



**UNIVERSITY OF NAIROBI**  
**SCHOOL OF COMPUTING AND INFORMATICS**

**EXAMINING THE RELATIONSHIP BETWEEN ICT GOVERNANCE  
DRIVERS AND EFFECTIVE ICT GOVERNANCE AT THE UNIVERSITY  
OF RWANDA**

**BY**

**NDUSHABANDI NKURUNZIZA JEAN BOSCO**

**P54/73430/2014**

**SUPERVISOR: DR. AGNES N. WAUSI**

A Research Project Submitted in Partial Fulfillment of the Requirements for the Award of the  
Degree of Master of Science in Information Technology Management of the University of  
Nairobi.

**DECEMBER 2015**

## DECLARATION

I, the undersigned, declare that this research project is my original work and has not been presented for a degree in any other University

.....

.....

Signature

Date

**NDUSHABANDI NKURUNZIZA JEAN BOSCO**

**P54/73430/2014**

This research project has been submitted for examination with my approval as the University Supervisor

.....

.....

Signature

Date

**Dr. AGNES N. WAUSI**

**School of Computing and Informatics**

**University of Nairobi**

## **ACKNOWLEDGEMENTS**

I would never have succeeded without the help and support of the following people.

First of all, I would like to express my sincere gratitude to my supervisor, Dr. Agnes WAUSI for her constructive advice and encouragement and guidance throughout this research project.

My thanks also, go to the panelist; Dr. Elisha T. O. Opiyo and Dr. Robert Oboko for their valuable advice, in particular during plenary sessions and for their input in every step.

Many thanks to the University of Nairobi administration through the School of Computing and Informatics under the leadership of Prof. William Okello for being supportive.

My thanks also go to the University of Rwanda the mother institution for funding my studies through Swedish International Development Agency.

I give thanks to you my colleagues students who offered support along the way.

My deep gratitude is expressed to my Parents, Brothers and Sisters, Family members and Friends who not only believed in me and gave the necessary support, but remained patient with me as I putted many months away from the country.

Above all, I am inexpressibly grateful to the Almighty God and my Savior.

I thank you All

NDUSHABANDI Nk. Jean Bosco

## **DEDICATION**

I dedicate this work to my beautiful wife Sylvie KANEZA and our Lovely children: Kellyan GANZA, Kloé TETA and Anaëlle ISARO who play a key role in inspiring me.

Thank you for your Love.

## ABSTRACT

Investments in information and communication technology (ICT) based systems and processes are essential for business organizations. Yet many organizations have not been able to derive maximum benefit from their substantial spending on ICT. Some organizations have seen their systems end up as technical or organizational failures. This research project aimed at examining the relationship between ICT strategic alignment, ICT performance management, ICT resource management and ICT governance at the University of Rwanda. Therefore, based on actor network theory, we developed a conceptual framework for a holistic approach. In order to examine the relationship, first, a literature review was conducted to explore ICT governance research. Empirical data was collected via a survey questionnaire where the unit of analysis was the college representatives as well as representatives from central administration consisting of top and senior authorities, middle managers as well as academic and ICT staff. A stratified purposive sampling was applied as a non-probability sampling. Data was collected using a sample size of 81 respondents consisting of **2** top authorities, **5** senior authorities, **30** middle managers, **21** Academic Staff and **23** ICT staff. The measurement of variables relied on 5 point Likert-scale. The study used both Pearson's correlation and multiple regression methods to carry out data analysis, whereas data presentation was in descriptive form. The findings revealed a significant positive relationship between ICT strategic alignment and ICT governance ( $R^2=41.8\%$  and  $Beta=0.676$ ); a significant positive relationship between ICT performance management and ICT governance ( $R^2=34.0\%$  and  $Beta=0.617$ ); a significant positive relationship between ICT resource management and ICT governance ( $R^2=47.4\%$  and  $Beta=0.607$ ) and a high and significant positive relationship between ICT strategic alignment together with ICT performance management and ICT resource management and ICT governance with ICT resource management ( $Beta=.466$ ,  $sig<.05$ ) being a better predictor of ICT governance than the ICT strategic alignment and ICT performance management. This research therefore recommends that while putting in place ICT governance structures, the University get the support from top, senior and middle managers but also involve all stakeholders in the development and implementation of ICT governance at the University.

**Keywords:** ICT Governance, ICT Management, ICT Strategic Alignment, ICT Performance Management, ICT Resource management, Actor Network Theory.

# TABLE OF CONTENT

<b>DECLARATION.....</b>	<b>II</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>III</b>
<b>DEDICATION .....</b>	<b>IV</b>
<b>ABSTRACT.....</b>	<b>V</b>
<b>TABLE OF CONTENT .....</b>	<b>VI</b>
<b>LIST OF FIGURES .....</b>	<b>IX</b>
<b>LIST OF TABLES .....</b>	<b>X</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>XI</b>
<b>CHAPTER ONE: INTRODUCTION .....</b>	<b>1</b>
1.1. BACKGROUND OF THE STUDY.....	1
1.2. DEFINITION OF TERMS.....	3
1.2.1. ICT Governance .....	3
1.2.2. ICT Strategic Alignment.....	4
1.2.3. ICT Performance management .....	4
1.2.4. ICT Resource Management .....	5
1.3. STATEMENT OF THE PROBLEM .....	6
1.4. PURPOSE OF THE STUDY .....	7
1.5. JUSTIFICATION .....	8
1.6. SCOPE .....	8
<b>CHAPTER TWO: LITERATURE REVIEW.....</b>	<b>9</b>
2.1. INTRODUCTION .....	9
2.2. THEORETICAL PERSPECTIVE TO ICT GOVERNANCE.....	9
2.2.1. Actor Network Theory.....	9
2.2.2. ICT Governance Background and Definition .....	11
2.2.3. ICT Governance vs. ICT Management.....	13

2.3.	ICT GOVERNANCE FRAMEWORKS AND PRACTICE.....	13
2.3.1.	Balanced Scorecard (BSC) .....	14
2.3.2.	IT Infrastructure Library (ITIL) .....	17
2.3.3.	Weill & Ross framework .....	18
2.3.4.	Control Objectives for Information and Related Technology (COBIT) .....	19
2.3.5.	ICT Governance Maturity.....	21
2.4.	ICT GOVERNANCE CONCEPTUAL APPROACH .....	23
2.4.1.	ICT Strategic alignment.....	23
2.4.2.	ICT Performance management .....	25
2.4.3.	ICT Resource management.....	26
2.5.	CONCEPTUAL FRAMEWORK.....	27
2.6.	HYPOTHESES FORMULATION .....	27
<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>		<b>28</b>
3.0.	INTRODUCTION .....	28
3.1.	RESEARCH DESIGN .....	28
3.2.	RESEARCH POPULATION.....	28
3.3.	SAMPLING FRAME.....	29
3.4.	SAMPLING AND SAMPLING TECHNIQUE.....	29
3.5.	RESEARCH INSTRUMENT AND TOOL.....	31
3.5.1.	Data Collection.....	31
3.5.2.	Ethics Considerations .....	31
3.5.3.	Validity and Reliability Test .....	32
3.5.3.1.	Reliability Test .....	32
3.5.3.2.	Validity Test.....	33
3.6.	DATA ANALYSIS.....	35
<b>CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND FINDINGS .....</b>		<b>36</b>
4.0.	INTRODUCTION .....	36
4.1.	DESCRIPTIVE ANALYSIS.....	36
4.1.1.	Gender distribution.....	36
4.1.2.	Job Position Level .....	37

4.1.3. Duration at the Current Job.....	38
4.2.    DESCRIPTIVE CROSS-TABULATION ANALYSIS.....	38
4.2.1. ICT Strategic Alignment.....	38
4.2.2. ICT Performance Management .....	42
4.2.3. ICT Resource Management .....	43
4.2.4. ICT Governance Mechanisms.....	44
Conclusion.....	46
4.3.    CORRELATION ANALYSIS .....	47
4.4.    MULTIPLE REGRESSION ANALYSIS .....	49
Conclusion.....	54
<b>CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS .....</b>	<b>55</b>
5.1.    DISCUSSION.....	55
5.2.    CONCLUSION .....	58
5.3.    RECOMMENDATION.....	60
5.4.    LIMITATIONS .....	60
<b>REFERENCES.....</b>	<b>62</b>
<b>APPENDIX A: DATA COLLECTION TOOL.....</b>	<b>67</b>



## LIST OF FIGURES

Figure 1 : ICTG Proposed Model .....	10
Figure 2: ICT Governance focus areas.....	12
Figure 3: ICT Governance vs. ICT Management .....	13
Figure 4: ICT Governance Arrangement.....	14
Figure 5: BSC four different perspectives .....	15
Figure 6: ITIL Framework.....	18
Figure 7: Weill and Ross's Framework.....	19
Figure 8 : COBIT 5 Framework .....	20
Figure 9: Conceptual Framework .....	27
Figure 10: Gender Distribution.....	36

## **LIST OF TABLES**

Table 1: Sampling .....	30
Table 2: Cronbach's alpha .....	32
Table 3: Reliability Coefficient .....	33
Table 4: Validity of Construct .....	34
Table 5: Content Validity .....	34
Table 6: Females distribution per Job position at UR.....	37
Table 7: Distribution per Job Position .....	37
Table 8: Distribution per Duration at the position .....	38
Table 9: ICT Strategy per Job Position .....	39
Table 10: ICT Strategy Awareness per Job Position .....	39
Table 11: Approved ICT Strategy per Job Position.....	40
Table 12: ICT Strategy is Articulated and Communicated .....	41
Table 13: ICT strategy is visible .....	41
Table 14: Stakeholders Involvement.....	42
Table 15: Good Project Management .....	42
Table 16: Financial Resource .....	43
Table 17: Skilled Staff and resource available .....	44
Table 18: Structure Mechanisms .....	44
Table 19: Process Mechanisms.....	45
Table 20: Relational Mechanisms.....	45
Table 21: ICT Infrastructure.....	46
Table 22: Pearson correlation coefficients .....	48
Table 23: Regression on H1 .....	50
Table 24: Regression on H2 .....	51
Table 25: Regression on H3 .....	52
Table 26: Regression on H4 .....	53
Table 27: Summary on Hypothesis.....	54

## **LIST OF ABBREVIATIONS**

ANT:	Actor-Network Theory
BSC:	Balanced Scorecard
CASS:	College Arts and Social Sciences
CAVM:	College of Agriculture and Veterinary Sciences
CBE:	College of Business and Economics
CE:	College of Education
CIO:	Chief Information Officer
CISR:	Center for Information Systems Research
CMHS:	College of Medicine and Health Sciences
COBIT:	Control Objectives for Information and related Technology
CST:	College of Science and Technology
EV:	Eigen value
EVA:	Economic Value Added
HQ:	Head Quarters
ICT:	Information and Communication Technology
ICTG:	ICT Governance
ICTPM:	ICT Performance Management
ICTRM:	ICT Resource Management
ICTSA:	ICT Strategic Alignment
ISACA:	Information Systems Audit and Control Association
IT:	Information Technology
ITGI:	Information Technology Governance Institute
ITIL:	Information Technology Infrastructure Library
KMO:	Kaiser-Meyer-Olkin
ROI:	Return On Investment
SLA:	Service Level Agreement
SPSS:	Statistical Package of the Social Sciences
UR:	University of Rwanda

# CHAPTER ONE: INTRODUCTION

## 1.1. Background of the Study

Universities around the world like other organizations have integrated ICT into their processes; for example introducing Intranets and Internet applications to communicate and share information among their community. The introduction of e-learning, have radically changed the learning landscape. E-learning enables lectures to be taken and learn anywhere and at any time. Therefore, most universities depend on Information and Communication Technology as an essential part of their day-to-day operations. As ICT has become more powerful, its use has spread throughout organizations at a rapid rate. It is easy for ICT project managers to know how much they spent on ICT initiatives, but very few could actually say what that investment returned to the organization. ICT is a powerful resource used by organisation to achieve their most important objectives. For example, ICT can represent a core driver of cost savings; it can enable automation of key business processes such as the supply chain; and it can be the cornerstone of new business strategies or models (Oyemade, 2012).

ICT projects are risky, and many fail to deliver on stated business objectives. Many consider ICT spending levels as a proxy for ICT organizational efficiency. Although ICT efficiency relates to ICT spending levels, an ICT organization's level of spending alone does not determine efficiency (Gartner, 2003). (Gartner, 2003) continues stating that every organization has limited resources and more to do than the budget will allow. Already squeezed on their spending allocation, executives are typically left with a meager ten percent of their ICT budget for innovation once operations, maintenance, upgrades, and migrations are paid for. So ICT projects that fail to deliver value are a major source of contention within organizations. That is why so much emphasis is placed on high quality ICT project management and why ICT project managers really need to pay closer attention to return on ICT investment.

Universities obtain a return value on their ICT investment not only in the form of cost savings but also by improving its global internal organization, user satisfaction, university image and outreach.

The top performing organizations implement ICT governance most effectively to support their strategies. The Center for Information Systems Research (CISR) shows that the top performing organizations generate up to 40% higher returns on their ICT investments than their competitors

with weak ICT governance (Trusted\_Advisor, 2013; Weill Peter, 2004). Effective implementation of ICT governance in the business units of an enterprise involves the process of institutionalization (e.g., changes in culture and behaviors of people), to use the processes, tools and metrics. The term “governance” is essentially associated with accountability and responsibilities within an organization that pay particular attention to organizational structure, management mechanisms, and policies (Al-Hatmi, 2014). Many times, ICT governance implementation fails due to ineffective institutionalization. Quite often, the root cause can be traced to lack of business-unit executive buy-in (Bhatia, 2013).

