fulfillment of stakeholder requirements by a company, which could be generated by creating value (see Figure 7) for the stakeholder by transforming their needs into achievable enterprise strategies. These

strategies are transformed into an enterprise IT-related and enabler goal with the use of COBIT 5 principles (Information Systems Audit and Control Association, 2012).

Figure 7

Creating Value for Stakeholders



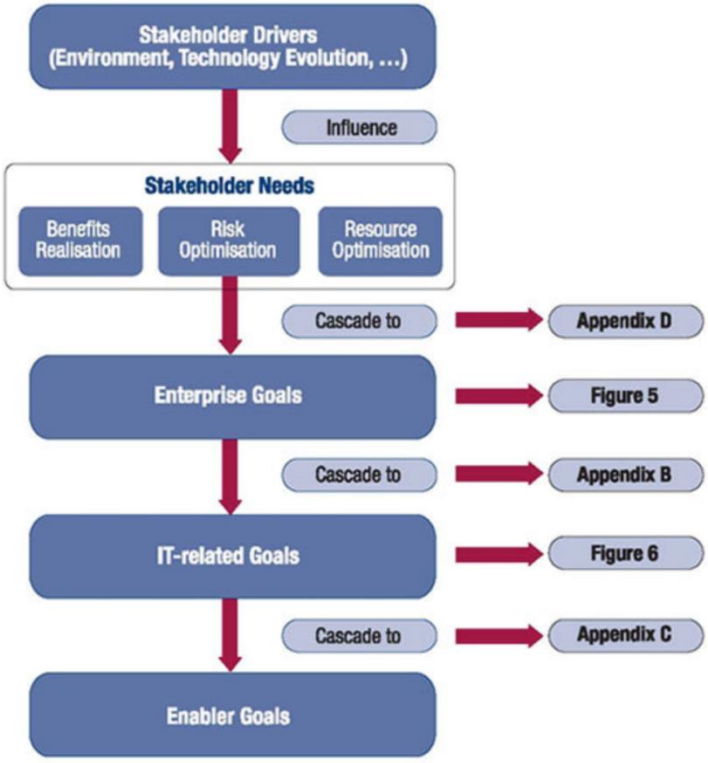
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Covering the enterprise end to end. This second principle covers all the processes where information is being processed in the enterprise. It would translate stakeholder needs (see Figure 8) into deliverables or influence 17 generic goals categorized to financial, customer, internal, learning, and growth (Steven De Haes, Debreceny, & Van Grembergen, 2013).

Applying a single integrated framework. This principle is about having a single integrated framework that consists of various standards required for the management and governance of IT enterprise. The integrated framework will positively affect the organization if it is designed in the correct way to help the management work effectively within their organization (Bernard, 2012).

Figure 8

Changing Stakeholders' Needs in Attainable and Customized Goals



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Enabling a holistic approach. This principle is about having a complete view of the organization and knowing all the governance and management processes. When decisions are done, it is necessary to have all the information required about the organization.COBIT5 provides the information in the form of enablers, which are factors that would affect the governance and management activities and their outcomes (Devos, 2015).

Separating governance from management. This principle specifies that governance is different from management, where management focuses on managing the operations and the

resources, and governance is how to set the objectives in the organization, direct, monitor, and evaluate the organization (Information Systems Audit and Control Association, 2012).

Enablers overview. COBIT 5 is an improved version of COBIT 4.1, which was used before introducing COBIT 5. The enablers of COBIT are defined as key factors and protruding points that individually and collectively affect the success of any program. The points moved forward or driven by the cascade of goals, aims, and objectives. There are seven COBIT enablers (1) regarding principles, policies, and framework; (2) the second deals with processes; (3) the third has to do with structures and organizations; (4) the fourth deals with culture, ethics, and behavior; (5) the fifth is pertinent to information; (6) the sixth is to do with infrastructure, services, and applications; and (7) the last principle deals with competencies, skills, and people (see Figure 6) (Oliver & Lainhart, 2012).

Drivers of digital governance. Drivers of IT governance are the factors upon which lies the basic foundation of digital governance. Digital governance is a very important factor for the technological revolution, which has generated many new important factors touching all areas of industry and society, in both public and private life (Schnoll, 2015). Technological advancement brought about revolutions never seen before. Alan Calder, a renowned writer and cybersecurity expert, wrote the book ‘IT Governance: A pocket guide’ in which he highlighted various aspects of computing considered new to people (Calder, 2007). He demonstrated clearly that when set up in a technically sound and effective manner, an organization's information technology will help it run efficiently.

According to Calder (2007), the first driver is the search for and desire to find competitive benefits. These can be achieved through intellectual assets and another source that will be discussed later. Intellectual assets may include individuals who are logically strong and

skillful or valuable and authentic sources of information. Along with the intellectual minds and reliable resources of information, technology has the highest priority. Calder (2007) highlighted the second driver as the growth of government with technology and referred to governance requirements for evolution across the Organization for Economic Co-operation and Development or OECD. The writer discussed these requirements aside from regulatory requirements as well as the capital market.

The third driver discussed by Calder (2007) focuses on the increasing amount and content of information, which is very important as it has a significant ethical side. Here, the ethical aspect of digital governance is concerned with privacy. Once the data is captured from people and the public, it will then be stored and registered in databases to make it available to every person who can access the database. Therefore, laws and legislation need to be formulated so people will refrain from misusing the confidential data of individuals. This issue is considered to be a security breach of the organization's data. Some hackers may illegally access an organization's IT infrastructure for malicious purposes, while others can misuse the data for their interest or financial gain. Government organizations' data always represent an interest for hackers and spammers as it contains important information that they could misuse; several threats are to be considered if the data is successfully breached (Schnoll, 2015). The fourth driver behind digital governance and IT is the threat to confidential governmental data. Keeping data confidential is important for government organizations and thus ensuring data security is an essential requirement (Calder, 2007; Schnoll, 2015).

The last driver is the standardizing and alignment of strategic organizational goals with IT projects. Aligning organizational strategy and IT projects will increase the efficiency of the organization and lead to a new concept called project governance. Calder (2007) explained the

strategic alignment with IT projects as the most effective means for planning. (Muller, 2017), in his book 'Project Governance,' stated that a government might fall if it does not have a proper structure in place. Strategic alignment and structure are an important topic to discuss. In his book, Muller offered a deep understanding of various governance preferences to be considered by an organization to achieve its goals. He described precisely the rate of unsuccessful projects that shifted an organization's focus toward project governance (Calder, 2007; Muller, 2017).

COBIT 5 and usage of the balanced scorecard

COBIT 5 uses the balanced scorecard (see Table 1) and is considered embedded in the COBIT 5 framework. Suer (2013) used the balanced scorecard for the deviation and demonstration of performance improvement and discussed using the balanced scorecard in COBIT 5. This concept was first introduced by David Norton and Robert Kaplan in the mid-1990s. This concept of the scorecard has the aim of moving away from short-term goals. Kaplan and Norton (1998) realized that organizations would focus on short-term goals only rather than looking at long-term goals. As Suer (2013) noted, most people who would invest in businesses are long-term investors as they look to future results and compare them with current results. From this point of view, the concept of balanced scorecards was introduced (Suer, 2013).

Similarly, it has always been confusing relating the two concepts of governing and management terms. Lane (2014) pointed this question to the reader to consider the correlation between these two terms. The author gave a historical background of the term management and demonstrated that organizations were vested in making comparisons of their performance with external financial pressures; it was believed that an organization suffering from financial pressures would not do well.

Table 1.

COBIT 5 Balanced Scorecard

BSC Dimension	Enterprise Goal	Relation to Governance Objectives		
		Benefits Realisation	Risk Optimisation	Resource Optimisation
Financial	1. Stakeholder value of business investments	P		S
	2. Portfolio of competitive products and services	P	P	S
	3. Managed business risk (safeguarding of assets)		P	S
	4. Compliance with external laws and regulations		P	
	5. Financial transparency	P	S	S
Customer	6. Customer-oriented service culture	P		S
	7. Business service continuity and availability		P	
	8. Agile responses to a changing business environment	P		S
	9. Information-based strategic decision making	P	P	P
	10. Optimisation of service delivery costs	P		P
Internal	11. Optimisation of business process functionality	P		P
	12. Optimisation of business process costs	P		P
	13. Managed business change programmes	P	P	S
	14. Operational and staff productivity	P		P
	15. Compliance with internal policies		P	
Learning and Growth	16. Skilled and motivated people	S	P	P
	17. Product and business innovation culture	P		

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Moreover, companies with good financial expenses would perform better with the integration of Kaplan and Norton's balanced scorecard; firms have thus started focusing on non-financial measures of their performance. Lane (2014) established that after introducing the balanced scorecard, it was understood that the concept of measuring performance based on financial performance is considered to be incorrect. Hence, the balanced scorecard is a commonly adopted approach by most organizations nowadays. When it comes to companies adopting IT governance, COBIT 5 is deemed the most convenient framework for a business enriched with the balanced scorecard concept. It was also realized that no organization is

considered to have weak performance due to budget or financial constraints. Governance is not holistically a matter of budget; it is a comprehensive aspect that could be used for beneficial gains by improving management and using different innovative skills for different tasks (Lane, 2014).

Governance and Management

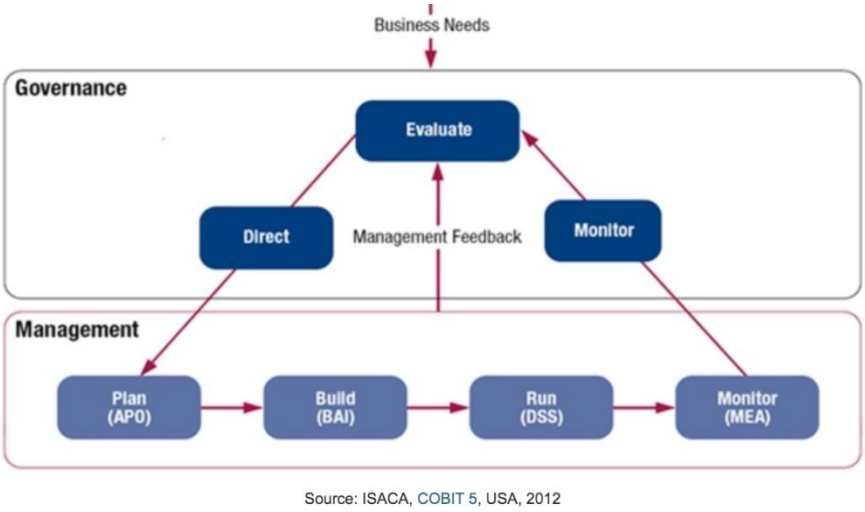
Governance focuses mainly on setting the organization's goals and directions, whereas management focuses on resource allocation and managing the organizations' daily operations. Governance focuses on what the organization is currently doing and what their plans are. Management is how the organization will reach its goals (Ing, Hawk, Simmonds, & Kosits, 2003).

When comparing IT governance and IT management, major differences and similarities can be considered. According to Van Grembergen (2006), the major difference is that management is an internal concept, while governance is an external one. Management is about planning, building, executing, monitoring, and controlling, while governance includes evaluation, directing, and monitoring (Van Grembergen, 2006).

Figure 9 shows the difference in governance and management. When business needs are considered an input, the governance will evaluate, direct and monitor while the management will do plan, build, run and monitor and this the management feedback will be an input to the governance in order to help them in their evaluations (Information Systems Audit and Control Association, 2012).

Figure 9

Differentiating Governance from Management



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Other IT Governance Frameworks

The COBIT 5 framework collaborates and aligns with other enterprise and IT standard and frameworks, including COSO, the Information Technology Infrastructure Library (ITIL), ISO/IEC 27001, capability maturity model of integration (CMMI), enterprise risk management (ERM), and ISO/IEC 38500 (ISACA, 2012). More specifically:

- **Information Technology Infrastructure Library (ITIL)**

  The ITIL is certified by the registered trademark of the UK's government commence office known as OGC. Dabade (2012) supported in his article on ITIL that it is considered the most widely used IT service management approach. Dabade (2012) provided a detailed ITIL historical background and specified that version 1 of ITIL was launched under the CCTA organization's banner with the name Government Information Technology Infrastructure Management Methodology. The second version was launched

focusing on IT management of services, and the third version launched in 2007 has five important factors: (1) strategy of the service; (2) transition of the service; (3) management of the security; (4) operation of services; and (5) continuous improvement of services (Dabade, 2012). There are two important points discussed in the article: DOI delegation of authority and TOE, which stands for technology, organization, and environment. The two frameworks are considered of high importance (Oliveira & Martins, 2011).

- **COSO**

COSO is an abbreviation of the Committee of Sponsoring Organizations of the Treadway Commission. COSO's ERM framework focuses on the internal environment, setting up the objectives, event identification, risk assessment, response and control activities, and information and communication. Bowling, Julien, and Rieger (2003) discussed the COSO framework and how ERM was waiting for this framework. The ERM framework took almost three years to be finalized, and once released, it assumed a comfortable place in the enterprise and market structure (Bowling et al., 2003).

- **Capability Maturity Model of Integration (CMMI)**

Ramanujan and Kesh (2004) discussed this framework in detail in their work. They explained the benefits of using the practices specified by the framework and how many organizations broadly adopted this framework. The Capability Maturity Model Integration (CMMI) was developed at the Carnegie Mellon University by the Software Engineering Institute as a process improvement tool for organizations that will help them to be more productive and reduce risk during the software development. CMMI is

currently administered by the CMMI Institute and was purchased in 2016 by ISACA (Humphrey, The, & Paulk, 2009).