(Weill Peter & Ross Jeanne W, 2004; De Haes S. & Van Grembergen W., 2009) have contributed a lot in literature review and they suggested two major frameworks for understanding ICTG implementation. Weill and Ross were among the first to investigate the real effect of ICT governance on organizations by studying 250 organizations. Their research revealed that organizations with superior ICT governance had 20% more profit than organizations with poor governance given the same strategic objectives. Their proposed framework focuses on decision-making structures, alignment processes and communication approaches and provides a matrix of ICT governance arrangements which are: Business Monarchy, IT Monarchy, Feudal, Federal, Duopoly and Anarchy (Weill Peter, 2004). (De Haes S. & Van Grembergen W., 2009) on the other hand emphasized on structures, processes and relational mechanisms as ICT governance arrangements. ICTG structures focus on roles and responsibilities, ICT organization structure, CIO on Board, ICT strategy committee, ICT steering committee(s), while ICTG processes refer to the ICT decision-making process and monitoring procedures. ICTG relational mechanisms focus on the active participation and collaboration of corporate executives, ICT management and business management to facilitate the coordination of ICTG structures and processes.

Both frameworks do not consider how ICTG emerges in organizations. Mohamed, Simon and Letch, then by going beyond and examining best practices of ICTG and understand how ICTG arrangements are emerging in organizations and the social and technical contexts in which ICTG arrangements arise (Mohamad H. & A. Simon & N. Letch, 2012). They adopted (De Haes S. & Van Grembergen W., 2009) definition of ICTG because the definition acknowledges the relationship between corporate governance and ICTG, and stresses the importance of having well-balanced ICTG arrangements in organizations.

ICTG processes, structures and relational mechanisms, need to be blended together in order to derive ICTG value to assist in achieving the business' ultimate goal (Mohamad H. & A. Simon & N. Letch, 2012). The relationship mechanisms introduce the social aspect which is well defined in Actor-Network Theory (ANT) by stating that human actors are not the only actors that compose the social sphere, since non-human actors are also part of it (Latour Bruno, 2005). Therefore, ANT's contribution to social theory is in the recognition that social actors and social relationships do not exist without non-human actors and if studied in isolation from each other, important dynamics can be missed (Whittle A. & Spicer A., 2008).

The next section tends to highlight and define different terminology in the ICT governance perspective. It will include ICT governance, ICT strategic alignment, ICT performance management and ICT resource management.

## **1.2. Definition of Terms**

### **1.2.1. ICT Governance**

ICT governance is not management; governance determines who has the authority to make changes while management carries out the changes.

ICT governance is not limited in scope, time or objective; governance is an ongoing activity that addresses business processes end to end and coordinates these processes across organizational boundaries.

ICT governance is not limited to senior management; ICT governance should be designed carefully to provide a clear and transparent ICT decision making process. Also decisions throughout the enterprise should be consistent with the direction in which senior management is taking the organization (ITGI., 2003)

ICT governance has been defined as:

“ICT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's ICT sustains and extends the organization's strategies and objectives (ITGI., 2003).”

“ICT governance is the organizational capacity exercised by the Board, executive management and ICT management to control the formulation and implementation of ICT strategy and in this way ensure the fusion of business and ICT” (Steven De Haes & Wim Van Grembergen, 2010).

“ICT governance is about specifying the decision rights and accountability framework to encourage desirable behavior in the use of ICT (Weill Peter & Ross Jeanne W, 2004).”

### **1.2.2. ICT Strategic Alignment**

Many reseahers have demonstreted that business and ICT performance are tightly coupled, and enterprises cannot be competitive if their business and ICT strategies are not aligned. (Lerina Aversano et al., 2012) stated that Strategic Alignment of ICT exists when goals, activities and processes of a business organization are in harmony with the ICT supporting them.

Strategic alignment can help organizations in three different ways as stipulated by (Mohammad Faryabi at al., 2012). The first is by maximizing the return on ICT investment; the second is by enabling organizations to achieve competitive advantage through ICT; and thirdly, it facilitates them to respond to new opportunities by providing direction and agility. However, achieving ICT strategic alignment with business requires commitment from both ICT and business executives. The alignment of ICT with an organization’s strategies requires the senior management to take a different approach towards ICT and devote certain amount of time, understanding the usage of ICT in the business. They must understand that ICT is an important strategic asset and business partner from strategy formulation to service delivery. There must be a mutual understanding and a shared vision among business and ICT executives, and to incorporate their understanding into consistent, integrated business and ICT missions, priorities, strategies, and processes (Mohammad Faryabi at al., 2012).

### **1.2.3. ICT Performance management**

ICT is considered as a strategic asset for an organization, thus it is crucial to receive value for each dollar organization invest on ICT. This requires a focus on performance management and the removal of non value-adding activities and processes. Performance management is closely related to performance measurement. They are sometimes mistaken for each other. In careful usage, performance management is the larger domain and includes performance measurement as

a component. (Haanappel S., 2011), in his thesis has define ICT performance as the area of setting goals, responsibility, accounting and monitoring, analyzing, governing and improving the performance of ICT. (Haanappel S., 2011) continue stating that ICT performance management is often an aspect of achieving organizational and strategic goals and also a critical aspect of organizational controls. Therefore appropriate measures are required in order to identify and create metrics for measuring the contribution of ICT to the organization's value chain (Haanappel S., 2011). (Gartner., 2006) on his part has defined ICT performance management as the “combination of management methodologies, metrics, and ICT (applications, tools and infrastructure) that enables users to define, monitor, and optimize results and outcomes to personal or departmental objectives while enabling alignment with strategic objectives across multiple organizational levels (personal, process, group, departmental, corporate or business ecosystem). The advantages of implementing performance management are:

- A clear view of the realisation of strategic financial and non-financial objectives;
- An explicit definition of key performance indicators for success (enabling monitoring);
- The application of forecasts and action-oriented reporting;
- Consistent management information at strategic, tactical and operational levels
- The results serve as a guideline for communication within the organization;
- The promotion of a results-oriented culture;
- Opportunities to benchmark the organization.

#### **1.2.4. ICT Resource Management**

ICT resource management is the efficient and effective deployment and allocation of an organization's resources when and where they are needed. Such resources may include mainly financial resources dedicated to ICT, ICT infrastructure and human skills in information technology. ICT Resource management includes planning, allocating and scheduling of resources to tasks, which typically include manpower, machines, money and materials. Resource management has an impact on schedules and budgets as well as resource leveling and smoothing.



### **1.3. Statement of the problem**

ICT governance has been introduced in many organizations including public universities, but there is still not much known about how ICT governance is practiced at the University of Rwanda. There has been a lot of research in the field of ICT governance, but the research was mainly theoretical stating how ICT governance should be organized. There was little empirical research that described how organizations were actually organizing ICT governance (Sambamurthy & Zmud, 1999; De Haes S. & Van Grembergen W., 2009). However, it is needed that besides theoretical research, also, empirical research has to be conducted to investigate ICT governance comprehensively (Peterson R.R et al, 2000; Peterson, 2001). This way ICT governance can be understood more thoroughly and useful recommendations can be provided to organizations.

Moreover, maximizing value from ICT investments has always been an imperative for business. From (Cognizant, 2013) experience, more than 50% of ICT investments are wasted or fail to deliver returns to the business. With the increase in complexity, the cost of ICT failure has become all the more significant. For ICT investments to deliver business value in today's complex landscape, ICT must be more tightly aligned with business objectives than ever before, carefully control risks both strategic and operational, more effectively manage ICT resources, and continuously improve ICT performance. Therefore, effective ICT governance must be a top item in the organization's agenda in order to maximize ICT's contribution to business value. The key benefits of implementing an ICT governance model include strategic alignment, resulting in increased business partner satisfaction in the order of 15% to 20%, enhanced value delivery, driven by improved project prioritization, leading to reduction of ICT budget by 8% to 10%, improved performance and resource management, lowering the total cost of ICT ownership by 10% to 15%, and better quality of ICT output, resulting in a reduction in ICT control issues by 50% (Cognizant, 2013).

The university obtains a return value on its ICT investment not only in the form of cost savings but also by improving its global internal organization, user satisfaction, corporate image and outreach. In line with the above-mentioned constraints and despite the efforts made to advance ICT applications at the University, ICT contribution to UR service delivery improvement could be coupled with ICT governance-related concerns including:

- Scattered and fragmented ICT initiatives and applications with the loss of synergies and economies of scale in and across the University.
- A lack of empirical data on which and to what extent ICT governance practices is applied.
- A lack of identified critical areas to which more focus can be directed for success given the ICT resources and related knowledge and culture constraints.
- A lack of top and middle management support and active involvement of both ICT and business personnel in planning, implementing and monitoring ICT-enabled business applications.
- A lack of clear coordination controls and active ICT performance measures in and across the University for its major activities, computerization and support.
- The ineffective use of the available ICT professionals and difficulty in holding individuals accountable for their results, thus affecting the optimal use of ICT.
- Difficulties in managing cost-effectively constantly rising ICT investment including ICT applications and enabling infrastructure.
- The lack of a clear guide for ICT integration into University strategies and reform program.

Moreover, these governance concerns are amplified by the low attention paid to best practices for using and managing ICT resources cost-effectively. These negative consequences are significant and relate to each other.

## **1.4. Purpose of the Study**

### **1.4.1. General objective**

This section indicates the purpose of this research project. The purpose of this research project was to examine the relationship between ICT strategic alignment, ICT performance management, ICT resource management and ICT governance at the University of Rwanda.

### **1.4.2. Specific objectives of the Study**

This section highlights the specific objectives derived from the general objective as indicated in the previous section. This was achieved through the following specific objectives to guide the whole research process:

1. To examine the relationship between ICT strategic alignment and ICT governance at the University of Rwanda.
2. To examine the relationship between ICT performance management and ICT governance at the University of Rwanda.
3. To examine the relationship between ICT resource management and ICT governance at the University of Rwanda.
4. To examine the relationship between ICT Strategic alignment together with ICT performance management and ICT resource management and ICT Governance at the University of Rwanda.

### **1.5. Justification**

This study provides important insight into several areas of interest to different stakeholders. First, it adds knowledge to the aspect of the ICT Governance in general, factors that drive ICT governance and the conceptual framework that follows in particular. Second, it built detailed knowledge about ICT Governance at the University of Rwanda. Third, it may improve decision making process based on the findings in general and the suggested framework in particular.

### **1.6. Scope**

It is within a set of boundary that this research project was conducted. The University of Rwanda was chosen as the only public university in the country in which the study took place. The purpose of this research project was to examine the relationship between ICT strategic alignment, ICT performance management, ICT resource management and ICT governance at the University of Rwanda.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1. Introduction

This chapter explores ICT governance's literature review of grounded theories that has been conducted with a particular focus on Actor Network Theory. The first part of the section provides the Theoretical Perspective to ICT Governance. The second part discusses ICT Governance Frameworks and Practice. The third part of the chapter focuses on the conceptual framework and hypothesis formulation.

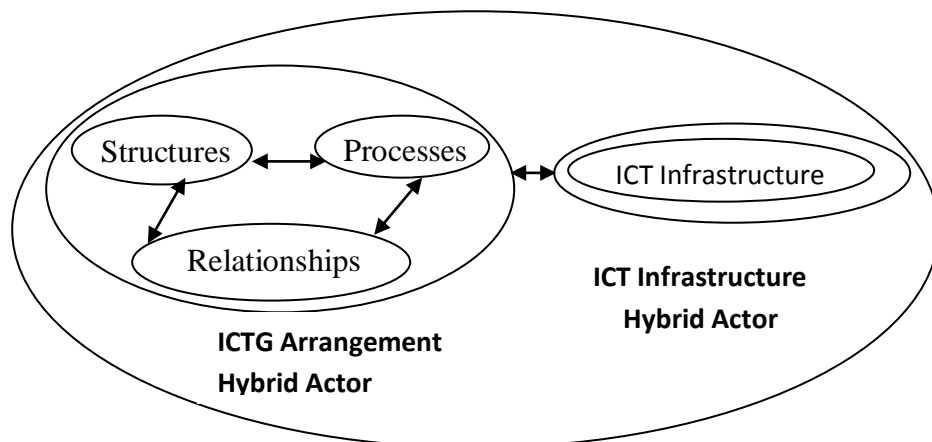
## 2.2. Theoretical Perspective to ICT Governance

### 2.2.1. Actor Network Theory

Actor network theory (ANT) emerged during the mid 1980s, primarily with the work of Bruno Latour, Michel Callon, and John Law. ANT is a conceptual frame for exploring collective socio-technical processes, where a particular attention focuses to science and technologic activity (A-Ritzer, 2004). ANT is a theoretical framework used in social studies of technology to explain the way technological artifacts are constructed in society (Latour Bruno, 2005). Heterogeneous networks are composed of multiple types of materials: people, devices, artifacts, texts, and institutions are just some of the things that can be a part of an actor-network. Interactions and processes between these materials generate "knowledge". Law places knowledge in double quotes because it can take a variety of forms, both abstract and tangible. Papers, presentations, data tables, patents, and developed skills are just some of the "knowledge" that can emerge (John Law, 1992). Social is composed of patterned heterogeneous networks and greater than just the people involved. The rationale behind the notion is that interactions between people are always mediated by language, by devices, by objects. They define the relationships and the context for activities by participating in social relations (Latour., 2005). As a result, objects can determine how people behave and the actions they perform. Many things are treated as single objects, without considering the networks that they embody. Then if a network appears to operate as a whole, it is treated as a single entity. We don't usually pay attention to all components until the network breaks down. Everything is a network, but people don't need to be constantly aware of this fact. Thus, punctualization (abstraction) takes place. Law has confirmed that the punctualization is considered to be precarious, because resources can't be guaranteed to work as

predicted (machines break down, programs crash, people forget or disobey instructions). Networks can degenerate as a result of resources failing or resisting (John Law, 1992).

Therefore based on ANT as a theoretical lens, (Mohamad H. & A. Simon & N. Letch, 2012) has developed the model to analyze how ICTG emerges and in what circumstances stable ICTG arrangements can be produced. This model links the interdependency between ICTG arrangements that are structures, processes and relational mechanisms with ICT infrastructure. Thus, the interaction between ICTG arrangements and ICT infrastructure serves as a foundation upon which to achieve business coherence and support the alignment of ICT strategy and business strategy (Mohamad H. H.& Letch N.& Simon A., 2013). In this case, ICTG arrangements and ICT infrastructure are actor-networks, but they can also be treated as an actor. They are both heterogeneous in the sense that they consist of interdependent elements of humans, organizational processes and technology. The interaction between ITG arrangements and ICT infrastructure can be explored through the lens of ANT because their development are not only limited to the critical role of technology, but it also involves human and its social aspect. Therefore, ITG arrangements and IT infrastructure are considered as a socio-technological phenomenon that highlights the enabling and restricting role of ICT in a socio-technical process (Mohamad H. & A. Simon & N. Letch, 2012).



**Figure 1 : ICTG Proposed Model**

**Source:** (Mohamad H. & A. Simon & N. Letch, 2012)

### **2.2.2. ICT Governance Background and Definition**

Information and communication technology (ICT) has long been recognized as one of the most critical factors for an organization to increase its efficiency, competitiveness and innovation (Majed Alyahya, 2013). However, Majed Alyahya continues arguing that merely investing in the state of the art, ICT cannot ensure the realization of these benefits to an organization (Majed Alyahya, 2013). As a consequence, the board of directors and top management need to understand the strategic importance of ICT and ought to put ICT governance firmly on their agenda. The overall objective of ICT governance, therefore, is to understand the issues and the strategic importance of ICT to enable the organization to sustain its operations and implement the strategies required to extend its activities into the future (Luc Kordel, 2004).

J.C. Henderson and N. Venkatraman are the pioneers in the field of ICT management research as they have introduced both the concepts business and ICT alignment and ICT governance in the early 1990's. In one of their research papers they came up with the term strategic alignment to align business strategy with ICT strategy on one hand and align strategies with internal organization and processes on the other (Henderson & Venkatraman, 1993). They argue that the inability to realize value from ICT investment is, in part due to the lack of alignment between ICT and Business strategies (Handerson & Venkatraman, 1999). (Luftman J., 2000) Considered in his research that ICT governance is one of the twelve components of the strategic alignment model and continued arguing that the ICT governance is how the authority for resources, risk, conflict resolution, and responsibility for ICT is shared among business partners, ICT management, and service providers. Project selection and prioritization issues are included there. Being on the agenda in many organizations and considering that, high-level ICT governance models are being created. (Steven De Haes & Wim Van Grembergen, 2010) considered that ICT governance consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives. However, having developed a high-level ICT governance model does not imply that governance is actually working in the organization. Conceiving the ICT governance model is the first step, implementing it as a sustainable solution is the next challenging step (Steven De Haes & Wim Van Grembergen, 2010).

Different researchers have differently defined ICT governance. As said before (Henderson & Venkatraman, 1993) in their paper, the first one to introduce the concept of ICT governance they

have defined ICT Governance as “policies, procedures and systems for the allocation of design-rights to the key decision makers both within the organization as well as external vendors and/or partners responsible for ICT management” (Handerson & Venkatraman, 1999).

(Weill Peter & Ross Jeanne W, 2004) on their side, they defined ICT governance as a “framework for decision rights and accountability to promote desirable behavior in the management and use of ICT”.

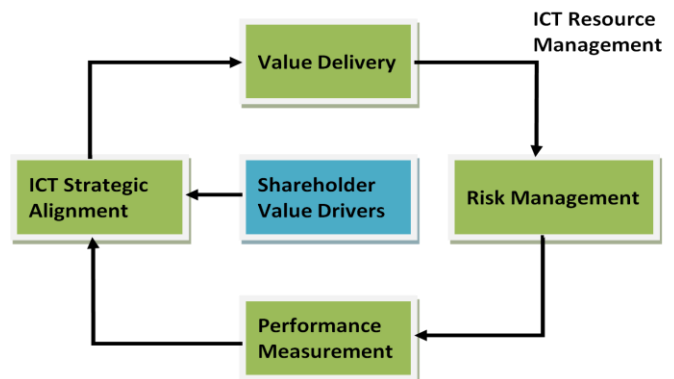
While (Peterson R. R, 2004) has defined ICT governance as a system by which an organization’s ICT portfolio is directed and controlled. ICT Governance describes (a) the distribution of ICT decision-making rights and responsibilities among different stakeholders in the organization, and (b) the rules and procedures for making and monitoring decisions on strategic ICT concerns.

The ICT governance Institute, on his part, defined ICT Governance as the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization’s IT sustains and extends the organization’s strategy and objectives (ITGI, 2001).

Last not least Van GREMBERGEN defined ICT governance as the organizational capacity exercised by the Board, executive management and ICT management to control the formulation and implementation of ICT strategy and in this way ensure the fusion of business and ICT (VAN GREMBERGEN W, 2002).

The above definitions lead to the five main focus areas for ICT governance, all driven by stakeholder value. Two of them are outcomes: value delivery and risk management. Three of them are drivers: strategic alignment, resource management and performance measurement.

- **ICT Strategic Alignment:** Investment vs. strategic objectives vs. business value
- **Value delivery:** Concentrating on optimizing expenses and proving the value of IT
- **Risk management:** Addressing the safeguarding of IT assets, disaster recovery and continuity of operations
- **Resource management:** Use and allocation of ICT resources.



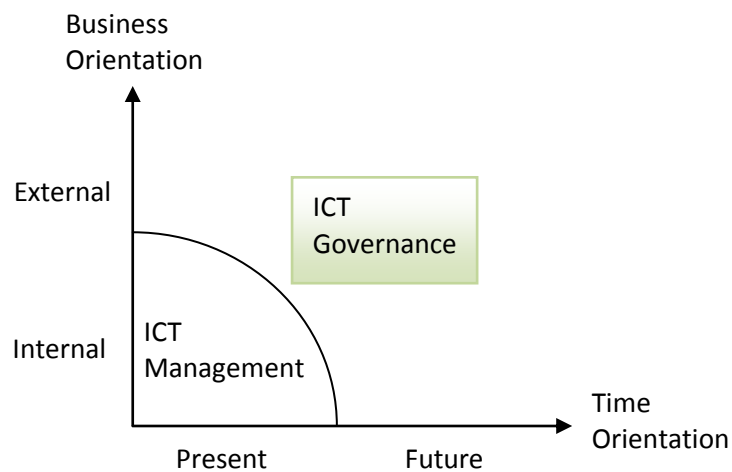
**Figure 2: ICT Governance focus areas**

- **Performance measurement:** Tracking project delivery and monitoring ICT services

### 2.2.3. ICT Governance vs. ICT Management

As per the above definitions ICT governance guides ICT direction and differs from ICT management. This section discusses the difference between ICT governance and ICT management. As organizations grow, managers must separate these two concepts because problems may become more complex and require more input from different people within the organization.

ICT Management is focused on the internal effective supply of ICT services and products and the management of present ICT operations; while ICT governance in turn is much broader, and concentrates on performing and transforming ICT, to meet present and future demands of the business (internal focus) and the business customers (external focus) (PETERSON, 2003)



**Figure 3: ICT Governance vs. ICT Management**

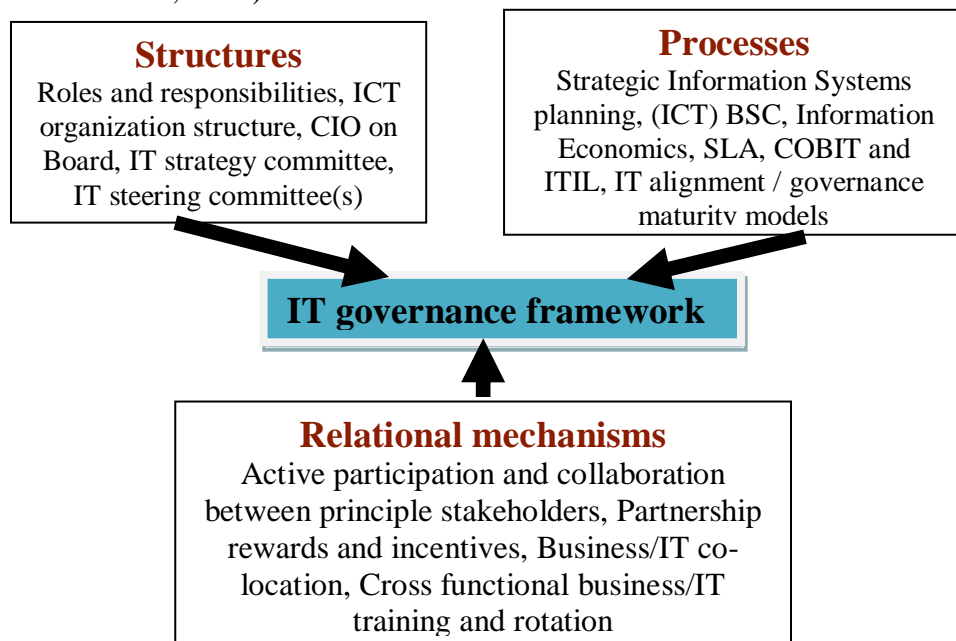
PETERSON, 2003, *Information Strategies and Tactics for Information Technology Governance*, in *Strategies for Information Technology Governance*, book edited by Van Grembergen W., Idea Group Publishing

### 2.3. ICT Governance Frameworks and Practice

This section elaborates and discusses the most well know and recognized frameworks of IT governance as well as provide a comparison between them. In this research project a particular attention is on same ICT governance frameworks; including the Balanced Scorecard (BSC), Information Technology Infrastructure Library (ITIL), Weill & Ross framework, and Control Objectives for Information and related Technology (COBIT).



The question is how then can organization pragmatically implement ICT governance? (Steven De H. & Wim Van Grembergen, 2004) stated that ICT governance can be deployed using a mixture of various structures, processes and relational mechanisms. ICT governance structures include formal structural devices and mechanisms for connecting and enabling horizontal, or liaison, contacts between business and ICT management decision-making functions (e.g. steering committees). ICT governance processes refer to formalization and institutionalization of strategic ICT decision making or ICT monitoring procedures (e.g. ICT balanced scorecard). The relational mechanisms finally are about the active participation of, and collaborative relationship among corporate executives, ICT management, and business management (e.g. training). Relational mechanisms are crucial in the ICT governance framework and paramount for attaining and sustaining business-ICT alignment, even when the appropriate structures and processes are in place (Peterson R. R, 2004).



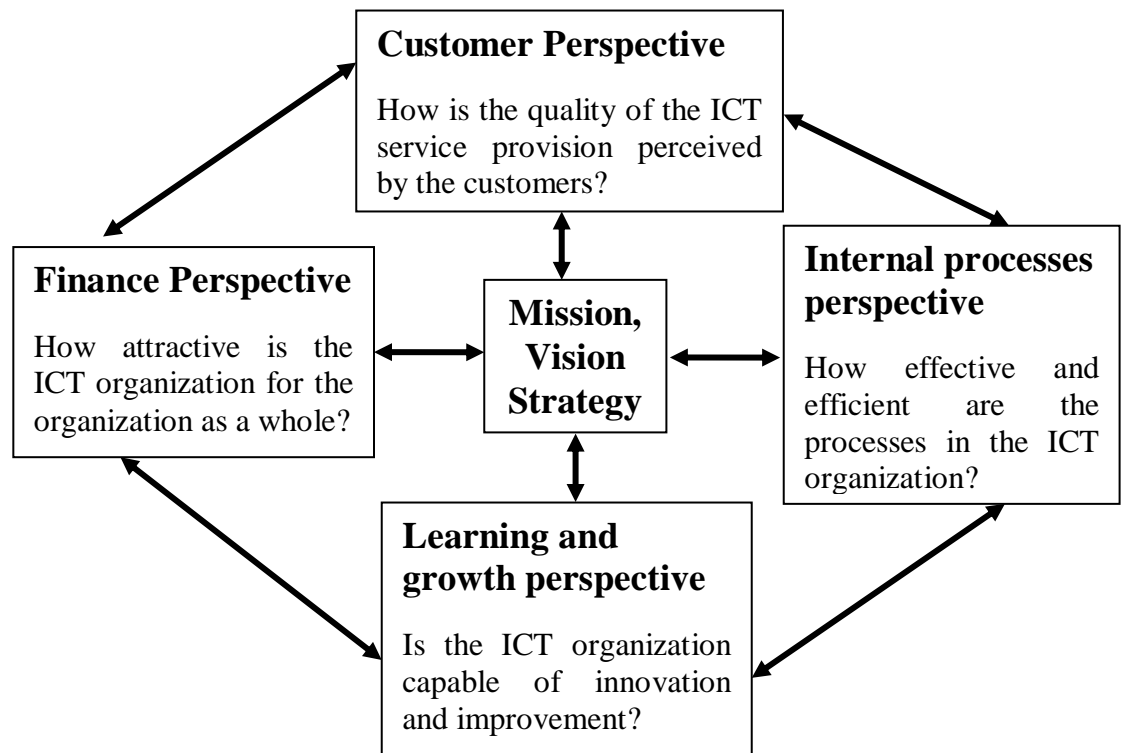
**Figure 4: ICT Governance Arrangement**

### 2.3.1. Balanced Scorecard (BSC)

Balanced Scorecard is a performance measurement framework from Dr. Robert Kaplan and Dr. David Norton from Harvard Business School. Their fundamental premise is that the evaluation of an organization should not be restricted to a traditional financial evaluation but should be supplemented with measures concerning customer satisfaction, internal processes and the ability to innovate (KAPLAN R.& NORTON D, 1992). By combining these perspectives the balanced

scorecard helps managers understand the interrelationships and tradeoffs between alternative performance dimensions and leads to improved decision making and problem solving (Shelly Ping-Ju Wu & Detmar W. S.& Ting-Peng L., 2015).