Table 2.

Maturity Levels

Software CMM Maturity Level	**Description of Software CMM Maturity Levels**
1) Initial	The software process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort and heroics.
2) Repeatable	Basic project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.
3) Defined	The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization. All projects use an approved, tailored version of the organization's standard software process for developing and maintaining software.
4) Managed	Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.
5) Optimizing	Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

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CMMI started as an evaluation/appraisal process for three areas, process and service development, second is the service and management, and the third is the service acquisition. CMMI is a process improvement tool; it is also a behavioral model that will help improve the performance of the organizations and develop the required benchmarks to measure their current level and plan for their future improvement (Software Engineering Institute, 2010).

Table 2 shows the five levels of Maturity of the software capability model; the levels go from 1 to 5, where Level 1 is considered initial as no defined processes are set in place. Level 2 repeatable is where basic processes are set. Level 3 is Defined where processes are defined for software management and documented. Level 4 is Managed,

where processes are defined and measured to reach a high-quality standard for software development. Level 5 is optimizing, where continuous process improvement is enabled, and the measures are analyzed to improve future results (Paulk, 1999).

CMMI is considered a good tool for process improvement where software development organizations might leverage this tool to improve the quality of their software by having a defined and measurable set of processes that will increase transparency within the organization and increase their competitiveness in the market.

- **ISO/IEC 20071**

ISO, the International Organization for Standardization, was developed for corporate governance to ensure that information is moving efficiently. This standard supports all stakeholders, including consumers, employees, investors, and everyone working within the organization (Calder, 2007). Whenever an organization adopts ISO/IEC 38500 with an IT governance framework in place, that organization will be more trusted to collaborate with, as other organizations feel confident working with organizations with a certified governance standard (Fenz, Goluch, Ekelhart, Riedl, & Weippl, 2007).

IT Innovation and Types

IT is continually undergoing innovation. It has also reached a high level of virtualization. Some of the innovation types are discussed below.

Internet of things (IoT). Xia, Yang, Wang, and Vinel (2012) discussed IoT in their research paper, where they defined it as a system of computing devices, mechanical and digital machines, objects, and people provided with unique identifiers and the ability to transfer data

without human interaction and that are well equipped with intelligence. IoT increased the ubiquity of the internet by connecting all required objects through certain systems. This will lead to a group of devices connected and communicating with people and other devices. IoT has increased opportunities to access a large number of applications to make our lives easier.

IoT has been developing rapidly, and two main models have been proposed for the future. The first one is a dimension model that will be able to classify the complicated technologies. The second one is the layer model that is built for future IoT system architecture. IoT is considered a new stage of IT development. One concern that is considered is security and how to protect users in extensive mobile contexts, where a model is proposed to have a billing operator as an agent to provide authentications to the service providers (Xia et al., 2012).

Wortmann and Flüchter (2015) also discussed IoT in the context of organizations, which are provided with many opportunities to create value from IoT. They addressed challenges faced by organizations when adapting IoT to business. One example is when a manager at a strategic level would require a study of using this technology to adapt a change in their business model to adapt to a new environment. There are lots of challenges, as hardware and software are in the early product development stages. Wortmann and Flüchter (2015) recommended that the best way to integrate businesses with new digital technology is to align it with their business strategy.

Cloud computing. Cloud computing is used in wide-ranging areas where important tasks are done without the actual involvement of a human user. It is mostly used to describe the data center that uses and shares all the work (Hayes, 2008). Cloud computing is a new spread technology used by businesses to succeed as it changes the way business is done, as in buying, selling, and communications between organizations. It rapidly spread to all basic IT areas in information systems, software, and hardware (Low, Chen, & Wu, 2011).

Mobility. Mobility is considered one of the new and emergent innovative technologies used worldwide (Guerrero-ibanez, Zeadally, & Contreras-Castillo, 2015). Businesses are working very hard to strengthen their architecture by using advanced innovative technology like mobility. Consequently, using this technology has helped people in organizations work from any place and, as a result, has increased the performance of the organization. Therefore, organizations have adopted middle grounds in the form of corporate owned-personally enabled (COPE) devices and mobile application management (MAM) and mobile device management (MDM) applications (White, Newman, Logan, & Radcliffe, 2006).

Mobility is not only used in organizations. It is used in the communications field, widely covering mobile phones and other mobile appliances, including laptops. Kwan and Schwanen (2016) supported that the changing dynamics of IT have enhanced the style of living and positively affected the transportation industry. Travel has become easier for people, and there is the ease of using applications specified for the travel industry (Kwan & Schwanen, 2016).

Mobility as an innovative technology has also been integrated into buses, taxis, and other transportation; with just one click, you will be connected to the vehicle social network (VSN). It has also been demonstrated by Ning, Xia, Ullah, Kong, and Hu (2017) that VSN with Vehicle of things (VoT) is a part of 'vehicular user-centric networks' and is one of the fundamental factors of IT innovation mobility (Xia et al., 2012).

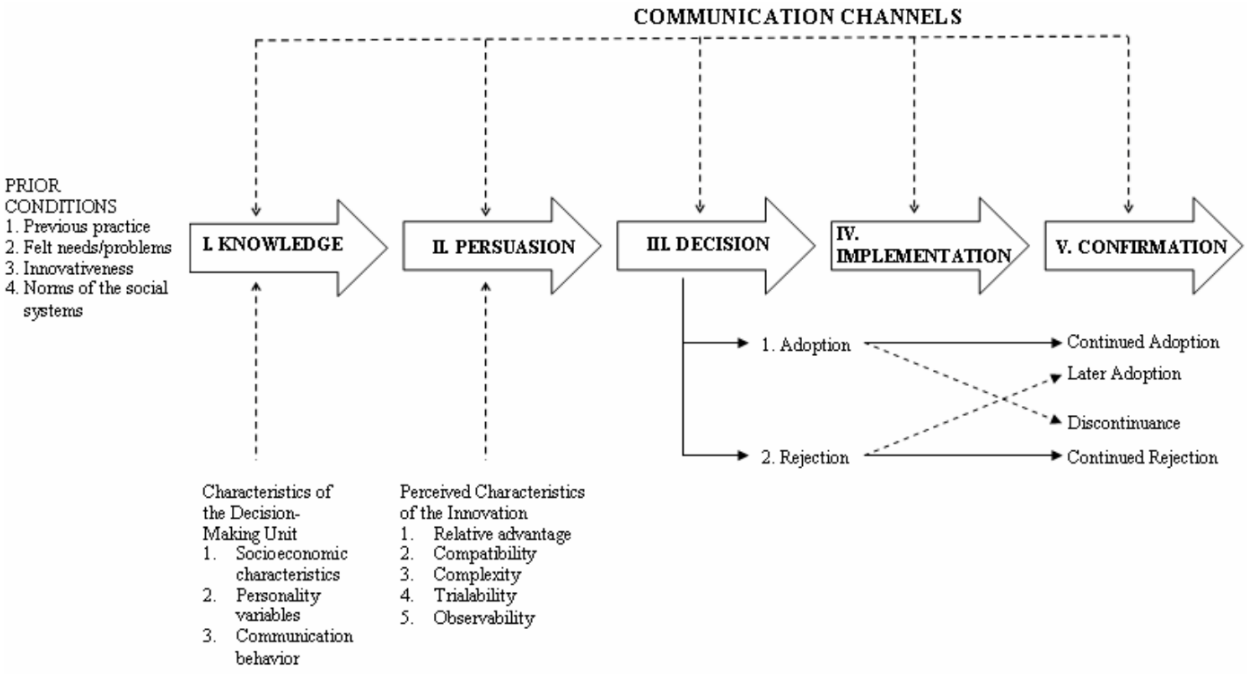
Diffusion of innovation (DOI)

E. M. Rogers developed the DOI theory in 1962, and it is considered one of the oldest theories of social science (see Figure 10). The main target Roger was aiming at with this theory is that people are required to adopt this concept as they should start adopting new ideas to keep up with the changing trends in society. Surry and Surry (1997) defined the DOI and mentioned

that the theory needs acceptance from people or a certain part of the community. The major aspect of the innovation concept is how it is communicated and when communication takes place. Moreover, innovation is fully dependent on the nature of the system, whether it is flexible or complex toward accepting the innovation concept (Surry & Surry, 1997).

Figure 10

Innovation-decision Process in DOI Theory



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DOI is a broad theory that can help define how and why and the rate at which new technological ideas are extending throughout a community or an organization. The theory could help to predict how the innovation would diffuse or spread within an organization at a certain period. It can also be used to communicate about the organizational innovativeness internally or

externally and the characteristics of an organization and sections of the innovativeness of an organization (Oliveira & Martins, 2011).

The basics of DOI theory focus on the level of innovation that is directly proportional to the characteristics of an individual. The internal characteristics of the organization are dependent on its external characteristics. Oliveira and Martins (2011) explained this in detail in their work: (1) the individual characteristics will define the individual ability to change; and (2) internal characteristics would include the concepts of centralization, complexity, formalization, interconnectedness, size, and organizational slack.

Centralization: The concept of centralization is defined as the extent to which power and control are limited by only a few individuals in the organization (Oliveira & Martins, 2011).

Complexity: The term defines how certain members of an organization have a level of knowledge about the organization than other members (Oliveira & Martins, 2011).

Interconnectedness: This highlights the importance of interpersonal skills when communicating with the business, and it defines how the various units are associated with one another with the help of interpersonal networks (Oliveira & Martins, 2011).

Formalization: This focuses on the rules and regulations; it reflects on how members of an organization are following the rules and regulations that are defined by the organization. It has to do with the code of conduct set by the company (Oliveira & Martins, 2011).

Organizational slack: This means how much-uncommitted resources are attached and connected to the organization (Oliveira & Martins, 2011).

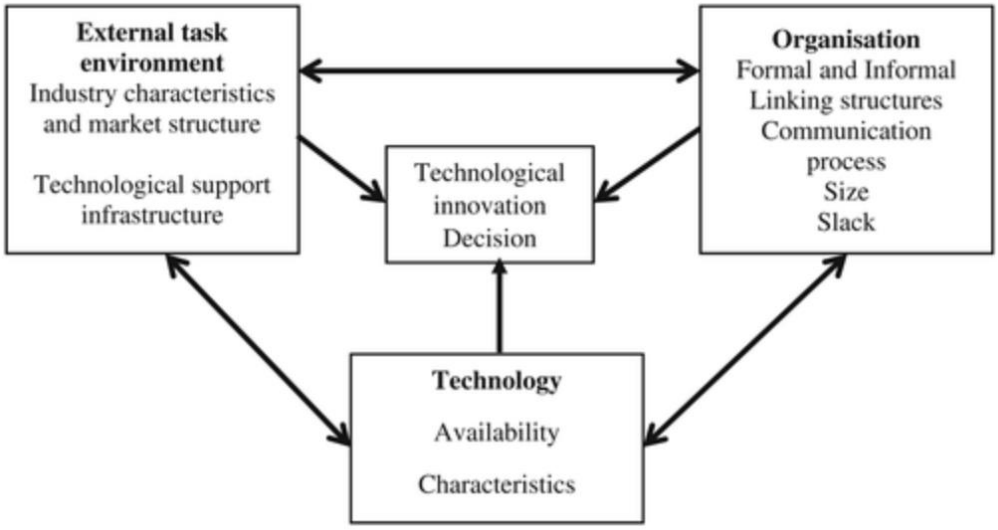
Size: This has to do with the volume or number of people working in the organization, which affects the DOI level (Oliveira & Martins, 2011).

Technology, Organization, and Environment (TOE) Framework

This framework is considered the basic IT governance framework. It highlights three important parts: (1) technology context; (2) environment context; and (3) organizational context (See Figure 11). According to Oliveira and Martins (2011), this concept was developed in 1990. This framework proved useful and can provide analysis for the work when adopting innovation using technology (Oliveira & Martins, 2011).

Figure 11

Technology, Organization and Environment Framework



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The technological context would include the technological readiness that incorporates technology infrastructure and IT human resources, where the infrastructure would contain the platforms where internet technologies could be successfully built. The IT resources would be the IT specialists that would develop the required web applications (Zhu & Kraemer, 2005).

The organizational context includes the firm size that would determine the level of IT innovational adoption. The large organizations are likely to adopt innovation. Moreover, these factors are considered to support the positive role of sizing, which are benefits of the latest IT technologies, budget availability to get the new technologies, and the faster capture of economies of scale (Lee & Xia, 2006). The environmental context measures the adoption of computers and the internet in the country; it is considered an important factor for decision-making for the adoption of e-business as it may indicate market potential (Zhu, Kraemer, & Xu, 2003).

IT Strategy

A strategy is a method of doing business. A competitive business strategy would perform different activities than its competitors in unique ways. These activities are difficult to duplicate, which resulted in a long-term competitive advantage. An organization would require to develop new strategies to subsist in the competitive environment by creating newly developed ways while developing their IT strategy (Smith, McKeen, & Singh, 2007).

"IT strategy should be articulated in terms of an external domain and an internal domain" (Henderson & Venkatraman, 1993, p. 3). The external domain is a business field that the organization competes in and the unique strategy attribute that would make the company more competitive. The internal domain is concerned with the specific logic for the design of critical business processes (Henderson & Venkatraman, 1993).