Various models can be used to set up performance management and the Balanced Scorecard model by Kaplan and Norton is used more and more in practice. This model was developed in order to provide a performance management system which aims to create an ideal balance between objectives in the short and long term, between financial and non-financial monitoring and between internal and external performance perspectives. The model recognizes that financial performance is important but the emphasis is placed on the fact that the basis for good financial performance consists of satisfied customers, a high level of innovation and internal business processes that run smoothly. Practice has made it clear that the Balanced Scorecard is also particularly suited for measuring the performance of ICT organizations. The Balanced Scorecard translates the vision and strategy of the enterprise into concrete objectives, organized along the lines of the four different perspectives: the financial perspective, the customer perspective, the internal processes perspective and the learning and growth perspective. Together, these perspectives constitute the framework for the Balanced Scorecard (KAPLAN R.& NORTON D, 1992).



**Figure 5: BSC four different perspectives**

### **a) Financial perspective**

The financial perspective comprises the more traditional indicators for establishing the organization's financial position. The factors measured here are those that generate proceeds for the shareholders. The financial perspective is the perspective that ultimately reveals the economic effects of the other three perspectives. Its monitoring shows whether an organization's strategy and the implementation of that strategy contribute to the improvement of the 'bottom line' or 'top line'. The financial perspective contains the financial ICT Indicators including the return on investment (ROI), the economic value added (EVA), growth in net result, the added value per employee and various cost ratios.

### **b) Customer perspective**

The customer perspective of the Balanced Scorecard centers around a single question: how does the customer perceive the quality of the ICT service? The customer has steadily become more significant in recent years. In the past, organizations were able to compete on the basis of the quality of their products and services as well as technological innovation. Today, organizations are focusing primarily on customers and their specific needs. It is extremely important in this context to carefully select one's market segments and customer groups. The customer perspective is concerned with the customer and market segments. Examples of measures that relate to this perspective include customer retention, new customer acquisition, customer profitability, and market share (Kaplan R.S. & Norton D.P., 1996).

### **c) Internal perspective**

The internal perspective of the Balanced Scorecard considers factors that indicate: 'How effective and efficient are the processes of the organization?' The internal business processes perspective includes internal processes that enable the organization to deliver value propositions and satisfy shareholder expectations. Examples of measures include time to develop the next generation of products and process capabilities.

#### **d) Growth and learning perspective**

The central question in the growth and learning perspective of the Balanced Scorecard is: Is the ICT organization capable of innovation and improvement? Today, many organizations operate in a highly dynamic environment. The fourth perspective of the Balanced Scorecard contains objectives and monitoring criteria with which to improve the organization's growth and learning process. These objectives usually concern the staff, the information systems and the internal procedures. The learning and growth perspective defines also the infrastructure of the organization's marketplace sustainability; the infrastructure refers to people, systems, and organizational procedures specifically. Employee satisfaction, retention, training, and skills are examples of measures in this perspective (Kaplan R.S. & Norton D.P., 1996).

#### **2.3.2. IT Infrastructure Library (ITIL)**

ITIL is a set of concepts and policies for managing information technology infrastructure, development and operations. It is a world-known, almost de facto standard for IT Service Management. ITIL consists of a series of books giving guidance on the provision of quality IT services, and on accommodation and environmental facilities needed to support IT. The ITIL library consists of 5 key volumes of Service Management: Service strategy, Service design, Service transition, Service operation and continual Service improvement. Within these a variable number of very specific disciplines are described:

- **Service strategy** encompasses a framework to build best practice in developing a long time service strategy. It covers many topics including: general strategy, competition and market space, service provider types, service management, organization design and development, financial management, demand management and key roles and responsibilities of staff engaging in service strategy.
- **Service design** includes design of architecture, processes, policies, documentation, and allowing for future business requirements.
- **Service transition** relates to the delivery of services required by the business into live operational use, and often encompasses the "project" side of IT. This area covers topics such as managing changes the business environment.

- **Service operation** is the part of the business cycle where the services and value are actually delivered. Also the monitoring of problems and balance between service reliability and cost are considered. Topics include balancing conflicting goals, event management, incident management, problem management, request fulfillment, asset management, service desk, technical and application management, as well as key roles and responsibilities for staff engaging in service operation.
- **Continual service improvement** is about aligning IT services to changing business needs by identifying and implementing improvements to the IT services that support the business processes.

## IT Infrastructure Library Framework

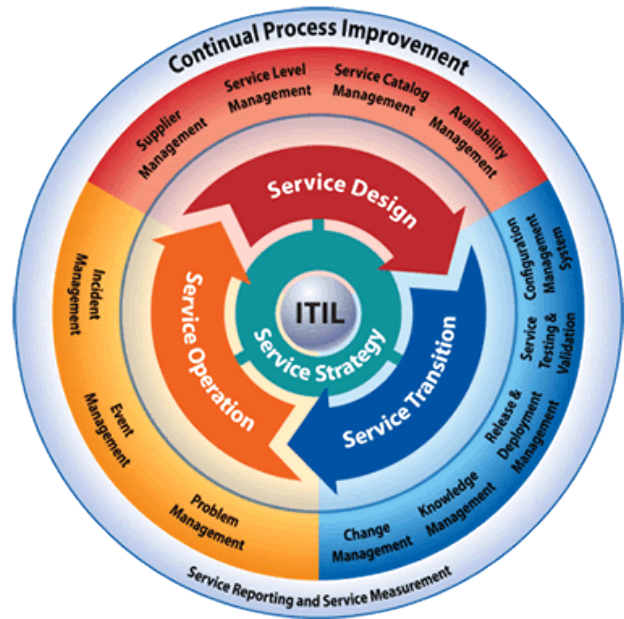


Figure 6: ITIL Framework

### 2.3.3. Weill & Ross framework

Weill and Ross define IT governance as the decision rights and accountability framework to encourage desirable behavior in the use of ICT. They identify three components of governance:

- **IT Decisions Domains:** The five key decision domains Weil & Ross identified to define the scope of IT are: IT principles, IT infrastructure strategies, IT architecture Business application needs IT investment.
- **IT Governance Archetypes:** Who governs the decision domains and how is it organized? Who decides or has input, and how? Weill and Ross suggest six archetypes which are: Leadership Monarchy, IT Monarchy, Feudal, Federal, IT Duopoly and Anarchy.
- **Implementation Mechanisms:** How are the decision and input structures formed and put in place?

## Weill and Ross's framework

	IT principles		IT infrastructure		IT architecture		Business application		IT investment	
	Input	Decision	Input	Decision	Input	Decision	Input	Decision	Input	Decision
Leadership Monarchy										
IT Monarchy										
Feudal										
Federal										
Duopoly										
Anarchy										

**Figure 7: Weill and Ross's Framework**

### 2.3.4. Control Objectives for Information and Related Technology (COBIT)

Control Objectives for Information and Related Technology (COBIT) is a set of best practices for Information technology management developed by ISACA and IT Governance Institute in 1996 which evolved into the current version COBIT5 released in 2012. COBIT5 framework is build based on five principles and seven COBIT5 enablers:

#### The five COBIT 5 principles:

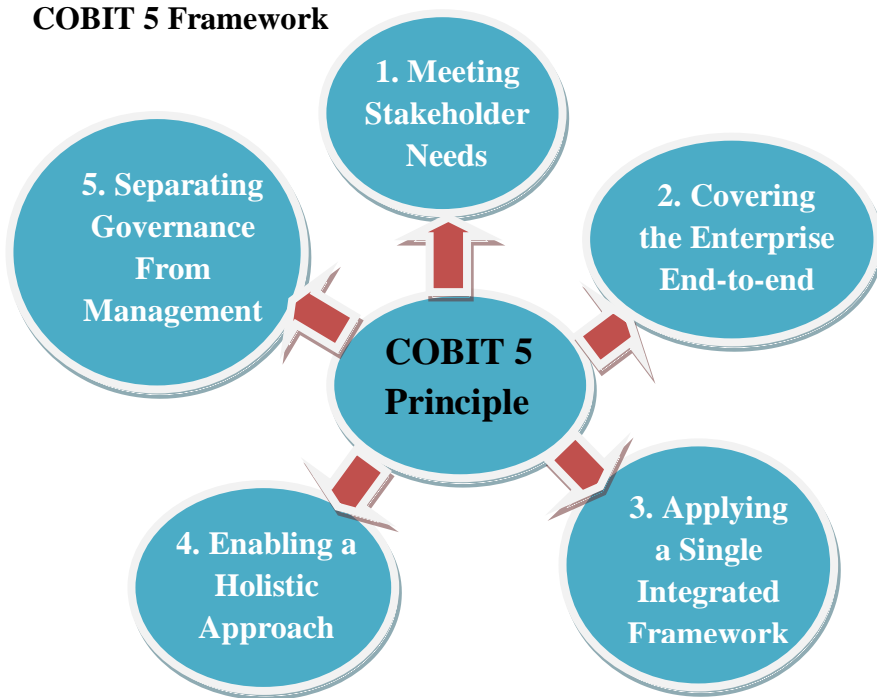
1. Meeting Stakeholder Needs
2. Covering the Enterprise End-to-end
3. Applying a Single Integrated Framework
4. Enabling a Holistic Approach
5. Separating Governance from Management

#### The Seven COBIT5 enablers

1. **Processes:** Describe an organized set of practices and activities to achieve certain objectives and produce a set of outputs in support of achieving overall IT-related goals.
2. **Organizational structures:** Are the key decision-making entities in an organization
3. **Culture, ethics and behavior:** Of individuals and of the organization; very often underestimated as a success factor in governance and management activities
4. **Principles, policies and frameworks:** Are the vehicles to translate the desired behavior into practical guidance for day-to-day management

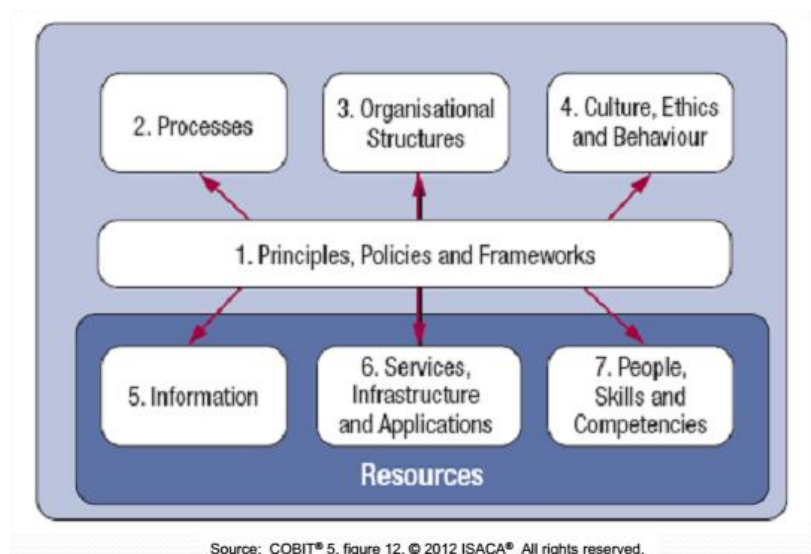
- 5. Information:** Is pervasive throughout any organization, i.e., deals with all information produced and used by the enterprise. Information is required for keeping the organization running and well governed, but at the operational level, information is very often the key product of the enterprise itself.
- 6. Services, infrastructure and applications:** Include the infrastructure, technology and applications that provide the enterprise with information technology processing and services
- 7. People, skills and competencies:** Are linked to people and are required for successful completion of all activities and for making correct decisions and taking corrective actions.

**COBIT 5 Framework**



Source: COBIT5, © 2012 ISACA All rights reserved

**Figure 8 : COBIT 5 Framework**



Source: COBIT® 5, figure 12. © 2012 ISACA® All rights reserved.

### **2.3.5. ICT Governance Maturity**

For effective ICT governance to be implemented, organizations need to assess how well they are currently performing and be able to identify where and how improvements can be made. This applies to both the ICT governance process itself and all the processes that need to be managed within ICT. The IT Governance Institute (ITGI., 2003) developed a detailed ICT Governance maturity model, which identifies 6 (from 0 to 5) levels of maturity, from ‘nonexistent’ to ‘optimized’ level.

#### **0. Nonexistent**

There is no senior management oversight of IT-related activities to ensure that the enterprise’s IT goals add value to the organization and to ensure that IT-related risks are appropriately managed.

#### **1. Initial/Ad Hoc**

The concept of IT governance does not exist formally and oversight is based mostly on management’s consideration of IT-related issues on a case-by-case basis. The governance of IT depends on the initiative and experience of the IT management team, with limited input from the rest of the organization.

Upper management is involved only when there are major problems or successes. The measurement of IT performance is typically limited to technical measures and only within the IT function.

#### **2. Repeatable but Intuitive**

There is a realization that more formalized oversight of IT is required and it needs to be a shared management responsibility requiring the support of top management. Regular governance practices such as review meetings, creation of performance reports, and investigation into problems take place, but rely mostly on the initiative of the IT management team, with voluntary or co-opted participation by key business stakeholders, depending on current IT projects and priorities. Problems identified are tackled on a project basis with teams formed as necessary to undertake improvements.



### **3. Defined Process**

An organizational and process framework has been defined for oversight and management of IT activities and is being introduced to the organization as the basis for IT governance. The board has issued guidance, which has been developed into specific procedures for management covering key governance activities. These include regular target-setting, reviews of performance, assessments of capability against planned needs, and project planning and funding for any necessary IT improvements. Previous informal but successful practices have been institutionalized and the techniques followed are relatively simple and unsophisticated.

### **4. Managed and Measurable**

Target-setting has developed to a fairly sophisticated stage with relationships between outcome goals in business terms, and IT process improvement measures now well understood. Real results have been communicated to management in the form of a balanced scorecard. The enterprise's management team is now working together for the common goal of maximizing IT value delivery and managing IT-related risks. There have been regular assessments of IT capabilities and projects have been completed that have delivered real improvements to IT's performance. Relationships among the IT function, its users in the business community and external service providers are now based on service definitions and service agreements.