IT strategy, considered very important terminology, is defined by Chew (2009) as the main plan of actions, objectives, and overall strategy within an IT department or organization. The best IT strategy is the one that would consider innovation to make a change to the organization. If the time is not set appropriately to adopt the innovation, then this would result in failure. Therefore, to have a successful strategy set in place, time, people, and the social system should be considered. Moreover, all systems should be changed to fit the organizational needs and take care of the important factors that will help the organization achieve innovation (Chew, 2009).

Summary

With the increasing use of internet technologies, IT governance emerged in the 20th century and has since gained much traction. Moreover, with the rise and spread of globalization, businesses are shifting towards e-commerce. Moreover, governments are using the latest

technologies to increase their output and the targets set within their IT strategies. The use of technology by the government will ensure public service delivery. Moreover, the integration of IT governance and corporate governance is required as businesses adapt to e-commerce models.

IT governance has different frameworks that can be adopted by organizations. Selecting the framework that would increase organizational competitiveness could be challenging as most organizations are looking at improving their IT innovation level. Moreover, increasing the level of innovation within an organization will allow the organization to become more competitive in the market as customers will be more attracted to the innovative ways in which the organization works and produces its products and services.

The IT strategy of an organization will always require including an innovation strategy in order to remain sustainable in the market. It is considered essential for any organization to develop its IT strategy to include innovation and governance to allow it to compete in the market. That will help them to enter the market successfully or to increase their competitiveness.

A section on theoretical frameworks discussed different IT governance frameworks and the emergence of these frameworks, their importance, and how they have been and are being used. The COBIT framework was also discussed in detail, including how it has evolved over the years. Other frameworks were presented, such as COSO, CMMI, and ISO. Further, IT innovation frameworks were presented, including the DOI theory and the TOE framework. Moreover, this chapter included a brief discussion of IT strategy, underlining the importance of an organization having a defined IT strategy that includes IT governance and IT innovation.

Chapter 3: Research Method

This research aimed to understand the relationship between IT governance and IT innovation and how their interactions will affect the organization. The lack of understanding the association between IT governance and innovation might affect the ability of the organization to power IT innovation. By addressing such factors, organizations can improve their power to be innovative, increasing their competitiveness and growth. This research looked at IT governance methodologies used within the organization and how they affect the IT innovation adoption within an organization.

This chapter includes discussions about the research methodology and design of this research, followed by a description of the population and the selected sampling method. A description of the instrument used to collect data and the method used to collect data is presented along with the data analysis methods section that was employed and aspects of reliability and validity that could affect the interpretation of the results followed. Next, the assumptions and limitations of the study are presented, along with a description of the measures that were taken to ensure this study was conducted ethically.

Research Methodology and Design

At an ontological and epistemological level, this research took an instrumental approach to consider reality in that it "emphasizes the interrelation between truth and action and connects the positive outcomes of an action to the truth behind the intention that led to that action" (Harkiolakis, 2017, p. 9). This research adopted the realist ontological view that the outcomes of the study might be replicable over time, which will allow new and enhanced theories to be made in the future. From an epistemological perspective, this study took an evidential position to collect quantitative data that aimed to determine a correlation between IT governance and

innovation across organizations. In line with a realist position, elements of positivism can be found because the study aimed at determining the relationship between IT governance and IT innovation.

With this being an exploratory study, the quantitative methodology was identified as the most appropriate one. The research applied the quantitative methodology to study a population of IT employees and identify the relationship between IT governance and IT innovation within an organization. The use of statistical tools helped to determine the relationship between the required variables. It was also deemed more suitable for testing hypotheses through statistical procedures and allowed for the generalizability of the findings (Sukamolson, 2007).

A qualitative approach would be more general and not ideal as data would be based on descriptions instead of statistical inferences and comparisons of measurable data that would allow the outcomes to be more generalizable in this particular study. A qualitative methodology also focuses mainly on human elements by collecting data on causes, phenomena, and consequences as perceived by individuals, and this would not be required for this study (Afful, 2017).

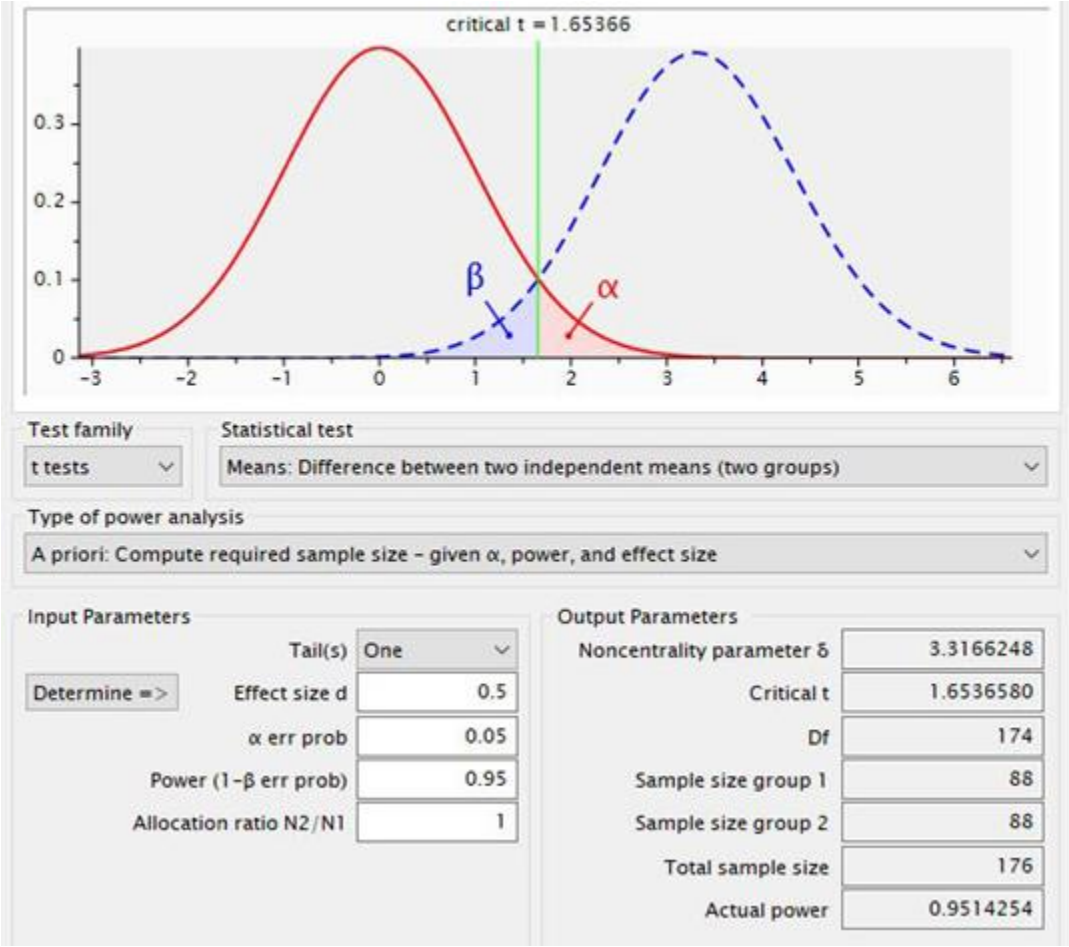
The non-experimental, correlational, and cross-sectional research design was selected for this study. Non-experimental designs could observe the associations among variables regarding the phenomenon; they are popular in social sciences research studies due to their non-offensive nature and could be conducted easily, like communicating a questionnaire link through the Internet. Moreover, cross-sectional design in this research will be based on the time of data collection where measurements take place at a specific time and depend on existing factors of the organization (Harkiolakis, 2017).

Population and Sample

The intended population of this study was IT personnel who are working in SME or large-scale organizations regardless of the industry type, where IT governance can be distinctly an identifiable entity in their organizations. The IT personnel would typically be an individual with background and education in IT, Business Management, or other business and management education areas that would qualify them to work as IT specialists.

Figure 12

*G*Power Analysis for Two-group Independent Sample T-test*



The sample size was calculated using G*Power 3.1 (Faul et al., 2009; Faul et al., 2007) as 176 IT personnel (Figure 12). It was required to know four of the five variables: number of groups, number of observations, effect size, significance level, or power. G*Power 3.1 was used to perform a statistical power analysis. A T-test was conducted, and a minimum sample size of 174 was calculated using G*Power 3.1 with $\alpha = .05$; effect size $d = 0.5$; power $(1-\beta) = .95$; and two tail significance with correlation point biserial model statistical test (Faul et al., 2007).

Materials/Instrumentation

A questionnaire was developed based on the literature and the research questions of the study to serve as the instrument for data collection. It was designed to filter out who is not considered an IT personnel in their organizations. It contained an initial section that collected demographic information and a validation questions section to ensure that qualified IT personnel contributed to the questionnaire. Following the introductory questions, questions related to the research questions were asked to gather information about the IT governance methodology used in the participants' organizations and how they affected the innovation and strategy within their organization. Questions were designed to be specific, close-ended with Likert scale responses to provide the needed data for the analysis. The structure of the questionnaire and the rationale behind the selection of questions is included in Appendix A.

The initial survey was reviewed for content and structure by Dr. Nicholas Harkiolakis, Ecole des Ponts, Business School, Dr. Paul Thurman, Columbia University, Columbia University Medical Center, and Mailman School of Public Health, Department of Health Policy and Management. Dr. Harkiolakis brings 30 years of experience in technology and research and has authored numerous publications, including the textbook *Quantitative Methods – From Theory to Publication*. Dr. Thurman brings more than 30 years of experience and currently teaches

strategic management and analysis courses at Columbia's Mailman School of Public Health and authored many publications, including the textbook *MBA Fundamentals Statistics*. Based on their feedback, the questionnaire was updated, and proceeded to conduct the pilot study.

A group of 15 IT employees who met both the participant and demographic product criteria for the pilot study population. Feedback was collected concerning the question's appropriateness for the subject matter of the study, their clarity and structure. The feedback from the pilot contributed to minor improvements to the questionnaire. The updated instrument was considered ready for submission to the sample population of the study.

Operational Definitions of Variables

The demographic variables of the study included:

*Gender***:** dichotomous with *Female, Male* as available options.

Age range: categorical with *below 30 years, 31 to 40 years, 41 to 50 years, 50 to 60 years, and greater than 60* as available options.

Education level: categorical with *Diploma/Certificate, Bachelor, Master, and Doctorate*.

Field of study category: categorical with *IT, Business, Engineering, Management, and Other* as available options.

Country of employment: categorical collected as text

Current Job Function/Sector: categorical with *Government, Government Supported, and Private* as available options.

Industry: categorical collected as text

Current Position: categorical with *Upper Management, Middle Management, and Lower Management* as available options.

Years of Employment: categorical with less than *5 years, 5 to 10 years, more than 10 years* as available options.

*Number of employees in organization***:** scale with values between 100 and 10000.

The subject matter questions were all considered ordinal as they were expressing opinions. A five-point Likert scale was considered with *Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree* as available options.

Study Procedures

After developing the questionnaire and its validation through the pilot study, an online version of the survey was developed using Google Forms. The research was promoted by a call for participation through the researcher network in social network platforms like LinkedIn, Facebook, as well as using WhatsApp. The potential participants were informed about this study and the details on how they can participate in it. The description contained the purpose of the study, procedures, benefits, and assurance of the privacy and confidentiality of the submitted information. The call for participation was posted for about one month, and participants were reminded several times to complete the survey to reach a sufficient number for the research analysis.

This research was conducted with ethical considerations in mind. The researcher made every effort to inform the participants of the research's purpose, and no personally identifiable information was collected that violated participants privacy. No incentives were given for participation as well as no reprimanding would happen to non-participating members.

The data collected through the online questionnaire were extracted in CSV format from the Google Forms site and imported into the IBM SPSS tool version 24 for processing. Descriptive and inferential statistics were conducted to address the requirements of this study.

The type of descriptive statistics used in this study included measurements of dispersion where range, variance, and standard deviation, identifying the spread of values by stating intervals and frequency, central tendency, and position measures. The type of inferential statistics applied in addressing the hypothesis of this study and identifying relationships and influences between the study variables included correlation tests, chi-square tests, and variance analysis.

Ordinal values were treated as scale when suitable, while some scale variables' values were grouped for convenience. For example, the age categories have been changed to scale, the five categories of the age: below 30, 31-40, 41-50, 50-60, >60 were assigned a 5-number scale. The number of years that the IT personnel has been working in the organization has three categories: <5, 5-10, >10, and then changed to a scale from 1 to 3.

Assumptions

Several assumptions were set in this study. It was assumed that the sample size of 174 IT personnel was appropriate to represent the population and will also provide the required data to address the research questions. It was assumed that all respondents were given the guidelines to fully and honestly answer the questions without any influence by external or internal factors. The collected sample data s is assumed to be generalizable to that extent. The survey population was assumed to represent the actual population of interest and not differentiated based on culture, age, gender, or socio-economic details.

As this was a purposive sampling based on 122 participants, it was expected that participants were able to answer the questions accurately, reflecting the reality of their current organization when answering the questions. Moreover, participants were assumed that they answered all questions honestly. Another assumption was that organizations that are medium or large would have an IT governance framework adopted within their organizations. It is also

assumed that IT personnel that contributed to the survey understood the concept of IT governance and IT innovation as it was adopted in their organizations and had the required years of experience within their organization. It is assumed that small organizations did not adopt the IT Governance framework since small-scale organizations would not have the required resources for the IT governance department to be functioning.

It was assumed that a qualitative approach would be more general as data would be based on descriptions instead of statistical inferences and the comparisons of measurable data that allow the outcomes to be more generalizable in this research. Assumptions were made when the statistical models were adopted, as when doing the correlational analysis, the assumption of homogeneity existed with the assumption that the correlations will be equal in different populations.