### **5. Optimized**

The IT governance practices have developed into a sophisticated approach using effective and efficient techniques. There is true transparency of IT activities, and the board feels in control of the IT strategy. IT activities have been optimally directed toward real business priorities, and the value being delivered to the enterprise can be measured and steps taken on a timely basis to correct significant deviations or problems. The balanced scorecard approach has evolved into one that is focused on the most important measures relevant to the enterprise's overall business strategy. The effort spent on risk management (and on IT management activities generally) has been streamlined through adoption of standardized and, where possible, automated processes. The practice of continuous improvement of IT capability is embedded in the culture and this includes regular external benchmarking and independent audits providing positive assurance to

management. Overall, the cost of IT is monitored effectively and the organization is able to achieve optimal IT spending through continuous internal improvements, the effective outsourcing of selected services and effective negotiation with vendors. When dealing with external business partners or service providers, the organization is able to demonstrate first-class performance and demand best practices from others.

## **2.4. ICT Governance Conceptual approach**

Based on the review of literature, we identified and considered three categories of factors that serve as determinants of ICT Governance: ICT Strategic Alignment, ICT Performance Management, and ICT Resource Management.

### **2.4.1. ICT Strategic alignment**

ICT strategic alignment focuses on ensuring the linkage of business and ICT plans; defining, maintaining and validating the ICT value proposition; and aligning ICT operations with enterprise operations, getting top and middle management support and ownership and ensures organization change strategy is established.

#### **2.4.1.1. Clear ICT strategy, principles and policies**

IS strategic planning relates to the long term direction an organization would like to take in leveraging technology for improving its business processes. The purpose of ICT strategy is that enterprises can enhance their level of information system, based on the modern information technology, and provide better services for the management strategy (Van Grembergen W.& S. De Haes & E. Guldentops., 2003). Lack of involvement of the ICT executive in the creation of the business strategy indicates that there is a risk that the ICT strategy and plans will not be aligned with the business strategy.

#### **2.4.1.2. Effective alignment and communication between ICT strategy and business strategy**

The alignment between business and ICT is one of important aspect of ICT governance. ICT-business alignment enables organizations to adhere to business objectives, and to maximize the value from ICT investment (De Haes S. & Van Grembergen W., 2009). The assumption is that

all organizations have a corporate or business strategy, and if they do not or at least if such a strategy is not written down, there is little with which to strategically align information technology. Furthermore, ICT cannot be viewed as different from business. A strategy for ICT can be formulated to fit the corporate strategy without regard to any other issues (Steve Clarke., 2001). This implies that there should be a better communications between ICT strategy and business strategy to avoid poor understanding of the value or contribution the other provides.

#### **2.4.1.3. Getting Adequate top and middle management support and ownership**

Top management must support and articulate the need for ICT governance and communicate its functionality within the context of the organization's strategy, structure and systems. Top management commitment for ICT related initiatives enhances ICT success by making ICT resources available, supporting and guiding the ICT functions. This requires top executives to act as business visionaries. According to IT Governance Institute (ITGI) the standard assists top management to understand and fulfill their legal, regulatory, and ethical obligations in respect of their organizations' use of ICT. The lack of such support may see ICT resources having little effect on performance, even when substantial investments are made to acquire or develop the ICT resources (Samuel D. L. & Aris B. S., 2013).

#### **2.4.1.4. Adequate stakeholders' involvement**

The success of ICTG implementations requires the engagement of stakeholders with clear roles, goals and a shared understanding of the common agenda. ISACA has defined a stakeholder as anyone, who has a responsibility for, an expectation from, or some other interest in the organization. COBIT 5 on the other hand has not only defined the Stakeholder but incorporates stakeholders as a vital and integral component throughout. (Weill Peter & Ross Jeanne W, 2004) revealed that the more the organization involves key stakeholders, the more successful the governance of ICT becomes. COBIT 5 continues stating that Enterprises exist to create value for their stakeholders by maintaining a balance between the realization of benefits, and the optimization of risk and use of resources. As the primary role for organization is to create value for Stakeholders, then it is reasonable to see stakeholders actively involved in the governance of information technology as a strategic asset.

## **2.4.2. ICT Performance management**

ICT performance measurement tracks and monitors strategy implementation, project completion, resource usage, process performance and service delivery, using, for example, balanced scorecards that translate strategy into action to achieve goals measurable beyond conventional accounting.

### **2.4.2.1. Good project management methodology**

A project is conducted within a management environment that is created for the purpose of delivering one or more products, services or results according to a specified business case. Prince2 defines a project as: 'A temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case'. The objective of the Project Management Methodology is that all projects are managed in accordance with a consistent and appropriate methodology throughout the duration of the project, ensuring sponsors expectations are met through a successful delivery against time, cost and quality parameters. The Project Management Methodology promulgates appropriate management and controls through the four phases of a project (1) Initiation & Approval (2) Governance & Planning (3) Execution & Control (4) Closure & Review

### **2.4.2.2. Effective performance management strategy**

Performance management is a discipline that aligns performance with strategy using performance metrics. A strategy, which is part of business strategy development and execution, directed towards individual and team performance, focused on employee development, integrated with a formal performance appraisal component, directed by line managers, and assimilated with HR and reward management systems (Sherry Lee Price, 2006). Performance management is a four-step cycle that involves: creating strategy and plans, monitoring the execution of those plans, and adjusting activity and objectives to achieve strategic goals. This four-step cycle revolves around integrated data and metrics, which provide a measurement framework to measure the effectiveness of strategic and management processes (Wayne W. Eckerson, 2009).

### **2.4.3. ICT Resource management**

Resource management is about the optimal investment in, and the proper management of, critical ICT resources which are applications, information, infrastructure and people. They are key issues related to the optimization of knowledge and infrastructure (ITGI., 2003).

#### **2.4.3.1. Sufficient financial support**

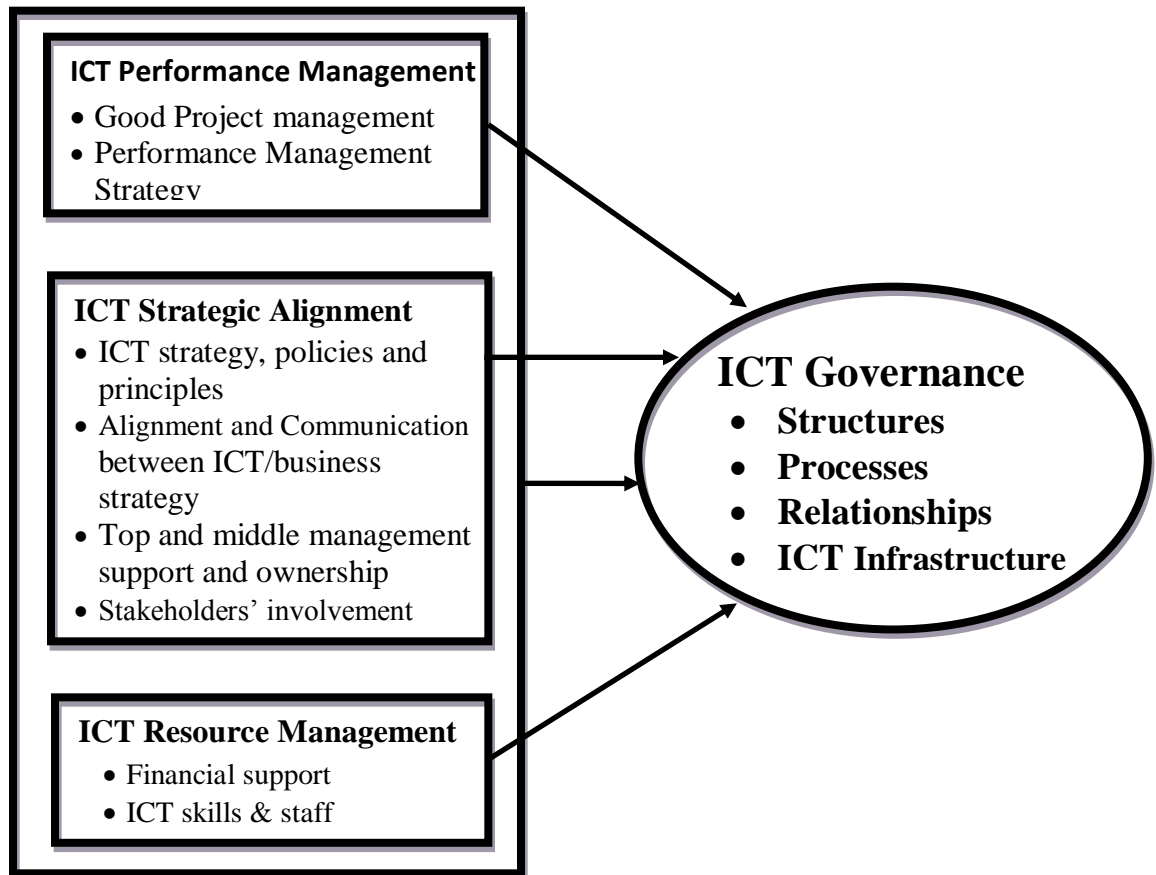
ICT strategic planning is required to manage and direct all ICT resources in line with the business strategy and priorities. Many organizations have not been able to derive maximum benefit from their substantial spending on ICT. Therefore ICT is seen as cost center. A framework should be established and maintained to manage ICT-enabled investment programs and that encompasses cost, benefits, prioritization within budget, a formal budgeting process and management against the budget.

#### **2.4.3.2. Adequate ICT skills & staff**

Inefficient ICT resources, ICT staff with inadequate skills or staff burnout or dissatisfaction, these are ICT human resource issues that require effective oversight and good governance to ensure that people management and skills development is addressed effectively. As people are important assets, governance and the internal control environment are heavily dependent on the motivation and competence of personnel.

From factors we identified earlier and the ICTG proposed model above, below is a proposed conceptual framework that integrates the factors that drive effective ICT governance in an organization. The results of a literature review suggest 4 hypotheses which are derived from the three categories of factors that drive effective ICT governance and the combined effect of all of them.

## 2.5. Conceptual Framework



**Figure 9: Conceptual Framework**

## 2.6. Hypotheses Formulation

To achieve the objective of the study, the following are the hypotheses to be tested based on collected data:

**H1:** ICT Strategic Alignment has a significant positive influence on ICT Governance.

**H2:** ICT Performance Management has a significant positive influence on ICT Governance.

**H3:** ICT Resource Management has a significant positive influence on ICT Governance.

**H4:** ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management they have a significant positive influence on ICT Governance.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.0. Introduction**

The purpose of this chapter is to provide the scientific basis for the study which has been conducted. This chapter also explains the reasons for using the various methods or techniques, giving advantages and the disadvantages of these methods or techniques. This chapter is organized into the following sub-headings: research design, target populations, sampling frame, Sampling and Sampling technique, Research Instrument and Tool, data collection procedures and sources and data analysis techniques.

### **3.1. Research Design**

Research design is governed by the notion of ‘fitness for purpose’. The purposes of the research determine the methodology and design of the research (Louis Cohen et al, 2005).

A quantitative approach is one in which the investigator primarily uses positivist claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data (Creswell, 2003). Moreover in quantitative studies, researchers advance the relationship among variables and pose this in terms of questions or hypotheses (Creswell, 2003).

Given the need to test and analyze statistically the correlated effect of the three factors on ICT governance, a quantitative approach was applied. This is because that; the main objective was to examine hypotheses, (independent vs. dependent variables) with emphases on testing and analyzing them quantitatively. In this study, the independent variables are the three factors for ICT governance (ICT Strategic Alignment, ICT Performance measurement and ICT Resource measurement) and the dependent variable is ICT governance effectiveness.

### **3.2. Research Population**

The term population refers to the entire group of individual, object, items, cases, articles or things with common attributes or characteristics (Abel Gitau Mugenda, 2011). Our study

population consisted of public university, in this study, the University of Rwanda as the only one public university in Rwanda. The unit of analysis was the college representatives as well as representatives from central administration consisting of Top and Senior authorities, Middle managers as well as Academic and ICT staff. As the only one public university in Rwanda, the university is composed by six independent, self governing academic entities called Colleges; including College of Education, College of Science and Technology, College of Business and Economics, College Arts and Social Sciences, College of Agriculture and Veterinary Sciences and College of Medicine and Health Sciences. Having its own governing body, each college has its own support offices for Planning, Finance, Students records, Human resource, Library and ICT. Following the study area, the whole university community cannot be interested or is not dealing with ICT governance at the University. Thus decision and policy makers as well as Academic and ICT staff from different colleges and central administration constituted our population.

### **3.3. Sampling Frame**

Surveys are useful and powerful in finding answers to research questions through data collection and subsequent analyses, but they can do more harm than good if the population is not correctly targeted. That is, if data are not collected from the people, events, or objects that can provide the correct answers to solve the problem, the survey would be in vain. The process of selecting the right individuals, objects, or events for study is known as sampling (Sekaran, 2003).

The sampling frame is the list of ultimate sampling entities, which may be people, household, organization or other units of analysis. It is a physical representation of the target population and comprises all the units that are potential member of a sample (Abel Gitau Mugenda, 2011). With regard to this research project; the researcher considered the list of employee from the university human resource management from each college and headquarter.

### **3.4. Sampling and Sampling Technique**

Instead of obtaining information from those who are most readily or conveniently available, it might sometimes become necessary to obtain information from specific target groups. The sampling here is confined to specific types of people who can provide the desired information, either because they are the only ones who have it, or conform to some criteria set by the



researcher. This type of sampling design is called purposive sampling (Sekaran, 2003). The population is first divided into mutually exclusive groups that are relevant, appropriate, and meaningful in the context of the study.