Limitations

Limitations are issues that the researcher of this study cannot control and might threaten the validity of the research. The researcher has no control over whether the sample is bias-free. The limitations to this research include the method of how the survey was distributed as it was dependent on the initial network of the researcher and then on the secondary connections. The study was limited to only IT personnel in their current organizations, who have experience in their current organization and have the required qualifications or study to perform in their current positions. The research was also limited to the organizations that adopted the IT governance framework and organizations that are considered medium or large.

The selected research methodology was applicable to find the relationship between IT governance and innovation and provide answers to the research question. Regarding the selected

instrument, a limitation was that the respondents were forced to answer questions to examine the variables required in this study.

Summary

The research methodology used was a quantitative approach that studied a population of IT employees and identified the relationship between two main variables IT governance and innovation within an organization. The survey was developed using google forms and was posted to participants online through a convenience sampling process through different media channels.

The research was a non-experimental, correlational, and cross-sectional research design for this study, and the sample size was calculated using G*Power 3.1, the intended population of this study were IT personnel who are working in SME or large-scale organizations regardless of industry type where IT governance can be distinctly an identifiable entity in their organizations. The goal of the survey was to attract a sample size of 176 participants. Participants were required to meet two thresholds, first to be an IT employee and have an IT governance framework implemented in their organizations.

Participants provided demographic information about themselves and their current organization, followed by selecting the answers through a Likert scale from Strongly Disagree to Strongly Agree about several questions related to the research questions. All questions were mandatory, and no personal information was collected or shared. The survey was reviewed by two experts as well as piloted to a test group for feedbacks. Reviews and changes were done accordingly after receiving the feedback and then being launched to other participants through LinkedIn and other platforms.

Data was exported to excel to be reviewed for errors before being processed through the IBM SPSS analysis tool. Descriptive and inferential statistics were conducted to address the

requirements of this study. Assumptions and limitations were identified that all participants answered the questions accurately and honestly. The research was also limited to the organizations that adopt an IT governance framework and organizations that are considered medium or large.

Chapter 4: Findings

The purpose of this study was to gather the data necessary to understand and examine the relationship between IT governance and IT innovation. Furthermore, the objective of this research was to understand the expectations of adopting IT governance and to identify the factors that influence the ability of IT governance to consider IT innovation. The study also considered the effect of the IT strategy on IT governance. After examining the validity and reliability of the collected data, an analysis of the responses that were captured through the pilot-tested survey follows. Furthermore, tests for violation of assumptions and a description of the results with a focus on the one-sample chi-square test for examining the distribution of answers in relation to hypothesized probabilities are included. Before concluding this chapter with findings and a summary, Spearman's rho was used to examine the strength of the relationships among related factors (Miller & Salkind, 2002).

Validity and Reliability of the Data

Before collecting data through a self-administered questionnaire, a pilot study was developed and reviewed by a panel of experts (Appendix A). As part of this process, assessing the validity and reliability of an instrument was important. By assessing the validity of an instrument, researchers can examine whether a variable is measured as intended (Bolarinwa, 2015). While there are other types of validity assessments, internal validity, for example, aims to evaluate the causal relationships between study variables by showing how one factor influences another (Torre & Picho, 2016). While establishing internal validity is important in experimental designs, there is a risk that unknown mediating factors are responsible for the measured influence, and not the study variables on each other (Bernstein, 2018). Furthermore, and sometimes to address these concerns, criterion validity is often used to establish how well a

measure can be used to predict an outcome (Bolarinwa, 2015). Internal and criterion validity, however, was not of concern for this research as the study was not aimed at establishing causality or predict outcomes.

In contrast, external validity is concerned with the representativeness of the data and how well the findings of a study can be applied to a generalized population (Torre & Picho, 2016). Important aspects of external validity are transferability and sample size (Bernstein, 2018), where having more participants take part in a study also increases its ability to increase the representativeness within a given population (Zyphur & Pierides, 2017). Furthermore, proper sample techniques, selecting an appropriate population, and reducing bias and errors during sampling can contribute to improved external validity (Hales, 2016). To achieve a power of .95, a minimum sample size of 176 was calculated using G*Power 3.1. However, while data collection finished with 122 qualified participants and thus, fell short of the initial estimation, there were still enough respondents to achieve a power of >.86, which is above a generally accepted minimum of .80 (Hertzog, 2008).

Reliability is a measurement of accuracy in data extraction; that is, how consistently this process can produce the same results (Flower, McKenna, & Upreti, 2015). Common approaches to ensuring the reliability of an instrument include the use of previously designed instruments that aimed to measure similar constructs or by assessing the stability, homogeneity, and equivalence (Heale & Twycross, 2015). Because this study relied on a newly developed instrument, considering the reliability assessments of other instruments was inappropriate. Instead, researchers can assess the internal consistency, or homogeneity, of a survey instrument through split-half reliability, item-to-item correlation, or Cronbach's α (Heale & Twycross, 2015), for example.

Cronbach's α calculates the average of all correlations in any combination and then uses split-halves to derive a value between 0 and 1 where researchers generally agree that acceptable reliability requires a score of 0.7 or above, with higher scores indicating better reliability (Heale & Twycross, 2015; López, Ponce-Espinosa, Rios-Zaruma, & Espinoza-Torres, 2018). The survey in this study included 14 non-demographic questions that assessed agreement on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree." The combined Cronbach's α for all non-demographic questions measured well above the minimum of .70, suggesting that the data collected through the survey instrument is sufficiently reliable (see Table 3).

Table 3

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Non-Demographic Survey Questions
0.917	0.921	14

Before examining the results, it is important to determine the normality of the distribution of the data, as this will influence the choice of available statistical tests (Buthmann, 2018). While some Likert-type scales can result in closer to normally distributed data, generally, the more common 5-point Likert scale lacks this ability (Leung, 2011). Even though the visual assessment of the P-P plots indicated that at least some data might resemble a normal distribution, a following Shapiro-Wilk test was unable to confirm this initial observation (see Appendix C). The results of the Shapiro-Wilk test suggested that all data is non-parametric, thus limiting the available choices for statistical testing. Working with distribution-free or non-parametric data requires the researcher to adjust their statistical analysis approach (McHugh, 2013).

Instead of using hypotheses testing, calculating the Pearson product-moment correlation coefficient, or using multiple linear regression as statistical tests for evaluating normally distributed data (Green & Salkind, 2016; Hashim, Mat Desa, & Ismail, 2018; Schmidt & Finan, 2018), for example, relying on Spearman's rho, the Kruskal-Wallis H, the chi-square test of independence, and the one-sample chi-square test was more appropriate (Green & Salkind, 2016; McHugh, 2013; WenJun & Xin, 2015). While Spearman's rho allowed for evaluating the strengths of the relationships between questions, the one-sample chi-square test illustrated the measured frequency of data in relation to their assumed proportional distributions. Furthermore, the Kruskal-Wallis H test was used to illustrate the statistical difference of the means between groups of demographic and subject matter questions(Green & Salkind, 2016). In contrast, the chi-square test of independence offered insights into whether variables were independent of each other (McHugh, 2013).

Results

After collecting and cleaning the participants' responses, 122 complete responses formed the sample of this study and were further analyzed using SPSS version 25. It needs to be noted that there were a total of six respondents who did not want to disclose their age. Table 4 displays the gender distribution in the sample population. The almost equal distribution between male and female participants removes gender bias in the sample of the study (Table 3).

Table 4

Gender Distribution Across the Sample

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	59	48	48	48
Male	63	52	52	100
Total	122	100	100	

Furthermore, 26% of the respondents were below 30 years of age, 43% said they were between 31 and 40 years, 24% said they were between 41 and 50 years, with 2% claiming to be above the age of 50, and 5% did not want to disclose their age. With 94% of all participants being 50 years of age or younger, the age distribution below 30 and between 41 and 50 are almost identical, suggesting equal participation from the younger and older age groups that cumulative form close to 50% of the total sample. The majority of the participants, 76%, hold a graduate-level degree, suggesting they may be more knowledgeable in their respected areas of study, compared to those with undergraduate degrees and diploma or certificate holders (11% and 13%, respectively). 91% of all participants obtained their degrees in IT, business, or engineering, with 32% selecting IT, 26% business, and 33% engineering as the focus of their studies. Many IT departments may look for leaders with diverse backgrounds to staff their positions, and having a degree in business, IT, or engineering illustrates these requirements and offers insights into participant sentiment across various professional backgrounds.

The majority of the participants, 64%, either worked in government or government-supported sectors, with private-sector employment making up the remaining 36%. Though this study primarily focused on SMEs and large organizations, given that many respondents work in the oil and gas industries in the UAE, the observed affiliation with government or government-supported sectors was expected. More than half, 52%, of the respondents worked in construction or the oil and gas industries and another 17% in education, IT, or telecommunication. The remaining participants came from vastly different industries, including audit, aerospace, aviation/airline, communication, document management systems, and utilities, among others. The lack of equal distribution across the various industries illustrates a bias toward the oil and

gas industry is reflective of the situation in UAE, where the core of the country's activities revolve around the oil and gas industry. However, the intended focus on particular business groups is also potentially limiting the applicability of the results of the study to other industries.

The sample was biased toward lower and mid-level management positions, with 46% of participants working in lower management, 43% holding mid-level management positions, only 11% said they work in upper management. The distribution suggests that the majority may have only limited or no final decision-making capabilities within their organization. Additionally, more than two-thirds of the participants have been employed for five or more years, with the majority of 47% stating they have been employed for more than ten years and 33% saying they had between five to ten years of work experience. Even though 20% said they had less than five years of work experience, most participants have held positions for five or more years and thus should be well-qualified to answer the questions of this study. Furthermore, the vast majority of participants, 87%, worked in organizations with 10,000 or fewer employees, with 48% having between 1,000 and 10,000 coworkers, and 38% stated that their organizations consisted of fewer than 1,000 employees. In contrast, only 13% of participants worked in organizations with more than 10,000 employees, suggesting a sample with a strong bias toward smaller and medium-sized organizations in alignment with the targeted population of the study.

One-sample chi-square test. The one-sample chi-square test is often also referred to as a goodness of fit test, where answers are evaluated for their distribution in relation to their expected frequencies (Miller & Salkind, 2002). Even though when using Likert-type scales, one might generally not expect to collect normally distributed data (Leung, 2011), examining the frequencies of answers can offer valuable insights into significant deviations and supplement the findings of other statistical tests such as Spearman's rho (Green & Salkind, 2016), for example.

The summarized findings of the one-sample chi-square test for all non-demographic questions are attached as Appendix D.

The results of the One-Sample Chi-Square test are noteworthy as they illustrate a similar significance across all questions. The majority of the participants disagreed with all questions, with only the answers related to governance awareness and training (Q6) closely aligning with the expected distribution, where 47 participants (39%) disagreed or strongly disagreed versus an expectation of 49 (40%). Only the answer related to realistic IT innovation deliverables (Q13) had more participants neither agree nor disagree (NAND) than those who chose to agree or strongly agree. Furthermore, while answers to questions related to formally defined strategy (Q1), governance awareness and training (Q5), artificial intelligence technologies (Q9), and positive returns on IT investments (Q14) were closely aligned with an expected distribution of 24% for NAND, the representation of the remaining answers fell well below or came in above (Q6 and Q13) the expectations.

When participants were asked about whether their IT department has a formally defined IT strategy (Q1), the majority (51%) said that they disagree or strongly disagree with this statement, making the findings significant with $\chi^2(4, N = 122) = 79.07$, $p < .01$. Furthermore, only 30% agreed with the question, with the remaining answers neither in agreement nor disagreement. Answers to most other questions show similar significance and preferences among the participants, although a few outliers warrant further examination. The notable outliers include answers to whether the IT department has IT metrics that measure the innovativeness of the IT department (Q6) and whether the IT department has realistic IT innovation deliverables in place (Q13). Additionally, whether the IT department strategy makes specific reference to the value of innovation and/or innovative technologies (Q3), whether the IT department has formally

defined operational processes and procedures (Q7), and whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12) also stood out.

The results for the one-sample chi-square test assessing participant agreement whether the IT department has IT metrics that measure the innovativeness of the IT department (Q6) was significant, with $\chi^2(4, N = 122) = 35.62$, $p < .01$. While 39% of the participants disagreed with the statement, 27% could neither agree nor disagree, which represents the highest value of NADA statements across all questions. Furthermore, most participants (52%) agreed that their IT department has realistic IT innovation deliverables in place (Q13), even though 27% also could not agree or disagree with this statement. Here, too, the findings were significant with $\chi^2(4, N = 122) = 52.51$, $p < .01$.

While proportionally, most participants disagreed with the questions in this study, the answers to whether the IT department strategy makes specific reference to the value of innovation and/or innovative technologies (Q3), and whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12), illustrated a much higher level of disagreement. Sixty-eight participants (56%) disagreed with Q3, which stands in contrast to only 37 who could agree, making it significant with $\chi^2(4, N = 122) = 112.75$, $p < .01$. Similarly, the one-sample chi-square test also illustrated a lack of agreement with Q12. The findings here were also significant, $\chi^2(4, N = 122) = 114.80$, $p < .01$, with 72 participants (59%) disagreeing or strongly disagreeing, making it the most disagreed-with question in this study.

Furthermore, 70 participants (57%) also disagreed or strongly disagreed with whether their IT department has formally defined operational processes and procedures (Q7), with only

26% supporting the statement. Here, the once-sample chi-square test also indicated significant findings with $\chi^2(4, N = 122) = 110.30$, $p < .01$. While around half of the sample was generally in disagreement with the questions, this was still a notable departure from the estimated frequency of 40% of participants that should either agree or disagree. Furthermore, there were several questions where participants could not agree or disagree to the extent that went well above an expected frequency of 20%.

Spearman's rho test. Researchers can compute Spearman's rho correlation coefficient to examine the strength of the relationships (WenJun & Xin, 2015). Therefore, Spearman's rho was used to evaluate the correlations between related questions grouped by those aimed at innovation in IT governance (Table 5), IT governance commitment to supporting innovations (Table 6), and governance and adoption of innovational technologies (Table 7). Generally, Spearman's rho confirmed significant relationships between most related questions. In particular, among the questions concerned with innovation in IT governance, strong relationships between Q1, Q2, and Q3, as well as between Q2 and Q3, exist.

As indicated by Spearman's rho, the relationship between whether the IT department has a formally defined IT strategy (Q1) and whether the IT department understands that IT challenges require innovative solutions (Q2) was significant with r_s=.61, $p < .01$, N=122. A similarly significant relationship, r_s=.65, $p < .01$, N=122, exists between Q1 and whether the IT department strategy makes specific reference to the value of innovation and/or innovative methodologies (Q3). Furthermore, a strong relationship between Q2 and Q3 was also evident with r_s=.74, $p < .01$, N=122 (see Table 5).

Table 5

Spearman's Rho for Questions on Innovation in IT Governance

		Q1	Q2	Q3
Q1	Correlation	1.000	.615**	.652**
	Sig. (2-tailed)		0.000	0.000
	N	122	122	122
Q2	Correlation		1.000	.742**
	Sig. (2-tailed)			0.000
	N		122	122
Q3	Correlation			1.000
	Sig. (2-tailed)			
	N			122

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6 illustrates the Spearman's rho correlations between related questions about whether the participant's organization has an IT governance commitment to supporting innovations. Spearman's rho indicated a strong relationship between whether the IT department has an identifiable unit in its IT governance structure dedicated to IT innovation (Q4) and whether the IT department provides IT governance awareness training (Q5) with r_s=.56, p < .01, N=122. A similar relationship, r_s=.61, p < .01, N=122, exists between Q4 and whether the IT department has IT metrics to measure innovation of the IT department (Q6) and likewise between Q4 and whether the IT department has formally defined operational processes and procedures (Q7) with r_s=.63, p < .01, N=122.

Furthermore, Spearman's rho also confirmed significant relationships between whether the IT department provides IT governance awareness training (Q5) and whether the IT department has IT metrics to measure innovation of the IT department (Q6), r_s=.66, p < .01, N=122, and Q5 and whether the IT department has formally defined operational processes and procedures (Q7) with r_s=.57, p < .01, N=122. Likewise, a strong relationship also exists between

Q6 and Q7, where the Spearman's rho test indicated r_s=.54, p < .01, N=122. Here, similarly to Spearman's rho results illustrated in Table 4, all questions within the group showed significant relationships among each other (see Table 6).

Table 6

Spearman's Rho for Questions on IT Governance Commitment to Supporting Innovations

		Q4	Q5	Q6	Q7
Q4	Correlation	1.000	.557**	.607**	.632**
	Sig. (2-tailed)		0.000	0.000	0.000
	N	122	122	122	122
Q5	Correlation		1.000	.656**	.565**
	Sig. (2-tailed)			0.000	0.000
	N		122	122	122
Q6	Correlation			1.000	.536**
	Sig. (2-tailed)				0.000
	N			122	122
Q7	Correlation				1.000
	Sig. (2-tailed)				
	N				122

**. Correlation is significant at the 0.01 level (2-tailed).

The results for Spearman's rho test about the questions related to IT governance adoption of innovational technologies (see Table 7) deviated from those earlier assessments in that not all questions showed a relationship. In particular, whether the IT department has realistic IT innovation deliverables in place (Q13) was only correlated with one other question: whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12). Most interestingly, Spearman's rho also indicated that the relationship between Q12 and Q13 is negative with r_s=-.18, p < .05, N=122.

The other discovered relationships included whether the IT department invests in IT projects that add value to its functions and operations (Q8) and whether the IT department adopts

artificial intelligence technologies (Q9), r_s=.61, p < .01, N=122, but also Q8 and whether the IT department engages in business process re-engineering (Q10) with r_s=.65, p < .01, N=122. Furthermore, a relationship, r_s=.69, p < .01, N=122, between Q8 and whether the IT department frequently launches new IT solutions and services (Q11), and also between Q8 and whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12) was also significant with r_s=.53, p < .01, N=122.

Table 7

Spearman's Rho for Questions on IT Governance and Adoption of Innovational Technologies

		Q8	Q9	Q10	Q11	Q12	Q13
Q8	Correlation	1.000	.609**	.648**	.691**	.525**	-0.132
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.147
	N	122	122	122	122	122	122
Q9	Correlation		1.000	.579**	.686**	.396**	0.033
	Sig. (2-tailed)			0.000	0.000	0.000	0.716
	N		122	122	122	122	122
Q10	Correlation			1.000	.680**	.574**	-0.12
	Sig. (2-tailed)				0.000	0.000	0.188
	N			122	122	122	122
Q11	Correlation				1.000	.533**	-0.119
	Sig. (2-tailed)					0.000	0.193
	N				122	122	122
Q12	Correlation					1.000	-.182*
	Sig. (2-tailed)						0.045
	N					122	122
Q13	Correlation						1.000
	Sig. (2-tailed)						
	N						122

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Similarly, Spearman's rho indicated a relationship, r_s=.58, p < .01, N=122, between whether the IT department adopts artificial intelligence technologies (Q9) and whether the IT

department engages in business process re-engineering (Q10), in addition to Q9 and whether the IT department frequently launches new IT solutions and services (Q11) with r_s=.69, $p < .01$, N=122. Additionally, there is also a significant relationship between Q9 and whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12), r_s=.40, $p < .01$, N=122.

There were also relationships between the IT department's engagement in business process re-engineering (Q10), whether the IT department frequently launches new IT solutions and services (Q11), and whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12), with r_s=.68, $p < .01$, N=122 and r_s=.57, $p < .01$, N=122 respectively. Lastly, Spearman's rho also indicated a significant relationship between Q11 and Q12 with r_s=.53, $p < .01$, N=122. As mentioned earlier, the only relationship identified between Q13 and the other questions in this group was with Q12; for all other pairings with Q12, Spearman's rho did not discover significant relationships.

Chi-Square test for independence. A Chi-Square test for independence across all non-demographic questions supplements the previous statistical analyses (see Appendix D). The Chi-Square test of independence is often used to evaluate non-parametric data to analyze the extent to which research variables are independent of each other and also to illustrate group differences (McHugh, 2013). Here, all question pairs show significant dependence at the $p < .01$ level regardless of which variables they aimed to investigate. These findings are in line with Spearman's rho test, except that the Chi-Square test for independence also shows a significant dependence between whether the IT department has realistic IT innovation deliverables in place (Q13) and all remaining questions (see Appendix B). In this study, the Chi-Square test for

independence confirmed an association among all non-demographic questions and could not confirm group differences.

Kruskal-Wallis H test. The Kruskal-Wallis H test is often used when computing the analysis of variance (ANOVA) is inappropriate because the data at hand is not normally distributed (Green & Salkind, 2016). As all data in this study was considered non-parametric, the Kruskal-Wallis H test was more appropriate and, therefore, calculated across all demographic and non-demographic questions instead (see Table 8 and Table 9). Several results are noteworthy, with reported differences in the means between examined items near or below $p = .05$. While the majority of groupings showed significant differences in their means, the Kruskal-Wallis H test illustrated that some demographic questions were more closely aligned with the non-demographic questions than others.

For example, the groupings between gender (D1) and whether the IT department has IT metrics to measure the innovativeness of the IT department (Q6), $\chi^2(1) = 4.905$, $p = .027$, whether the IT department adopts artificial intelligence technologies (Q9), $\chi^2(1) = 3.705$, $p = .054$, whether the IT department engages in business process re-engineering (Q10), $\chi^2(1) = 3.62$, $p = .057$, and whether the IT department experiences positive returns on its IT investments (Q14, $\chi^2(1) = 5.161$, $p = .023$, were all notable. In contrast, the organization's sector (D6) showed no connection in the means of how participants would reply to the non-demographic questions. Furthermore, the Kruskal-Wallis H test only revealed a potential connection between the levels of education (D3) and whether the IT department experiences positive returns on its IT investments (Q14), $\chi^2(2) = 6.29$, $p = .043$.

Table 8

Kruskal-Wallis H Test Between Demographic Questions D1 to D10 and Q1 to Q7

	Statistics	Q1	Q2	Q3	Q4	Q5	Q6	Q7
D1	Kruskal-Wallis	0.365	0.158	0.886	1.064	1.958	4.905	2.978
	df	1	1	1	1	1	1	1
	Asymp. Sig.	0.546	0.691	0.347	0.302	0.162	0.027	0.084
D2	Kruskal-Wallis	6.136	7.453	14.563	4.896	3.967	0.802	11.417
	df	4	4	4	4	4	4	4
	Asymp. Sig.	0.189	0.114	0.006	0.298	0.411	0.938	0.022
D3	Kruskal-Wallis	1.43	4.254	0.063	0.379	2.056	0.987	2.274
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.489	0.119	0.969	0.827	0.358	0.611	0.321
D4	Kruskal-Wallis	5.713	7.371	8.063	4.444	2.233	1.44	6.281
	df	3	3	3	3	3	3	3
	Asymp. Sig.	0.126	0.061	0.045	0.217	0.525	0.696	0.099
D6	Kruskal-Wallis	2.348	4.982	5.391	1.744	0.553	2.057	4.675
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.309	0.083	0.068	0.418	0.758	0.358	0.097
D8	Kruskal-Wallis	0.873	0.238	0.196	3.669	9.655	6.453	3.202
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.646	0.888	0.907	0.16	0.008	0.04	0.202
D9	Kruskal-Wallis	5.349	5.919	14.255	4.736	13.737	4.514	6.017
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.069	0.052	0.001	0.094	0.001	0.105	0.049
D10	Kruskal-Wallis	11.11	10.169	6.161	5.903	5.381	2.26	13.258
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.004	0.006	0.046	0.052	0.068	0.323	0.001

Furthermore, the participants' tendencies to answers about Age (D2) and whether the IT department strategy makes specific reference to the value of innovation and/or innovative

methodologies (Q3), $\chi^2(4) = 14.563$, $p = .006$, or whether the IT department has formally defined operational processes and procedures (Q7), $\chi^2(4) = 11.417$, $p = .022$, or whether the IT department invests in IT projects that add value to its function and operations (Q8), $\chi^2(4) = 17.102$, $p = .002$, and whether the IT department experiences positive returns on its IT investments (Q14), $\chi^2(4) = 11.393$, $p = .022$, were also similar. Answers related to how many employees the organization has (D10) and questions Q1 to Q4 and Q7 to Q11 showed significantly similar means(see Table 8 and Table 9), suggesting that the size of the organization may have a strong impact on how participants answered most questions.

The Kruskal-Wallis H test also showed significantly similar means between the main field of study (D4) and whether the IT department strategy makes specific reference to the value of innovation and/or innovative methodologies (Q3), $\chi^2(3) = 8.063$, $p = .045$, whether the IT department engages in business process re-engineering (Q10), $\chi^2(3) = 8.515$, $p = .036$, whether the IT department frequently launches new It solutions and services (Q11), $\chi^2(3) = 9.548$, $p = .023$, and whether the IT department experiences positive returns on its IT investments (Q14), $\chi^2(3) = 8.899$, $p = .031$. Furthermore groupings between the current position (D8) and whether the IT department provides IT governance awareness and training (Q5) , $\chi^2(2) = 9.655$, $p = .008$, and whether the IT department has IT metrics to measure the innovativeness of the IT department (Q6) , $\chi^2(2) = 9.453$, $p = .004$, and whether the IT department invests in IT projects that add value to its functions and operations (Q8), $\chi^2(2) = 9.308$, $p = .01$, and whether the IT department adopts artificial intelligence technologies (Q9) , $\chi^2(2) = 9.236$, $p = .01$, and Q10, $\chi^2(2) = 7.146$, $p = .028$, and also Q11, $\chi^2(2) = 7.811$, $p = .02$.