Following the objectives of this study, stratified purposive sampling was applied as a non-probability sampling where the units that are investigated were based on researcher's judgment focusing on particular characteristics of the population that are of the researcher's interest. Strata are in this case; Top and Senior Authorities, Middle managers as well as Academic and ICT staff from each college and headquarter. This technique was used because the study needed to glean knowledge from university representatives that were in a particular position or had expertise related to ICT governance in the organization. The respondents were distributed as follows:

**Table 1: Sampling**

Colleges	STRATA					Total
	Top Authorities	Senior Authorities	Middle Managers	Academic Staff	ICT Staff	
<b>CMHS</b>	0	1	5	4	4	<b>14</b>
<b>CASS</b>	0	1	5	4	4	<b>14</b>
<b>CST</b>	0	1	5	4	4	<b>14</b>
<b>CAVM</b>	0	1	5	4	4	<b>14</b>
<b>CE</b>	0	1	5	4	4	<b>14</b>
<b>CBE</b>	0	1	5	4	4	<b>14</b>
<b>HQ</b>	3	0	3	0	2	<b>8</b>
<b>Total</b>	<b>3</b>	<b>6</b>	<b>33</b>	<b>24</b>	<b>26</b>	<b>92</b>
<b>Analyzed</b>	<b>2</b>	<b>5</b>	<b>30</b>	<b>21</b>	<b>23</b>	<b>81</b>

Source: Own Survey Data, September 2015

From the Table 1 above, Top authorities include the Vice Chancellor, Deputy Vice Chancellor for Administration and Finance and the Deputy Vice Chancellor for Academic and Research; Senior Authorities are constituted by the six Principals of the six Colleges; Middle managers include not only Director of Finance, Director Planning, Director Human resource, Deans and Project managers from each college but also Director of Finance, Director Planning, Director Human resource from the central administration here called headquarter. Academic staffs are

mostly senior lectures who may have occupied managerial positions before. Lastly, ICT staffs are from colleges and central administration and are occupying departmental positions.

### **3.5. Research Instrument and Tool**

#### **3.5.1. Data Collection**

To conduct this research, primary and secondary data were gathered. Secondary sources of data were constituted by relevant literature such as journals, books and internet web site, while the instrument which was used for the collection of the primary data was a self-administered questionnaire. The questionnaire included the four dimensions, which are: ICT governance mechanisms, ICT strategic alignment, ICT performance management and ICT resource management. A Likert five-point scale ranges from "strongly disagree" to "strongly agree" was used to examine participants' responses to questionnaire statements. The questions were to ask the respondent how strongly he/she agreed or disagreed with a statement or series of statements.

The questionnaire had two sections where the first section of the survey questionnaire aimed at understanding the respondent information, responsibility, their actual job position at UR and before. The second section of the survey questionnaire was aimed at understanding the four dimensions of ICT Governance which are ICT Governance Mechanisms, ICT Strategic Alignment, ICT Performance Management and ICT Resource Management.

A paper based questionnaire was hand delivered to potential respondents from each college and the University headquarters. A total of 92 questionnaires were issued and 83 questionnaires were received giving a response rate of  $83/92 = 90.2\%$ . 2 questionnaires had invalid data and therefore could not proceed to the stage of analysis. The number of valid questionnaires that were analyzed further was 81.

#### **3.5.2. Ethics Considerations**

Ethical conduct should also be reflected in the behavior of the researchers who conduct the investigation, the participants who provide the data, the analysts who provide the results and the presentation of the interpretation of the results and suggests alternative solutions. Thus ethical behavior pervades each step of the research process including data collection, data analysis and reporting and even dissemination of information on the Internet. The author of this

research project took into consideration the ethical issue of maintaining privacy. Therefore all responses were treated anonymously.

### 3.5.3. Validity and Reliability Test

The validity and reliability was measured in this research to refer to the quality or trustworthiness of data. To maximize validity and reliability of the data, the researcher used an appropriate data collection procedure and sampling technique; not only by targeting the right population, but also yield accurate data (Abel Gitau Mugenda, 2011). Three forms of validity were tested which are validity of content, validity of instrument and validity of construct.

#### 3.5.3.1. Reliability Test

The reliability was calculated using internal consistency technique which is the internal consistency of the questionnaire that was determined through Cronbach's alpha coefficient to calculate the correlation of each item based on the mean inter-item correlation. The Cronbach's Alpha coefficient ( $\alpha$ ), should not, according to recommendations, be below 0.70 (Abel Gitau Mugenda, 2011). Cronbach's alpha reliability coefficient normally ranges between 0 and 1. However, there is actually no lower limit to the coefficient. The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale (Joseph A. Gliem, 2003). The Table 2 below provides the rules of thumb (Joseph A. Gliem, 2003) :

**Table 2: Cronbach's alpha**

<b>Cronbach's alpha</b>	<b>Internal consistency</b>
$\geq 0.9$	Excellent
$\geq 0.8$	Good
$\geq 0.7$	Acceptable
$\geq 0.6$	Questionable
$\geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Results in the Table 3 bellow indicated that the questionnaire was reliable as observed from the Cronbach's Alpha values which were above 0.7 in either case respectively. The Alpha values meet acceptance standards for the research and reflecting a similarity in the research. Therefore; since, the Cronbach's alpha score for all items the instruments are above acceptable level of alpha (i.e. 0.70), the instruments employed in this study was reliable.

**Table 3: Reliability Coefficient**

<b>Variables</b>	<b>Cronbach's Alpha</b>	<b>N of Items</b>
<b>Independent</b>	<b>.902</b>	<b>44</b>
<b>Dependent</b>	<b>.894</b>	<b>26</b>

Source: Own Survey Data, September 2015

### **3.5.3.2. Validity Test**

Validity is the extent to which data accurately reflects what they are meant to reflect. There are some factors which can affect the validity of data, for example, if a respondent is in a haste to complete the questionnaire, the validity of this response could be affected; also misinterpretation of questions by the respondents will also affect validity. Therefore the researcher performed three different tests for this research namely Validity of Instrument, Validity of Construct and Validity of Content.

#### **3.5.3.2.1. Validity of Instrument**

For this study the researcher used the validity of instrument to measure the degree to which collected data were not reflecting any opinion or biased. Experts not only evaluated the constructs but also determined the accuracy of the questionnaire. In order to test the validity of the instruments, questionnaires were first scrutinized and approved by the university supervisor. Advised by the supervisor, the researcher later carried out a pre-test of the instruments by distributing the questionnaire to four potential respondents representing middle managers, academic as well as ICT staff. The pre-test results showed some questions were not clear to the respondents. Some terms in the piloted questionnaire were rather ambiguous and led to wrong interpretations. After piloting, the ambiguous questions were corrected and the questionnaires given back to the same respondents. This was done to determine whether the instrument would yield the needed data.

#### **3.5.3.2.2. Validity of Construct**

To measure the construct validity, the researcher employed the factor analysis using principal component analysis extraction method and varimax rotation method to determine the Eigen value and factor loading matrix of each item of the instrument. The factor loading of items are evaluated using the criteria of Eigen value. A factor having Eigen value greater than 1 has been selected to assure the construct validity of the instrument. The

instrument with Eigen value greater than 1 and factor loading exceeded the .50 cut-off value is valid. Therefore; the SPSS output of the factor analysis of each items of the study is illustrated as follows;

**Table 4: Validity of Construct**

Variables of the study	Number of Items	Factor Analysis		
		Component	Eigen Value	Factor Loading
ICT Strategic Alignment	24	9	1.062	79.13%
ICT Performance Management	10	4	1.012	71.81%
ICT Resource Management	10	3	1.199	66.76%
ICTG Mechanisms	26	6	1.173	71.58%

Source: Own Survey Data, September 2015

As it is shown in Table 4 above; among the 24 items concerning the ICT strategic alignment, 9 components had Eigen value (EV) greater than 1 and the factor loading greater than 50%. Among the 10 items of ICT performance management, 4 components had EV>1 and factor loading greater than 50%. Among the 10 items of ICT resource management, 3 components had EV>1 and factor loading greater than 50%. Among the 26 items of ICT governance mechanisms, 6 components, which had EV>1 and factor loading greater than 50%. The researcher concluded that the instrument employed in this study is considered as valid because of the factors loading for all items of the instrument were beyond the acceptable level which 50% cut -off points.

### 3.5.3.2.3. Validity of Content

The content validity of the study also assessed using factor analysis through KMO (Kaiser-Meyer-Olkin) and Bartlett's test. KMO value indicates the sampling adequacy of the study and KOM value should be above the bare minimum of .50 for all variables. The Bartlett's test also indicates the test of sphericity and significance level of the measurement instrument at p<.50. Thus, the KMO and Bartlett's test result are summarizes in the Table 5.

**Table 5: Content Validity**

	KMO for sampling adequacy	Chi-Square (Approx)	Degree of Freedom	Sig.
ICT Strategic Alignment	0.681	1084.342288	276	0.000
ICT Performance Management	0.572	245.7586731	45	0.000
ICT Resource Management	0.783	301.8262671	45	0.000
ICTG Mechanisms	0.773	1476.775102	325	0.000

Source: Own Survey Data, September 2015

As it is shown in Table 5, the KMO value of all variables is above the proposed cut-off level of KMO greater than .50 and the Bartlett's test of all variables of the study are .000, which are highly significant at  $P < .001$ . Therefore, the researcher considered the sample of the study being adequate.

### **3.6. Data analysis**

Collected data was first edited to remove errors, then, coded before being entered into computer software SPSS 16.0 for quantitative analysis. Data was analyzed according to descriptive information following the research objectives. Descriptive statistical analysis was employed, as it enabled the researcher to reduce, summarize, organize, evaluate and interpret the numeric information. Quantitative data were presented into tabular form and figures therein were interpreted. These took the forms of percentages and frequency distribution. The findings were presented by use of tables, bar graphs, frequencies and percentages.

In this section also, the Pearson's Correlation Coefficients were run to examine the correlation among the studied variables which were set out in the objectives of this study where higher correlation value indicates stronger relationship between both sets of data. Lastly the multiple regressions analysis was run to determine the statistical relationship between two or more variables. In this case, we have the four variables where three of them are defined as independent are the cause of the behavior of another one defined as dependent variable.

# CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND FINDINGS

## 4.0. Introduction

This chapter presents the analysis and the findings of the research. The study targeted a sample size of 92 respondents from which 81 filled in and returned the questionnaires with valid data making a response rate of 88.04%. The aims of this preliminary data analysis in this chapter are to analyze and present the results of the descriptive analysis associated with gender, the job position, and the duration at that position. The first section deals with descriptive analysis and descriptive cross-tabulation analysis to have an understanding of the results in the context of ICT governance. The second section presents the findings using the Pearson’s Correlation and multiple regression analysis for hypotheses testing.

## 4.1. Descriptive analysis

The demographic features of the respondents are general information in the study and included the gender, the job position, and the duration the respondent has held the job. Results obtained about each of them together with their relevance to the study are presented below.

### 4.1.1. Gender distribution

Figure 10 show that most of the respondents are male representing 77.78% and the females representing 22.22%. This implies that there is a greater positive male response rate representation of respondents in terms of gender compared to the female. This is true because females, since long, have been under represented in many disciplines despite the national policy of having at least 30% of women in all sectors in Rwanda.

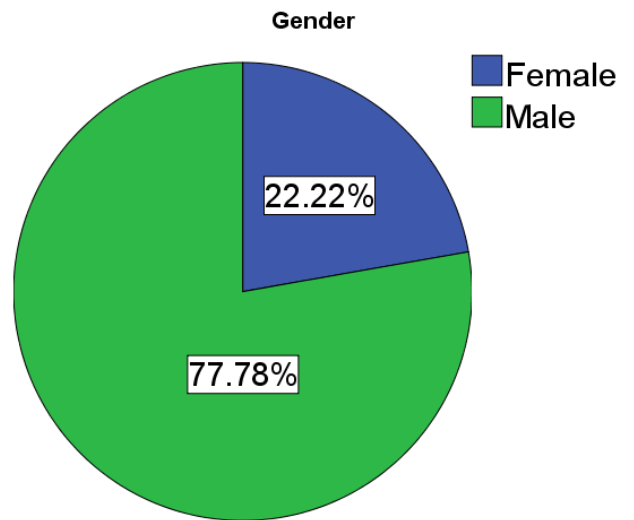


Figure 10: Gender Distribution

The Table 6 shows the gender distribution per job position, where among the 3 top authorities, there is 0% of female; among the 5 senior authorities responded 40% of them are women, while women represent 20% among the middle managers; 19.04% are women among academic staff and finally women represent 26.08% of ICT staff.

**Table 6: Females distribution per Job position at UR**

		<b>Job position at UR</b>					
		<b>Top authority</b>	<b>Senior Authority</b>	<b>Middle manager</b>	<b>Academic staff</b>	<b>ICT staff</b>	<b>Total</b>
Gender	Female	0 0%	2 40%	6 20%	4 19.04%	6 26.08%	18 22.22%
	Male	2	3	24	17	17	63
Total		<b>2</b>	<b>5</b>	<b>30</b>	<b>21</b>	<b>23</b>	<b>81</b>

Source: Own Survey Data, September 2015

#### 4.1.2. Job Position Level

Job Position Level plays an important role in any decision making areas including ICT Governance. The Table 7 represents the distribution of Job Position of the respondents.

**Table 7: Distribution per Job Position**

	<b>Frequency</b>	<b>Percent</b>
<b>Top authority</b>	2	2.5
<b>Senior Authority</b>	5	6.2
<b>Middle manager</b>	30	37.0
<b>Academic staff</b>	21	25.9
<b>ICT staff</b>	23	28.4
<b>Total</b>	<b>81</b>	<b>100.0</b>

Source: Own Survey Data, September 2015

From the Table 7, top and senior authorities are represented by 2 and 5 respectively. They are not under represented as such because there are 3 top authorities and 6 senior authorities in total. But considering total respondents, there are 2.5% of top authorities, 6.2% of senior authorities, 37% of middle manager, 25.9% of academic staff and 28.4% of ICT staff.



### 4.1.3. Duration at the Current Job

Experience in a position counts a lot in the management which involves, among others, various ICT decision making process. The Table 8 shows the duration the respondents have occupied their current position in UR. Findings from Table 8 revealed that 97.53% of respondents have occupied their positions since the UR was formed. The University of Rwanda was formed in September 2013 and data was collected also in the month of September 2015. That means that data were collected at the starting of the third year. Only 1 senior authority and 1 middle manager have occupied their positions since one year. These may be new appointments.