Table 9

Kruskal-Wallis H Test Between Demographic Questions D1 to D10 and Q8 to Q14

	Statistics	Q8	Q9	Q10	Q11	Q12	Q13	Q14
D1	Kruskal-Wallis	0.312	3.705	3.62	2.828	0.912	0.533	5.161
	df	1	1	1	1	1	1	1
	Asymp. Sig.	0.576	0.054	0.057	0.093	0.34	0.465	0.023
D2	Kruskal-Wallis	17.102	6.261	7.029	5.187	4.393	2.203	11.393
	df	4	4	4	4	4	4	4
	Asymp. Sig.	0.002	0.18	0.134	0.269	0.355	0.698	0.022
D3	Kruskal-Wallis	0.572	3.176	0.58	3.831	2.866	3.891	6.29
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.751	0.204	0.748	0.147	0.239	0.143	0.043
D4	Kruskal-Wallis	7.381	0.639	8.515	9.548	3.544	4.108	8.899
	df	3	3	3	3	3	3	3
	Asymp. Sig.	0.061	0.888	0.036	0.023	0.315	0.25	0.031
D6	Kruskal-Wallis	4.714	5.167	0.372	2.34	0.772	0.663	1.362
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.095	0.076	0.83	0.31	0.68	0.718	0.506
D8	Kruskal-Wallis	9.308	9.236	7.146	7.811	1.993	2.742	4.751
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.01	0.01	0.028	0.02	0.369	0.254	0.093
D9	Kruskal-Wallis	16.739	10.255	2.413	7.687	3.98	0.8	7.807
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0	0.006	0.299	0.021	0.137	0.67	0.02
D10	Kruskal-Wallis	9.934	8.464	9.229	10.773	0.427	4.141	3.791
	df	2	2	2	2	2	2	2
	Asymp. Sig.	0.007	0.015	0.01	0.005	0.808	0.126	0.15

Additionally, the Kruskal-Wallis H test also found that the means between years of employment (D9) and whether the IT department understands that IT challenges require

innovative solutions (Q2), $\chi^2(2) = 5.919$, $p = .052$, whether the IT department strategy makes specific reference to the value of innovation and/or innovative methodologies (Q3), $\chi^2(2) = 14.255$, $p = .001$, and whether the IT department provides IT governance awareness and training (Q5), $\chi^2(2) = 13.737$, $p = .001$, are similar. Furthermore, the groupings between D9 and whether the IT department invests in IT projects that add value to its functions and operations (Q8), $\chi^2(2) = 16.739$, $p < .01$, or whether the IT department adopts artificial intelligence technologies (Q9) , $\chi^2(2) = 10.255$, $p = .006$, or whether the IT department frequently launches new It solutions and services (Q11), $\chi^2(2) = 7.687$, $p = .021$, or whether the IT department experiences positive returns on its IT investments (Q14), $\chi^2(2) = 7.807$, $p = .02$, were also significant.

Research Questions and Hypotheses

The first research question and associated hypothesis focused on a statistically significant association between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations. Here, 69% of participants disagreed or had no opinion on whether their IT department has a formally defined IT strategy (Q1), and 66% expressed similar opinions about whether the IT department has IT metrics to measure the innovativeness of the IT department (Q6). Furthermore, Spearman's rho indicated a significant relationship between all questions associated with innovation in IT governance (See Table 4). The data analysis confirmed a relationship between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations, and, therefore, the null hypothesis $H1_0$ was rejected.

The second research question and associated hypothesis aimed to answer whether there is a statistically significant association between IT innovation references in IT governance strategy and the IT department's success in organizations. On the question of whether the IT department

has identifiable units in its IT governance structure dedicated to IT innovation (Q4), 67% of the participants disagreed or had no opinion. Coincidentally, compared to the responses related to whether the IT department experiences positive returns on its IT investments (Q14), 69% of the participants also disagreed or had no opinion. Furthermore, Spearman's rho indicated that all questions aimed at answering RQ2 showed a relationship with each other (see Table 5). In all cases, the one-sample chi-square test also indicated that most respondents disagreed or had no opinion when answering these questions. These results confirmed a relationship between IT innovation references in IT governance strategy and the IT department's success in organizations and, therefore, the null hypothesis $H2_0$ was rejected.

The third research question and associated hypothesis aimed to answer whether there is a statistically significant association between IT governance commitment to innovation and the adaption of innovation strategies by the IT department in the organization. Here, 67% of the participants disagreed or had no opinion on whether their IT department frequently launches new IT solutions and services (Q11), and 78% expressed a similar sentiment on whether their IT department has realistic IT innovation deliverables in place. However, Spearman's rho did not discover a significant relationship between these two questions. Coincidentally, on the question of whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12), 73% of the participants agreed or had no opinion, and Spearman's rho indicated a significant negative relationship with r_s=-.18, $p < .05$, N=122. Overall, the one-sample chi-square and Spearman's rho test confirmed that there is a significant association between IT governance commitment to innovation and the adaption of innovation strategies by the IT department in the organization, and thus the null hypothesis $H3_0$ was rejected.

The fourth and last research question and related hypothesis in this study were concerned with whether there is a statistically significant association between IT governance commitment to innovation and the IT department's success in organizations. 69% of the participants disagreed or had no opinion on whether the IT department experiences positive returns on its IT investments (Q14). The same percentage also disagreed or had no opinion on whether the IT department has a formally defined IT strategy in place (Q1). Similarly, the Kruskal-Wallis H test also indicated similar means between Q1 and Q14 with $\chi^2(2) = 11.11$, $p = .004$. Coincidentally, the chi-square test of independence also confirmed a consistent relationship between the variables, suggesting that there is a statistically significant relationship between IT governance commitment to innovation and the IT department's success in organizations. Therefore, the null hypothesis $H4_0$ was rejected.

Evaluation of the Findings

The findings of this study confirmed a relationship between IT innovation references in IT governance strategy and the adoption of innovative technologies by the IT department in organizations. Generally, Spearman's rho indicated strong interrelationships between Q1 to Q3. For example, the relationship between whether the IT department has a formally defined IT strategy (Q1) and whether the IT department understands that IT challenges require innovative solutions (Q2) was significant with $r_s=.61$, $p < .01$, $N=122$. Similarly, $r_s=.65$, $p < .01$, $N=122$, indicated a strong relationship between Q1 and whether the IT department strategy makes specific reference to the value of innovation and/or innovative methodologies (Q3), but also between Q2 and Q3 with $r_s=.74$, $p < .01$, $N=122$. These findings align with other literature where the use of explicit requirements in IT governance strategy definitions seems to suggest a

more favorable desired outcome (Alhassan, Sammon, & Daly, 2019; Johnston & Hale, 2009; Schou & Shoemaker, 2007; Steinbart, Raschke, Gal, & Dilla, 2013).

Similarly, additional findings also confirmed a relationship between IT innovation references in IT governance strategy and the IT department's success in organizations. Here, Spearman's rho also indicated strong relationships between the questions in a group. For example, on the question of whether the IT department has an identifiable unit in its IT governance structure dedicated to IT innovation (Q4) and whether the IT department provides IT governance awareness training (Q5), a significant relationship emerged with r_s=.56, $p < .01$, N=122. Furthermore, with r_s=.61, $p < .01$, N=122, a relationship also exists between Q4 and whether the IT department has IT metrics to measure innovation of the IT department (Q6) and likewise between Q4 and whether the IT department has formally defined operational processes and procedures (Q7) with r_s=.63, $p < .01$, N=122. In addition to the connections identified by Spearman's rho, the Kruskal-Wallis and Chi-Square test of independence indicated similar or additional relationships.

Furthermore, this study also confirmed a relationship between IT governance commitment to innovation and the adoption of innovation strategies by the IT department in organizations. However, unlike the previously examined question groups, Spearman's rho did not confirm a relationship between all examined questions. In particular, whether the IT department has realistic IT innovation deliverables in place (Q13) was only correlated with one other question: whether the IT department extends or customizes IT solutions or services according to the needs of other organizational departments (Q12). Most interestingly, Spearman's rho also indicated that the relationship between Q12 and Q13 is negative with r_s=-

.18, $p < .05$, N=122. The negative correlation here is unique, as all other correlations in this study were positive.

Lastly, the findings also confirmed a relationship between IT governance commitment to innovation and the IT department's success in organizations. Here, the Chi-Square test of independence showed a strong relationship between all other examined questions in addition to the Kruskal-Wallis, which also indicated a similarity in the means of the answers between demographic questions related to gender (D1), age (D2), the highest education level (D3), the main field of study (D4), and years of employment (D9) and whether the IT department experiences positive returns on its IT investments (Q14). Of particular interest here are the findings of the Chi-Square test of independence, which may suggest that all questions in this study, while measuring different variables and constructs, are interrelated to some extent. It needs to be noted that the findings are largely based on disagreement; that is, the majority of participants disagreed with the sentiment of the questions, and a large proportion had no opinion, suggesting that for this study, a lack of strategy or emphasis related to innovation also resulted in a lack of positive outcome in general.

Summary

The focus in this section was on discussing the reliability and validity of the data, the results of the data analysis, and the evaluation of the findings. While researchers can often use previous reliability assessments when incorporating existing instruments, this study relied on new development instead. Therefore, Cronbach's α was calculated, and at .917 indicated excellent reliability. Furthermore, by including 122 qualified participants, the external validity was above the aimed-for minimum of .80 (Hertzog, 2008), and achieved a power of >.86. As the distribution of data affects the choice of statistical approaches, p-p plots, the one-sample Chi-

Square, and the Shapiro-Wilks test were used to assess normality. While the p-p plots suggested somewhat normally distributed data, the Shapiro-Wilks could not confirm this assumption, suggesting that treating the data as non-parametric throughout the following analyses would be most appropriate.

48.4% of the participants were male, with the remainder being female. With 93.6% of all participants being 50 years of age or younger, the age distribution below 30 and between 41 and 50 are almost identical, suggesting a balanced split among the younger and older age groups with close to 50% of the total sample. The majority of the participants, 76.2%, said they hold a graduate-level degree, with undergrads making up 10.7%, and diploma or certificate holders the remaining 13.1%. 91% of all participants obtained their degrees in IT, business, or engineering, with 32% selecting IT, 26.2% business, and 32.8% engineering as the focus of their studies. The remaining 9% of the participants stated other topics as their answer. Following the analysis of demographic-related questions, a one-sample Chi-Square test was used to examine the expected distribution of answers against the actual responses from the participants.

Furthermore, Spearman's rho was used to calculate the strength of the relationships between grouped questions. In contrast, the Chi-Square test of independence and the Kruskal-Wallis H test was used to confirm relationships or similar means in the observed responses. All tests confirmed interrelationships between the examined variables to a varying extent, which led to rejecting all null hypotheses in this study. It needs to be noted that the majority of respondents disagreed with all questions, suggesting that a lack of IT governance on innovation may directly influence the observed outcomes, or at least have a mediating role.

Chapter 5: Implications, Recommendations, and Conclusions

This study investigated whether IT governance enables IT innovation in organizations and, thus, allowing the organizations to compete in the marketplace sustainably (Arkhipova, Vaia, DeLone, & Braghin, 2016; Grembergen & Haes, 2018; Héroux & Fortin, 2016; Tonelli, de Souza Bermejo, Aparecida dos Santos, Zuppo, & Zambalde, 2017). Therefore, the purpose of this quantitative exploratory study was to identify the factors that influence the ability of IT governance in some organizations to consider IT innovations that will allow the organization to compete in the marketplace sustainably.

The analysis of the collected data illustrated significant tendencies and correlations across the questions that participants were asked to answer. Most notably, the one-sample chi-square test indicated that most participants disagreed or slightly disagreed with all questions regardless of the associated constructs and variables (see Chapter 4). Spearman's Rho tests revealed significant relationships between the questions in the same groups, namely between Q1 to Q3 (see table 4), Q4 to Q7 (see table 5), and Q8 to Q12 (see table 6). There was no significant correlation between Q13 and Q12, Q10, Q9, or Q8. However, Spearman's rho identified a negative correlation between Q11 and Q13, which was also the only negative correlation identified throughout the entire test. Coincidentally, the Kruskal-Wallis H test also indicated a strong connection between some answers and demographics to a varying extent. These observations may indicate that demographics may have had some impact on how participants answered the questions, but given the variance across the responses, such as those related to seniority, age, education, or the size of an organization, other factors may also be influencing how participants would answer questions.

The limitations of this study included, among others, the choice of research design. By relying on a nonexperimental research design, this study examined the relationships between study variables but did not establish causation (Kumar, 2011). Additionally, the questionnaire was specifically designed to answer the research questions related to IT governance, IT innovation references, and the strategies and outcomes associated with innovation in an organization. Other factors that may mitigate strategies and outcomes or in-depth questions about justifications or individual approaches were not included in the assessment.

Furthermore, unlike qualitative research designs, which focus on collecting supplemental, contextual, and rich data, by selecting a quantitative design, the research was limited to collecting and analyzing empirical data (McCusker & Gunaydin, 2014). While contextual and rich data could have provided additional insights into why some participants had particular opinions or which organizational structures might impact their decisions, only a mixed methodology or qualitative approach would allow for the collection of this type of data as part of the study process (Zyphur & Pierides, 2017). By using a correlational methodology, the study was limited to examining the relationships between dependent and independent variables.

This chapter will discuss the implications of the data analysis in this study, followed by the recommendations for practice and a discussion on recommended future research to inform organizational change management processes in IT governance and help drive innovation. Even though this study identified strong relationships between IT governance, IT innovation references, IT innovation strategies, and IT department success, the findings were particularly inconclusive about the actual strategies that may lead to success, leaving room to support further study and considering other factors. Lastly, this chapter will discuss the study and its findings,

including a conclusion, and its implications for IT departments and organizations to achieve sustained IT innovation through IT governance and associated strategies.

Implications

The research questions in this study can be grouped into two distinct topics: IT Governance and its impact on innovative technologies and IT innovation references and their impact on the IT department's success and innovation. The data analysis illustrated how a lack of IT governance also produced equally strong responses by participants about whether their organization adopted innovative technologies or whether it resulted in a perceived success of the IT department (see Tables 4 and 5). Here, the vast majority of participants said that their IT department fails to adopt innovation strategies or lacks success, which could potentially mean that, at least in some cases, IT is unable to support organizational goals.

Similarly, the research question associated with IT innovation references and the adoption of innovative technologies or an IT department's success also illustrated how a lack of an IT department's success had little impact on the innovation strategies employed by organizations, for example. As observed with IT governance, most participants said their organizations lack any such commitment or reference while also confirming that the adoption or success of innovative technologies is equally absent. Although the research questions did not assume as to what relationships they aimed to discover, the data of the study suggests that there is at least no adverse relationship between a lack of IT governance and references on innovation and potential outcomes. On the contrary, the data analysis indicated that a lack of references to IT innovation or an IT governance strategy might generally correspond to a lack of IT department success and adaption of innovative technologies.

While the discovered statistically significant relationships indicate that innovation may not exist without governance or IT innovation reference, the nonexperimental research design did not allow for assessing causation. In particular, the existing literature suggests that sustainable innovation at a firm is based on repeatable processes and organizational structures, including resources and competencies, for example, where continuous innovation is the result of processes and not chance (André Cherubini, Denise, Fernanda Maciel, Jorge, & Paulo Antônio, 2017; Jurksiene & Pundziene, 2016; Kodama, 2017; Queiroz, Tallon, Sharma, & Coltman, 2018; Schoemaker, Heaton, & Teece, 2018; Sudrajat, Budiastuti, Setiadi, & Supeli, 2016). As such, a lack of IT governance and references to innovation in IT could explain why participants generally suggested that their organizations also fail to adopt innovative strategies or succeed within and beyond their IT departments.

While all examined questions showed a strong relationship between the examined questions (see appendix D), Spearman's Rho indicated a negative correlation between whether the IT department frequently launches new IT solutions and services (Q11) and whether the IT department has realistic IT innovation deliverables in place (Q13). This observation aligns well with the existing literature on the challenges of technology acceptance and promoting innovation in organizations (Barney, 1986; Jurksiene & Pundziene, 2016; Venkatesh, Morris, Davis, & Davis, 2003).

Recommendations for Practice

One goal of this study was to determine whether the use of IT governance or specific references to innovation can lead to the adoption of innovative technologies by the IT department and, as a result, support organizational success. 70% of the participants said that their IT department made no specific reference to the value of innovation and/or innovative

methodologies or that they had no opinion on whether they did, and 74% said they were either not aware or disagreed with whether their department had formally defined operational processes and procedures. Looking at this data alone suggests that the participants in this study were largely working at organizations that did not have sufficiently defined or communicated IT governance by promoting innovation and innovative methodologies in addition to defining general operational processes and procedures. Therefore, the first recommendation for practice is to define operational processes and procedures, as well as including references to innovation and innovative methodologies as part of a holistic approach to IT governance. Furthermore, a comprehensive approach to IT governance also requires organizations to adopt processes that ensure communication of processes and references across the entire organization. Without such communication, launching new IT solutions may also result in unrealistic expectations related to IT deliverables.

Another finding of this study revolved around the lack of perceived usage of innovative technologies, such as artificial intelligence, or employing metrics that would measure the innovativeness of the IT department. 72% of the participants had no opinion or disagreed with whether their IT department adopts artificial intelligence technologies, and 66% had no opinion or said that their IT department does not use IT metrics to measure the innovativeness of the IT department. While a lack of using innovative technologies in IT may be the result of poor governance or a failure to commit to innovation, IT departments are often only a part of a larger organization, and innovation may be decided through collaboration across management and departments and not by the IT department alone. In practice, the recommendation here is to create a culture of innovation that spans across departments and incorporates all levels of leadership. A business intelligence (BI) unit may not know about the benefits of artificial

intelligence and thus never asked or required the IT department to innovate in this direction. Sales and product management may also lack specific insight into what innovative technologies could do for the IT department and, in turn, which benefits they could provide to their departments. As such, this recommendation to focus on innovation extends beyond the IT department and seeks to incorporate the organization as a whole if the goal is to create sustainable and long-lasting benefits and competitive advantages.

Recommendations for Future Research

While this study identified statistically relevant associations between IT governance, references to innovation, the adaption of innovation strategies, and the success of the IT department in a given organization, the majority of the participants disagreed with or had no opinion on the questions. Even though the disagreement on whether the organization had IT governance, innovation, or metrics in place also resulted in participants suggesting that there was a lack of innovation or IT department success in general at the same time, the absence of one factor does not confirm that it is exclusively responsible for the perceived lack of innovation or success of the IT department either. To examine these constructs further, future research may focus on experimental designs or employ a longitudinal study to investigate whether a presence of IT governance and references to innovation in IT, in other words, whether a consistent culture of innovation exists across an entire organization, could contribute to positive outcomes.

Furthermore, the participants in this study originated from within the UAE, and a majority of them worked in government-supported or affiliated oil and gas industries, as well as telecommunications. The geographic limitation may introduce cultural bias into how innovation is perceived. Corporate structures may also be unique, especially because most participants worked at organizations that were owned or strongly influenced by their governments.

Therefore, future research should include a more diversified population from other geographic areas and, most importantly, other industries. Here, it is possible that including other, more competitive and innovative industries, such as manufacturing, aeronautics, entertainment, and autonomous vehicles, for example, may positively confirm the examined relationships.

Lastly, most participants either had no opinion or disagreed with the statements in the questions they were asked, which may suggest that crafting additional or different questions could offer more conclusive insights. As a result, future research should also incorporate or rely on qualitative research methods, including multiple case studies, to further examine how individuals and organizations perceive, focus on, and create sustainable innovation within their organizations. Other factors than those examined here may be responsible for driving innovation at successful and highly innovative IT departments and organizations. Utilizing a qualitative approach could provide rich data and contribute to a much deeper and more nuanced understanding of some processes and strategies that are guiding successful IT departments and organizations and which may enable them to achieve lasting competitive advantages. With this understanding, additional research could then explore whether similar constructs and processes are also in place at other organizations and across various industries and whether they have the same impact there on innovation and IT department success.

Conclusions

This study aimed to identify and investigate the factors that influence the ability of IT governance in organizations to consider IT innovations that will allow the organization to compete in the marketplace sustainably. By using the COBIT 5 and ITIL frameworks as a lens and the basis for the theoretical framework of this study (Ding, 2015), assumptions included that organizations that are medium or large will have an IT governance framework adopted within

their organizations. It was also assumed that the participants in the study understood the concept of IT governance and IT innovation as it was adopted in their organizations, as well as they have the required years of experience within their organization. In particular, the frequency of disagreement and statements of no opinion either way, however, question whether participants understood the concepts of IT governance or were familiar with common frameworks, such as Cobit 5 or ITIL.

While most participants disagreed with the questions, they were asked about IT governance structures and innovation references in general, they also disagreed with those that focused on establishing whether innovation plays an important role in their organization or whether the IT department should be considered successful, for example. Here, the identified correlations were strong but did not provide insight into whether the presence of IT governance or references to innovation would lead to actual strategies for utilizing innovative technologies or contribute to an IT department's success. While some existing literature suggests that continuing and sustainable innovation requires the development of unique competencies, processes, paths, and procedures, this study was unable to confirm whether this would be the case among it participants, merely because most participants stated that they do not believe that their organizations and IT departments have sufficient IT governance or references to innovation in place that would encourage the use of innovative technologies that may lead to success within the IT department.

The findings of this study illustrate the need for further investigation from various angles. While the results suggested strong relationships between the study variables, the findings only supported the understanding that a lack of IT governance and reference to innovation may also fail to produce positive results or innovative strategies in a given organization. Furthermore, the

observations in this study are limited by its population that largely consisted of participants working in the oil and gas industries or telecommunications in the UAE. While it may be conceivable that other industries and geographies would contribute similar responses, the opposite may also be true. Without expanding the population to other markets and industries, the transferability and generalization of the findings are currently limited.

While the study design confirmed a statistically significant relationship between the study variables, it could not identify causation. Further research is needed to explore the origins of innovation at various organizations and to pinpoint the relationships that inform the decision-making processes carried out by the management at organizations and whether these decisions lead to innovation or actively limit an IT department's success. Knowing whether certain policies or approaches to IT governance can positively influence innovation strategies and IT department success outcomes would provide a valuable framework by which organizations in various industries could judge their innovativeness and adjust their actions to gain and sustain competitive advantages.

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Appendix A: Research Survey

IT Governance and Innovation Questionnaire

Survey Owner: Laila Aoudi **Date: Oct 2019**

1. **Introduction**

To Survey Participants:

The goal of this research is to provide an understanding of how the relationship between IT governance and IT innovation in organizations. Please proceed to complete the questionnaire if you are currently working as an information technology professional in a SME or large organization with clearly identifiable IT governance function/structure. No personally identifiable information is collected, and you are free to stop or leave at any time you want.

Please proceed to complete the questionnaire if you are currently working as an information technology professional in a SME or large organization with clearly identifiable IT governance function/structure. No personally identifiable information is collected, and you are free to stop or leave at any time you want.

2. **Exploring Survey Participant's Perceptions on the Study Topic**

Part A: Demographics

Participants will be asked to provide demographic information including:

- Gender (drop down)
- Age (drop down of ranges)
- Education level (drop down)
- Field of study category (drop down)
- Country that you are working in (free text)
- Current Job Function/Sector (drop down)

- Industry (free text)
- Current Position (drop down)
- Years of Employment (drop down)
- Approximately how many employees does your organization have? (free text)

Justification: Demographic question are required to understand the identity of the participants answering the survey ensuring that they meet the demographic requirements for this study as well as is necessary when doing data analysis in the study(Harkiolakis, 2017).

Part B:

Section 1: Survey Questions refer to identify the awareness of the existence of innovation references in the organization's IT governance.

As an IT employee at their organization, they select your level of agreement to the following statements:

Q1. My organization has a formally defined IT strategy.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question gives an idea if the company has set in place an IT strategy and is updated frequently based on needs (Chandler et al., 1999)

Q2. My organization understands that IT challenges require innovative solutions.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will give information whether the IT decision maker knows the importance of understanding the IT opportunities that

will increase the innovation level of the organization and increase competitiveness in the market as this helps in the IT strategy design (Teece & Leih, 2016).

Q3. My organization's IT strategy makes specific reference to the value of innovation and/or innovative methodologies.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will give us an idea about the organization if they have an established innovation methodology in their IT strategy. This will help in measuring the relation between IT strategy and Innovation (Crema et al., 2014).

Section2: Questions to identify practical measures the organization takes to support innovation in IT governance

Q4. My organization has an identifiable unit in its IT governance structure dedicated to IT innovation

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will help in knowing if the IT innovation is part of the IT governance framework or not. (György et al., 2012)

Q5. My organization provides IT governance awareness and training.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will give an idea of the level of communication and understanding of the IT governance framework within the

organization as this will be required as part of implementation of the framework. (Nfuka & Rusu, 2013)

Q6. My organization has IT metrics to measure the innovativeness of the IT department.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will address the IT strategy level of implementation in the organization, if the performance is measured effectively this will give an idea that IT strategy is set in place effectively. (Chandler et al., 1999)

Q7. My IT department has formally defined operational processes and procedures.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will give an understanding of the level of IT governance adoption in their organization, having defined processes, procedures and defined business values are considered in main elements when developing an IT governance framework in the organization. (González & González, 2015).

Section3: Questions to identify the innovation level of the IT department

Q8. My organization invests in IT projects that add value to its function and operations.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will also give an idea on the level of IT governance framework adopted in the organization as investment is considered one of the elements in an IT governance framework as investing in added value project that will increase the organization competiveness in the market. (Nfuka & Rusu, 2013)

Q9. My IT department adopts artificial intelligence technologies.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will address the level of innovation technologies adopted in the organization, the company will be considered to have high level of innovation adopted in their organization if they would have AI technologies adopted in their organization.(Plastino & Purdy, 2018)

Q10. My IT department engages in business process re-engineering

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will address the level of process innovation adopted in the organization. (Atalay et al., 2013)

Q11. My IT department frequently launches new IT solutions and services.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will give an idea if it adopts product innovation in their organization. (Atalay et al., 2013)

Q12. My organization extends or customize IT solutions or services according to the needs of other organizational departments.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will address if the organization enhance or customize their products of solutions and services as this will allow us to know if they adopt product innovation in their organization. (Atalay et al., 2013)

Q13. My organization has in place realistic IT innovation deliverables.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will help in detecting if the IT innovation methodology adopted is effective or not, if deliverables is well defined then the IT innovation would have a positive effect on the organization performance. (György et al., 2012)

Section 4: Question to measure the perceived success of the IT department.

Q14. My organization experiences positive returns on its IT investments.

Strongly Disagree	*Disagree*	*Neither Agree nor Disagree*	*Agree*	*Strongly Agree*

Justification: In relation to Research Question (), this question will give an idea on the ROI within the organization, if they have an IT governance in place and their ROI is considered to be good then the IT governance framework set is considered to be effective. (Peterson, 2004)

Appendix B: Survey & Design Flow

IT Governance and Innovation Questionnaire

The goal of this research is to provide an understanding of how the relationship between IT governance and IT innovation in organizations. Please proceed to complete the questionnaire if you are currently working as an information technology professional in a SME or large organization with clearly identifiable IT governance function/structure. No personally identifiable information is collected, and you are free to stop or leave at any time you want.