**Table 8: Distribution per Duration at the position**

Job position at UR	Duration at the position at UR			Total
	0 to 1 year	1 to 2 years	2 to 3 years	
Top authority	0	2	0	2
Senior Authority	1	4	0	5
Middle manager	1	16	13	30
Academic staff	0	11	10	21
ICT staff	0	12	11	23
<b>Total</b>	<b>2</b>	<b>45</b>	<b>34</b>	<b>81</b>

Source: Own Survey Data, September 2015

In terms of decision making, these results show that more than 97% of respondents are familiar with the UR from its inception as per the duration on their current position. This implies that not only they should be informed on the direction UR has taken but also they should be well informed about the UR decision making structures, direction and even strategic plan.

## 4.2. Descriptive Cross-Tabulation Analysis

Cross-tabulation analysis was used to get a better understanding on how responses differ when considering specially their current job position. In this section most findings dealt with responses from respondents according to their job position against ICT strategic alignment, ICT performance management, ICT resource management and ICT governance mechanisms.

### 4.2.1. ICT Strategic Alignment

This section deals with the experience of respondents with ICT Strategic Alignment which comprises ICT strategy, principles and policies; Alignment and Communication between

ICT/UR strategies; stakeholder's involvement; and Top and Middle managers support; and ownership.

**a) ICT strategy, Policies and principles**

As a basic understanding, findings from Table 9 indicated that 98.76% agreed that the University should have an ICT Strategy or equivalent document. Meanwhile, from the Table 10, only 32% of total respondents indicated that they are aware about the University ICT strategy or equivalent document and 67.9% they either strongly disagree, disagree or they don't know about the university strategy or equivalent document.

**Table 9: ICT Strategy per Job Position**

	The University should have an ICT strategy, or equivalent document			Total
	Disagree	Agree	Strong Agree	
<b>Top authority</b>	0	0	2	<b>2</b>
<b>Senior Authority</b>	0	0	5	<b>5</b>
<b>Middle manager</b>	1	9	20	<b>30</b>
<b>Academic staff</b>	0	4	17	<b>21</b>
<b>ICT staff</b>	0	9	14	<b>23</b>
<b>Total</b>	<b>1</b>	<b>22</b>	<b>58</b>	<b>81</b>

Source: Own Survey Data, September 2015

**Table 10: ICT Strategy Awareness per Job Position**

	Staff who are aware about the University ICT strategy or equivalent document					Total
	Strong Disagree	Disagree	Don't know or N/A	Agree	Strong Agree	
<b>Top authority</b>	0	0	0	1	1	<b>2</b>
<b>Senior Authority</b>	0	0	3	0	2	<b>5</b>
<b>Middle manager</b>	4	4	10	8	4	<b>30</b>
<b>Academic staff</b>	4	7	9	1	0	<b>21</b>
<b>ICT staff</b>	3	5	6	8	1	<b>23</b>
<b>Total</b>	<b>11</b>	<b>16</b>	<b>28</b>	<b>18</b>	<b>8</b>	<b>81</b>

Source: Own Survey Data, September 2015

From Table 9 and Table 10, the researcher confirmed that there might be a university ICT direction, but the issue may be how such a direction is communicated to different stakeholders or how stakeholders are involved or are participating in its development.

Findings from Table 11 revealed that 96.3% strongly disagree, disagree or don't know whether the ICT strategy has been approved by appropriate organs. This confirms that there is an absence of a formally written ICT strategy as there is a draft of ICT strategic plan under development by a team of ICT professional from different colleges under the leadership of the ICT Coordinator. As it was confirmed by the (TU Delft, 2015), the ICT strategic plan was initiated by ICT professional but not yet approved by the highest authorities and it needs further elaboration. The report continues stating that an active participation of heads of the colleges and administrative department should be included.

**Table 11: Approved ICT Strategy per Job Position**

	<b>ICT strategy has been approved by the appropriate institutional ICT governance committee and by the Senior Management</b>					<b>Total</b>
	<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>	
<b>Top authority</b>	0	2	0	0	0	<b>2</b>
<b>Senior Authority</b>	1	1	3	0	0	<b>5</b>
<b>Middle manager</b>	13	2	14	1	0	<b>30</b>
<b>Academic staff</b>	8	3	10	0	0	<b>21</b>
<b>ICT staff</b>	11	5	5	1	1	<b>23</b>
<b>Total</b>	<b>33</b>	<b>13</b>	<b>32</b>	<b>2</b>	<b>1</b>	<b>81</b>

Source: Own Survey Data, September 2015

**b) Alignment and Communication between ICT/UR strategies**

To be supported and then communicated to key stakeholders, an ICT strategy should include and articulate the university objectives. Top and senior management should in turn communicate the university direction to which ICT should be aligned.

Findings from the Table 12 indicated that 100% of top and senior manager confirmed that the university direction to which ICT should be aligned is effectively articulated and communicated; while 54.3% strongly disagreed, disagreed or don't know about the direction to which ICT should be aligned.

**Table 12: ICT Strategy is Articulated and Communicated**

	<b>Senior management articulates and communicates the University direction to which ICT should be aligned</b>					<b>Total</b>
	<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>	
<b>Top authority</b>	0	0	0	1	1	<b>2</b>
<b>Senior Authority</b>	0	0	0	4	1	<b>5</b>
<b>Middle manager</b>	14	2	4	8	2	<b>30</b>
<b>Academic staff</b>	4	2	7	7	1	<b>21</b>
<b>ICT staff</b>	5	4	2	7	5	<b>23</b>
<b>Total</b>	<b>23</b>	<b>8</b>	<b>13</b>	<b>27</b>	<b>10</b>	<b>81</b>

Source: Own Survey Data, September 2015

In the same line of alignment and communication, findings from Table 13 indicated that 88.88% of respondent confirmed that the ICT strategy is not visible nor communicated across the university. This confirms that the direction is not yet written and approved by appropriate organs.

**Table 13: ICT strategy is visible**

	<b>ICT strategy is visible and clearly communicated across the institution to all personnel responsible for its deployment</b>					<b>Total</b>
	<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>	
<b>Top authority</b>	0	2	0	0	0	<b>2</b>
<b>Senior Authority</b>	3	1	0	1	0	<b>5</b>
<b>Middle manager</b>	17	10	2	1	0	<b>30</b>
<b>Academic staff</b>	11	5	3	2	0	<b>21</b>
<b>ICT staff</b>	5	7	6	3	2	<b>23</b>
<b>Total</b>	<b>36</b>	<b>25</b>	<b>11</b>	<b>7</b>	<b>2</b>	<b>81</b>

Source: Own Survey Data, September 2015

### c) Stakeholders involvement

To become a success, the implementation of ICT strategy requires the engagement of stakeholders with clear roles, goals and a shared understanding of the common agenda.

Findings from Table 14 indicate that 90.12% strongly disagreed, disagreed or don't know whether the ICT strategy and policies are communicated to internal or external stakeholders. In this context more effort should be put in place to engage all stakeholders in the development and implementation of ICT strategy and policies.

**Table 14: Stakeholders Involvement**

	Strategy and Policies are communicated to internal as well as external stakeholders					Total
	Strong Disagree	Disagree	Don't know or N/A	Agree	Strong Agree	
<b>Top authority</b>	0	1	0	0	1	<b>2</b>
<b>Senior Authority</b>	2	3	0	0	0	<b>5</b>
<b>Middle manager</b>	12	10	5	2	1	<b>30</b>
<b>Academic staff</b>	5	12	3	1	0	<b>21</b>
<b>ICT staff</b>	6	10	4	3	0	<b>23</b>
<b>Total</b>	<b>25</b>	<b>36</b>	<b>12</b>	<b>6</b>	<b>2</b>	<b>81</b>

Source: Own Survey Data, September 2015

#### 4.2.2. ICT Performance Management

The ability of the University to manage ICT performance is based on how well the university addresses short-term and long-term ICT projects, decisions and control frameworks. This section deals with the experience of respondents with project management methodology and effective performance management strategy at the University.

##### 4.2.2.1. Good project management methodology

**Table 15: Good Project Management**

	Senior Management obtains regular progress reports on major ICT projects.					Total
	Strong Disagree	Disagree	Don't know or N/A	Agree	Strong Agree	
<b>Top authority</b>	0	0	0	0	2	<b>2</b>
<b>Senior Authority</b>	0	2	0	2	1	<b>5</b>
<b>Middle manager</b>	3	5	12	9	1	<b>30</b>
<b>Academic staff</b>	0	2	18	1	0	<b>21</b>
<b>ICT staff</b>	1	3	6	12	1	<b>23</b>
<b>Total</b>	<b>4</b>	<b>12</b>	<b>36</b>	<b>24</b>	<b>5</b>	<b>81</b>

Source: Own Survey Data, September 2015

Findings from Table 15 indicated that only 35.8% of respondents agreed or strongly agreed that senior management obtain regular progress reports on major ICT projects while 64.2% have strongly disagreed, disagreed or don't know that senior management obtain regular progress

reports on major ICT projects. Among the 35.8 %, includes 100% of top authorities, 60% of senior authorities and 56.5% of ICT staff. These results show that more efforts have to be made to institute an ICT performance measurement framework where project management methodology should guide the university into evaluating and monitoring of ICT project implementation.

#### 4.2.3. ICT Resource Management

ICT strategic planning is required to manage and direct all ICT resources in line with the business strategy and priorities. ICT resources include financial, skilled staff and infrastructure.

##### 4.2.3.1. Sufficient Financial Resource

Findings from Table 16 have shown that 53.1% of respondents confirmed that there is a sufficient financial support from executive. On the other hand 46.9% strongly disagreed, disagreed or don't know about the financial support from executive. Among the 46.9% include 4 out of 5 senior authorities with the same position of not having sufficient financial support from executive.

**Table 16: Financial Resource**

	<b>ICT projects are getting sufficient financial support from Executive.</b>					<b>Total</b>
	<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>	
<b>Top Authority</b>	0	0	0	1	1	<b>2</b>
<b>Senior Authority</b>	1	1	0	2	1	<b>5</b>
<b>Middle Manager</b>	5	4	5	14	2	<b>30</b>
<b>Academic Staff</b>	5	6	2	7	1	<b>21</b>
<b>ICT Staff</b>	1	4	4	12	2	<b>23</b>
<b>Total</b>	<b>12</b>	<b>15</b>	<b>11</b>	<b>36</b>	<b>7</b>	<b>81</b>

Source: Own Survey Data, September 2015

##### 4.2.3.2. Skilled staff and infrastructure are made available.

Findings from Table 17 have revealed that 83.9% strongly disagreed, disagreed or don't know whether skilled staff and infrastructure are made available to meet the required university strategy.

**Table 17: Skilled Staff and resource available**

	ICT resources, infrastructures and skills are made available to meet the required University strategic objectives					Total
	Strong Disagree	Disagree	Don't know or N/A	Agree	Strong Agree	
<b>Top Authority</b>	0	1	0	0	1	<b>2</b>
<b>Senior Authority</b>	1	3	0	1	0	<b>5</b>
<b>Middle Manager</b>	9	12	1	8	0	<b>30</b>
<b>Academic Staff</b>	4	12	5	0	0	<b>21</b>
<b>ICT Staff</b>	6	11	3	2	1	<b>23</b>
<b>Total</b>	<b>20</b>	<b>39</b>	<b>9</b>	<b>11</b>	<b>2</b>	<b>81</b>

Source: Own Survey Data, September 2015

#### 4.2.4. ICT Governance Mechanisms

##### 4.2.4.1. Structure Mechanisms

Findings from Table 18 have revealed that 81.5% strongly disagreed, disagreed or don't know about structures that ensure accountability and flexibility to the ICT organizational needs while only 18.5% strongly agreed or agreed that there are structures that ensure accountability and flexibility to the ICT organizational needs. From the same Table 18 96.3% of respondents confirmed that the CIO is not on Board, 77.8% of respondent confirmed that there is no ICT organization structure and 93.8% of respondent confirmed also that there is no ICT steering committee at the University of Rwanda.

**Table 18: Structure Mechanisms**

		Strong Disagree	Disagree	Don't know or N/A	Agree	Strong Agree
<b>Structure Mechanisms</b>	The University has instituted structures that ensure accountability and flexibility to the ICT organizational needs.	22	30	14	11	4
	The CIO is on Board	35	16	27	3	0
	There is an ICT organization structure at the UR.	20	16	27	17	1
	There is an ICT steering Committee at the UR	33	16	27	5	0

Source: Own Survey Data, September 2015

#### 4.2.4.2. Process Mechanisms

Results from Table 19 have shown that 97.5% of respondent strong disagreed, disagreed or don't know about the ICT performance measurement using ICT Balanced Scorecard, in the same line 96.3% confirmed that ICT Governance Frameworks like COBIT or ITIL are not implemented and 96.3% of respondent strong disagreed, disagreed or don't about a periodic assessment of ICT governance maturity at the University of Rwanda.

**Table 19: Process Mechanisms**

		<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>
<b>Process Mechanisms</b>	ICT Performance Measurement using ICT Balanced Scorecard.	18	20	41	2	0
	ICT Governance Frameworks like COBIT or ITIL are implemented.	19	21	38	3	0
	ICT Governance maturity is assessed after a certain period.	43	9	26	3	0

Source: Own Survey Data, September 2015

#### 4.2.4.3. Relational Mechanisms

**Table 20: Relational Mechanisms**

		<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>
<b>Relational Mechanisms</b>	There is an active participation and collaboration between all stakeholders	13	41	7	19	1
	There is a use of informal meeting between University and ICT executive/senior management about general activities and directions	3	2	12	46	18
	Trainings are given to UR staff about ICT services	4	9	13	49	6
	Trainings are given to UR ICT staff about the UR direction	11	18	25	26	1
	Systems are in place to share and distribute knowledge about ICTG framework and responsibilities	23	32	18	6	2

Source: Own Survey Data, September 2015



Results from Table 20 have shown that 75.3% of respondent strong disagreed, disagreed or don't about the participation and collaboration between all stakeholders. Meanwhile 79.01% of respondent ha confirmed that informal meeting about general activities and directions are used between UR and ICT executives. Results from the same Table 20 also revealed that trainings are given to UR staff about ICT services at a rate of 68% of respondents while 66.7% of respondent strong disagreed, disagreed or don't about the trainings given to UR ICT staff about UR direction. Finally, 90.2% of respondent strong disagreed, disagreed or don't about systems which are in place to share and distribute knowledge about ICTG framework and responsibilities.