* Required

D1. Gender *

○ Male

○ Female

D2. Age *

○ below 30

○ 31-40

○ 41-50

○ over 50

D3. Highest education level *

○ Diploma/Certificate

○ Undergraduate

○ Graduate

D4. Main field of study *

○ IT

○ Business

○ Engineering

○ Management

○ Other

D5. Country you are working in *

Your answer

D6. Organization Sector *

○ Government

○ Government Supported

○ Private

D7. Organization Industry *

Your answer

D8. Current Position *

○ Upper Management

○ Middle Management

○ Lower management

○ Other:

D9. Years of Employment *

○ Less than 5

○ 5-10

○ More than 10

D10. Approximately how many employees does your organization have? *

Your answer

Q1. My IT department has a formally defined IT strategy. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q2. My IT department understands that IT challenges require innovative solutions. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q3. My IT department strategy makes specific reference to the value of innovation and/or innovative methodologies. *

○ Strongly Disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q4. My IT department has an identifiable unit in its IT governance structure dedicated to IT innovation . *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q5. My IT department provides IT governance awareness and training. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q6. My IT department has IT metrics to measure the innovativeness of the IT department. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q7. My IT department has formally defined operational processes and procedures. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q8. My IT department invests in IT projects that add value to its function and operations. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q9. My IT department adopts artificial intelligence technologies. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q10. My IT department engages in business process re-engineering. *

Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly Agree

Q11. My IT department frequently launches new IT solutions and services. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly Agree

Q12. My IT department extends or customize IT solutions or services according to the needs of other organizational departments. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Q13. My IT department has in place realistic IT innovation deliverables. *

○ Strongly Agree

○ Agree

○ Neither Agree nor Disagree

○ Disagree

○ Strongly Disagree

Q14. My IT department experiences positive returns on its IT investments. *

○ Strongly disagree

○ Disagree

○ Neither Agree nor Disagree

○ Agree

○ Strongly agree

Appendix C: Test of Normality

	Shapiro-Wilk		
	Statistic	df	Sig.
Q1. My IT department has a formally defined IT strategy.	0.837	122	0.000
Q2. My IT department understands that IT challenges require innovative solutions.	0.815	122	0.000
Q3. My IT department strategy makes specific reference to the value of innovation and/or innovative methodologies.	0.817	122	0.000
Q4. My IT department has an identifiable unit in its IT governance structure dedicated to IT innovation .	0.857	122	0.000
Q5. My IT department provides IT governance awareness and training.	0.875	122	0.000
Q6. My IT department has IT metrics to measure the innovativeness of the IT department.	0.905	122	0.000
Q7. My IT department has formally defined operational processes and procedures.	0.823	122	0.000
Q8. My IT department invests in IT projects that add value to its function and operations.	0.828	122	0.000
Q9. My IT department adopts artificial intelligence technologies.	0.869	122	0.000
Q10. My IT department engages in business process re-engineering.	0.851	122	0.000
Q11. My IT department frequently launches new IT solutions and services.	0.833	122	0.000
Q12. My IT department extends or customize IT solutions or services according to the needs of other organizational departments.	0.814	122	0.000
Q13. My IT department has in place realistic IT innovation deliverables.	0.863	122	0.000
Q14. My IT department experiences positive returns on its IT investments.	0.866	122	0.000

Appendix D: Frequencies and Summary of One-Sample Chi-Square Test

Frequencies

Q1. My IT department has a formally defined IT strategy.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	4	24.4	-20.4	3.3
Agree	6	24.4	-18.4	4.9
Neither Agree nor Disagree	23	24.4	-1.4	18.9
Disagree	58	24.4	33.6	47.5
Strongly Agree	31	24.4	6.6	25.4
Total	122			

Q2. My IT department understands that IT challenges require innovative solutions.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	1	24.4	-23.4	0.8
Agree	7	24.4	-17.4	5.7
Neither Agree nor Disagree	15	24.4	-9.4	12.3
Disagree	62	24.4	37.6	50.8
Strongly Agree	37	24.4	12.6	30.3
Total	122			

Q3. My IT department strategy makes specific reference to the value of innovation and/or innovative methodologies.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	1	24.4	-23.4	0.8
Agree	7	24.4	-17.4	5.7
Neither Agree nor Disagree	17	24.4	-7.4	13.9
Disagree	67	24.4	42.6	54.9
Strongly Agree	30	24.4	5.6	24.6
Total	122			

Q4. My IT department has an identifiable unit in its IT governance structure dedicated to IT innovation .

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	2	24.4	-22.4	1.6
Agree	16	24.4	-8.4	13.1
Neither Agree nor Disagree	21	24.4	-3.4	17.2
Disagree	59	24.4	34.6	48.4
Strongly Agree	24	24.4	-0.4	19.7

Total	122		

Q5. My IT department provides IT governance awareness and training.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	2	24.4	-22.4	1.6
Agree	23	24.4	-1.4	18.9
Neither Agree nor Disagree	24	24.4	-0.4	19.7
Disagree	53	24.4	28.6	43.4
Strongly Agree	20	24.4	-4.4	16.4
Total	122			

Q6. My IT department has IT metrics to measure the innovativeness of the IT department.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	5	24.4	-19.4	4.1
Agree	26	24.4	1.6	21.3
Neither Agree nor Disagree	34	24.4	9.6	27.9
Disagree	42	24.4	17.6	34.4
Strongly Agree	15	24.4	-9.4	12.3
Total	122			

Q7. My IT department has formally defined operational processes and procedures.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	2	24.4	-22.4	1.6
Agree	8	24.4	-16.4	6.6
Neither Agree nor Disagree	20	24.4	-4.4	16.4
Disagree	68	24.4	43.6	55.7
Strongly Agree	24	24.4	-0.4	19.7
Total	122			

Q8. My IT department invests in IT projects that add value to its function and operations.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	2	24.4	-22.4	1.6
Agree	13	24.4	-11.4	10.7
Neither Agree nor Disagree	18	24.4	-6.4	14.8
Disagree	67	24.4	42.6	54.9
Strongly Agree	22	24.4	-2.4	18.0
Total	122			

Q9. My IT department adopts artificial intelligence technologies.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	4	24.4	-20.4	3.3
Agree	22	24.4	-2.4	18.0
Neither Agree nor Disagree	27	24.4	2.6	22.1
Disagree	57	24.4	32.6	46.7
Strongly Agree	12	24.4	-12.4	9.8
Total	122			

Q10. My IT department engages in business process re-engineering.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	3	24.4	-21.4	2.5
Agree	18	24.4	-6.4	14.8
Neither Agree nor Disagree	19	24.4	-5.4	15.6
Disagree	61	24.4	36.6	50.0
Strongly Agree	21	24.4	-3.4	17.2
Total	122			

Q11. My IT department frequently launches new IT solutions and services.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	2	24.4	-22.4	1.6
Agree	12	24.4	-12.4	9.8
Neither Agree nor Disagree	17	24.4	-7.4	13.9
Disagree	63	24.4	38.6	51.6
Strongly Agree	28	24.4	3.6	23.0
Total	122			

Q12. My IT department extends or customize IT solutions or services according to the needs of other organizational departments.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	2	24.4	-22.4	1.6
Agree	12	24.4	-12.4	9.8
Neither Agree nor Disagree	17	24.4	-7.4	13.9
Disagree	70	24.4	45.6	57.4
Strongly Agree	21	24.4	-3.4	17.2
Total	122			

Q13. My IT department has in place realistic IT innovation deliverables.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	13	24.4	-11.4	10.7
Agree	22	24.4	-2.4	18.0
Neither Agree nor Disagree	33	24.4	8.6	27.0
Disagree	50	24.4	25.6	41.0
Strongly Agree	4	24.4	-20.4	3.3
Total	122			

Q14. My IT department experiences positive returns on its IT investments.

	Observed N	Expected N	Residual	Proportion in %
Strongly Disagree	1	24.4	-23.4	0.8
Agree	17	24.4	-7.4	13.9
Neither Agree nor Disagree	26	24.4	1.6	21.3
Disagree	58	24.4	33.6	47.5
Strongly Agree	20	24.4	-4.4	16.4
Total	122			

Summary

Question	Chi-Square	df	Asymp. Sig.	Exact Sig.	Point Probability
Q1 (formally defined strategy)	79.066[a]	4	0.000	0.000	0.000
Q2 (challenges require innovative solutions)	102.918[a]	4	0.000	0.000	0.000
Q3 (references to the value of innovation)	112.754[a]	4	0.000	0.000	0.000
Q4 (IT governance structure)	73.000[a]	4	0.000	0.000	0.000
Q5 (governance awareness and training)	54.967[a]	4	0.000	0.000	0.000
Q6 (innovativeness of the IT department)	35.623[a]	4	0.000	0.000	0.000
Q7 (defined operational processes and)	110.295[a]	4	0.000	0.000	0.000
Q8 (projects that add value to its functions)	102.180[a]	4	0.000	0.000	0.000
Q9 (artificial intelligence technologies)	67.426[a]	4	0.000	0.000	0.000
Q10 (business process reengineering)	77.016[a]	4	0.000	0.000	0.000
Q11 (new IT solutions and services)	90.705[a]	4	0.000	0.000	0.000
Q12 (customize IT solutions and services)	114.803[a]	4	0.000	0.000	0.000
Q13 (realistic IT innovation deliverables)	52.508[a]	4	0.000	0.000	0.000

Q14 (positive returns on its IT investments)	71.852[a]	4	0.000	0.000	0.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 24.4.

Appendix E: Chi-Square Test of Independence

Tested Pair	Pearson Chi-Square	df	Asymptotic Significance (2-sided)
Q1 & Q2*	141.177	16	0.000
Q1 & Q3*	143.076	16	0.000
Q1 & Q4*	107.338	16	0.000
Q1 & Q5*	75.664	16	0.000
Q1 & Q6*	58.933	16	0.000
Q1 & Q7*	100.985	16	0.000
Q1 & Q8*	85.258	16	0.000
Q1 & Q9*	44.586	16	0.000
Q1 & Q10*	73.223	16	0.000
Q1 & Q11*	75.784	16	0.000
Q1 & Q12*	68.457	16	0.000
Q1 & Q13*	51.312	16	0.000
Q1 & Q14*	90.156	16	0.000
Q2 & Q3*	275.280	16	0.000
Q2 & Q4*	127.870	16	0.000
Q2 & Q5*	130.793	16	0.000
Q2 & Q6*	65.505	16	0.000
Q2 & Q7*	148.037	16	0.000
Q2 & Q8*	138.908	16	0.000
Q2 & Q9*	47.632	16	0.000

Q2 & Q10*	102.279	16	0.000
Q2 & Q11*	133.604	16	0.000
Q2 & Q12*	96.886	16	0.000
Q2 & Q13*	80.131	16	0.000
Q2 & Q14*	169.515	16	0.000
Q3 & Q4*	145.935	16	0.000
Q3 & Q5*	120.636	16	0.000
Q3 & Q6*	75.113	16	0.000
Q3 & Q7*	138.537	16	0.000
Q3 & Q8*	116.676	16	0.000
Q3 & Q9*	59.730	16	0.000
Q3 & Q10*	93.397	16	0.000
Q3 & Q11*	135.857	16	0.000
Q3 & Q12*	109.800	16	0.000
Q3 & Q13*	88.784	16	0.000
Q3 & Q14*	187.668	16	0.000
Q4 & Q5*	96.705	16	0.000
Q4 & Q6*	96.885	16	0.000
Q4 & Q7*	106.181	16	0.000
Q4 & Q8*	123.220	16	0.000
Q4 & Q9*	68.892	16	0.000
Q4 & Q10*	84.286	16	0.000

Q4 & Q11*	95.544	16	0.000
Q4 & Q12*	69.520	16	0.000
Q4 & Q13*	74.164	16	0.000
Q4 & Q14*	118.012	16	0.000
Q5 & Q6*	169.362	16	0.000
Q5 & Q7*	122.266	16	0.000
Q5 & Q8*	111.604	16	0.000
Q5 & Q9*	74.347	16	0.000
Q5 & Q10*	76.707	16	0.000
Q5 & Q11*	113.494	16	0.000
Q5 & Q12*	100.246	16	0.000
Q5 & Q13*	86.864	16	0.000
Q5 & Q14*	129.709	16	0.000
Q6 & Q7*	132.806	16	0.000
Q6 & Q8*	87.158	16	0.000
Q6 & Q9*	97.513	16	0.000
Q6 & Q10*	96.720	16	0.000
Q6 & Q11*	79.432	16	0.000
Q6 & Q12*	102.514	16	0.000
Q6 & Q13*	96.551	16	0.000
Q6 & Q14*	94.720	16	0.000
Q7 & Q8*	157.690	16	0.000

Q7 & Q9*	73.506	16	0.000
Q7 & Q10*	157.290	16	0.000
Q7 & Q11*	149.896	16	0.000
Q7 & Q12*	110.364	16	0.000
Q7 & Q13*	71.373	16	0.000
Q7 & Q14*	122.703	16	0.000
Q8 & Q9*	115.324	16	0.000
Q8 & Q10*	124.985	16	0.000
Q8 & Q11*	156.243	16	0.000
Q8 & Q12*	110.807	16	0.000
Q8 & Q13*	76.207	16	0.000
Q8 & Q14*	126.349	16	0.000
Q9 & Q10*	110.899	16	0.000
Q9 & Q11*	119.235	16	0.000
Q9 & Q12*	60.442	16	0.000
Q9 & Q13*	95.293	16	0.000
Q9 & Q14*	74.270	16	0.000
Q10 & Q11*	121.785	16	0.000
Q10 & Q12*	99.690	16	0.000
Q10 & Q13*	95.541	16	0.000
Q10 & Q14*	130.544	16	0.000
Q11 & Q12*	113.435	16	0.000

Q11 & Q13*	99.136	16	0.000
Q11 & Q14*	160.382	16	0.000
Q12 & Q13*	92.169	16	0.000
Q12 & Q14*	149.311	16	0.000
Q13 & Q14*	130.563	16	0.000
*) significant at the <0.01 level			