#### 4.2.4.4. ICT infrastructure

**Table 21: ICT Infrastructure**

		<b>Strong Disagree</b>	<b>Disagree</b>	<b>Don't know or N/A</b>	<b>Agree</b>	<b>Strong Agree</b>
<b>ICT Infrastructure</b>	ICT infrastructure is part of overall ICT governance	0	0	2	27	52
	Standardized and integrated ICT infrastructure and systems are in place to optimize costs and information flow across the UR	42	16	9	9	5

Source: Own Survey Data, September 2015

For general knowledge about ICT infrastructure enabling ICT governance, 97.5% of respondent strong agreed, agreed that ICT infrastructure is part of overall ICT governance but 82.7 of respondent strong disagreed, disagreed or don't about standardized and integrated ICT infrastructure and systems that are in place to optimize costs and information flow across the UR.

#### **Conclusion**

The aim of the descriptive cross-tabulation analysis was to get a better understanding on how responses from respondents differ when considering their current job position. It has been seen that there is no formal written ICT strategy, but from the findings the university has a clear direction as it has been confirmed by top as well as senior authorities. The absence of a formal written and approved ICT strategy should not affect the ICT governance at the University of Rwanda if there was any.

By having a strategic perspective, top and senior authorities should build up mechanisms of cascading the ICT strategy downward to middle managers as the one in charge of its deployment and implementation. Moreover, to become a success the ICT strategy during its implementation should get an involvement of all stakeholders.

Furthermore, findings have clearly shown that there is no sign of ICTG implementation or development at the University of Rwanda.

Any of the ICTG arrangements are on the stage of development.

### **4.3. Correlation Analysis**

In this section, with the correlation analysis the researcher measured the degree to which two sets of data are related. Higher correlation value indicates stronger relationship between both sets of data. When the correlation is 1 or -1, a perfectly linear positive or negative relationship exists. When the correlation is 0, there is no relationship between the two sets of data. Positive correlation indicates that the values of the two variables being analyzed move in the same direction. The opposite is happening in a negative correlation. The closer the correlation coefficient is to either -1.00 or +1.00, the stronger the relationship is between the two variables. A perfect negative correlation of -1.00 indicates that for every member of the sample or population, a higher score on one variable is related to a lower score on the other variable. The opposite is happening in a perfect positive correlation of +1.00. The Pearson's correlation coefficient was computed to measure the degree of relationships between the study variables as per the objectives. The correlation covered the following study objectives:

1. To examine the relationship between ICT strategic alignment and ICT governance effectiveness at the University of Rwanda.
2. To examine the relationship between ICT performance management and ICT governance effectiveness at the University of Rwanda.
3. To examine the relationship between ICT resource management and ICT governance effectiveness at the University of Rwanda.
4. To examine the relationship between ICT Strategic alignment together with ICT Performance management and ICT Resource management and ICT Governance effectiveness at the University of Rwanda.

Below are the results of the Pearson correlation coefficients;

**Table 22: Pearson correlation coefficients**

		ICTG	ICTSA	ICTPM	ICTRM	COMBINED
Pearson Correlation	ICTG	1				
	ICTSA	<b>.646**</b>	1			
	ICTPM	<b>.583**</b>	<b>.773**</b>	1		
	ICTRM	<b>.689**</b>	<b>.599**</b>	<b>.629**</b>	1	
	COMBINED	<b>.730**</b>	<b>.886**</b>	<b>.897**</b>	<b>.861**</b>	1

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

Source: Own Survey Data, September 2015

#### **4.3.1. The Relationship between ICT Strategic alignment and ICT Governance**

**H1:** ICT Strategic alignment has a positive influence on ICT Governance.

Findings from Table 22 show that there was a significant positive relationship between ICT strategic alignment and ICT Governance (**r =.646; sig. p<.01**). This implies that existence of ICT strategic alignment at the University will result into an effective ICT Governance and the lack of ICT strategic alignment results into poor ICT Governance.

#### **4.3.2. The Relationship between ICT Performance management ICT Governance**

**H2:** ICT Performance management has a positive influence on ICT Governance.

Findings from Table 22 show that there was a significant positive relationship between ICT Performance Management and ICT Governance (**r=.583; sig. p<.01**). This implies that existence of ICT Performance Management at the University will result into an effective ICT Governance and lack of ICT Performance Management results into poor ICT Governance.

#### **4.3.3. The Relationship between ICT Resource management and ICT Governance**

**H3:** ICT Resource management has a positive influence on ICT Governance.

Findings from Table 22 show that there was a significant positive relationship between ICT Resource Management and ICT Governance (**r=.689; sig. p<.01**). This implies that existence of ICT Resource Management at the University will result into an effective ICT Governance and lack of ICT Resource Management results into poor ICT Governance.

#### **4.3.4. The Relationship between ICT Strategic alignment together with ICT Performance management and ICT Resource management and ICT Governance**

**H4:** ICT Strategic alignment together with ICT Performance management and ICT Resource management they have a positive influence on ICT Governance.

Findings from Table 22 show that there was a significant positive relationship between ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management and ICT Governance ( $r=.730$ ; sig.  $p<.01$ ). This implies that existence of ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management at the University will result into an effective ICT Governance and the absence of one or more element results into poor ICT Governance.

#### **4.4. Multiple Regression Analysis**

Multiple regression analysis was carried out in order to test the extent of impact of independent variables on dependent variable. Thus, this multiple regression analysis was performed to address hypothesis of this study, that are, to find out whether ICT alignment has a positive influence on ICT governance or not; ICT performance management has a positive influence on ICT governance or not; ICT resource management has a positive influence on ICT governance or not and whether ICT strategic alignment together with ICT performance management and ICT resource management have a positive influence on ICT governance or not.

##### **4.4.1. H1: ICT Strategic alignment has a significant positive influence on ICT Governance**

To assess the influence of ICT Strategic alignment on ICT Governance, linear multiple regression analysis was carried out. The result of the regression model as it is summarized in Table 23 where the ICT strategic alignment here the independent variables explains **41.8%** of the variance in the overall ICT governance here dependent variable. This value is significant as indicated by the F-value and the significance ( $F=56.709$ ,  $p=000$ ). F ratio helps to assess the statistical significance of the overall regression models. The larger the ratio, the more the variance in the dependent variable is explained by the independent variable. The ratio found in this study indicates a low significant at **.000** levels. This level means that the chances that the results of regression model are due to random events instead of true relationship between variables are **0.0%**. This level is by far lower than the standard level of **5%** as defined by the probability of F in SPSS.

This implies that the researcher is certain that the relationship between ICT strategic alignment and ICT governance is weak at **95%** which is the confidence level.

From the same Table 23; ICTSA is positively influencing the ICT governance with better coefficient  $\beta > 0$ . Regression result show that ICT Strategic Alignment has a direct positive (**beta=0.676**) impact on ICT Governance. Therefore, the first hypothesis (H1) of the study is accepted, which implies, the more there is an ICT Strategic Alignment at the University the more the effective ICT governance.

**Table 23: Regression on H1**

1. Model summary					
Model	R	R Square	Adjusted R Square	F	Sig
1	.646 <sup>a</sup>	.418	.411	56.709	.000 <sup>a</sup>
2. Beta coefficients					
Model1	Un-standardized		Standardized	t	Sig.
	B	Std. Error	Beta		
(Constant)	.657	.264		2.491	.015
ICTSA	.676	.090	.646	7.531	.000

Dependent Variable: ICTG

a. Predictors: (Constant), ICTSA

Source: Own Survey Data, September 2015

#### 4.4.2. H2: ICT Performance management has a significant positive influence on ICT Governance.

To assess the influence of ICT Performance Management on ICT Governance, linear multiple regression analysis was carried out. The result of the regression model as it is summarized in Table 24 where the ICT Performance Management here the independent variables explains **34.0%** of the variance in the overall ICT governance here dependent variable. This value is significant as indicated by the F-value and the significance (**F=40.681, p=000**). F ratio helps to assess the statistical significance of the overall regression models. The larger the ratio, the more the variance in the dependent variable is explained by the independent variable. The ratio found in this study indicates a low significant at **.000** levels. This level means that the chances that the results of regression model are due to random events instead of true relationship between

variables are **0.0%**. This level is by far lower than the standard level of **5%** as defined by the probability of F in SPSS.

This implies that the researcher is certain that the relationship between ICT performance management and ICT governance is weak at **95%** which is the confidence level.

**Table 24: Regression on H2**

1. Model summary					
Model	R	R Square	Adjusted R Square	F	Sig.
1	.583a	.340	.332	40.681	.000 <sup>a</sup>
2. Beta coefficients					
Model1	Un-standardized		Standardized	t	Sig.
	B	Std. Error	Beta		
(Constant)	.899	.273		3.288	.002
ICTPM	.617	.097	.583	6.378	.000

Dependent Variable: ICTG

a. Predictors: (Constant), ICTPM

Source: Own Survey Data, September 2015

From the same Table 24; ICTPM is positively influencing the ICT governance with better coefficient  $\beta > 0$ . Regression result show that ICT Performance Management has a direct positive (**beta=0.617**) impact on ICT Governance. Therefore, the second hypothesis (**H2**) of the study is accepted, which implies, the more there is an ICT Performance Management at the University the more the effectiveness of ICT Governance.

#### **4.4.3. H3: ICT Resource management has a positive significant influence on ICT Governance.**

To assess the influence of ICT Resource Management on ICT Governance, linear multiple regression analysis was carried out. The result of the regression model as it is summarized in Table 25 where the ICT Resource Management here the independent variables explains **47.4%** of the variance in the overall ICT governance here dependent variable. This value is significant as indicated by the F-value and the significance (**F=71.206, p=000**). F ratio helps to assess the statistical significance of the overall regression models. The larger the ratio, the more the variance in the dependent variable is explained by the independent variable. The ratio found in this study indicates a low significant at **.000** levels. This level means that the chances that the

results of regression model are due to random events instead of true relationship between variables are **0.0%**. This level is by far lower than the standard level of **5%** as defined by the probability of F in SPSS.

This implies that the researcher is certain that the relationship between ICT resource management and ICT governance is weak at **95%** which is the confidence level.

**Table 25: Regression on H3**

1. Model summary					
Model	R	R Square	Adjusted R Square	F	Sig
1	.689a	.474	.467	71.206	.000 <sup>a</sup>
2. Beta coefficients					
Model1	Un-standardized		Standardized	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.073	.188		5.712	.000
ICTRM	.607	.072	.689	8.438	.000

Dependent Variable: ICTG

a. Predictors: (Constant), ICTRM

Source: Own Survey Data, September 2015

From the same Table 25; ICTRM is positively influencing the ICT governance with better coefficient  $\beta > 0$ . Regression result show that ICT Resource Management has a direct positive (**beta=0.607**) impact on ICT Governance. Therefore, the third hypothesis (**H3**) of the study is accepted, which implies that, the more there is an ICT Resource Management at the University the more the effectiveness of ICT Governance.

#### **4.4.4. ICT Strategic alignment together with ICT Performance management and ICT**

**Resource management they have a significant positive influence on ICT Governance.**

To assess the combined influence of ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management on ICT Governance, multiple regression analysis was carried out and the result of the regression model as it is summarized in Table 26 where the combined effect of ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management here the independent variables explains **56.0%** (**R=.748, R<sup>2</sup>=.560**) of the variance in the overall Structure mechanism here dependent variable. This value is highly significant as indicated by the F-value and the significance (**F = 32.601, p=000**). F ratio helps to

assess the statistical significance of the overall regression models. The larger the ratio, the more the variance in the dependent variable is explained by the independent variable. The ratio found in this study indicates a low significant at **.000** levels. This level means that the chances that the results of regression model are due to random events instead of true relationship between variables are **0.0%**. This level is by far lower than the standard level of **5%** as defined by the probability of F in SPSS.

This implies that the researcher is certain that the relationship between the combined effect of ICT strategic alignment together with ICT performance management and ICT resource management and ICT governance is weak at **95%** which is the confidence level.

**Table 26: Regression on H4**

1. Model summary					
Model	R	R Square	Adjusted R Square	F	Sig
1	.748 <sup>a</sup>	.560	.542	32.601	.000 <sup>a</sup>
2. Beta coefficients					
Model1	Un-standardized		Standardized	t	Sig.
	B	Std. Error	Beta		
(Constant)	.449	.244		1.842	.069
ICTSA	.371	.128	.355	2.903	.005
ICTPM	.016	.133	.015	.123	.903
ICTRM	.411	.088	.466	4.662	.000

Dependent Variable: ICTG

a. Predictors: (Constant), ICTSA, ICTPM, ICTRM

Source: Own Survey Data, September 2015

From the same Table 26; the combined effect of ICTSA together with ICTPM and ICTRM is positively influencing the ICT governance with beta coefficient  $\beta > 0$ . Multiple regression result shows that the combined effect of ICTSA together with ICTPM and ICTRM has a direct positive impact on ICT Governance. Therefore, the fourth hypothesis (**H4**) of the study is accepted, which implies that, the more there is a combined effect of ICTSA together with ICTPM and ICTRM at the University the more the effectiveness of ICT Governance. Results further indicate that ICTRM ( $\beta = .411$ ) are a better predictor of ICTG than ICTSA ( $\beta = .371$ ) and ICTPM ( $\beta = .016$ ).



## Conclusion

The main findings of the research project can be summarized as follows. The first set of results has shown the descriptive analysis which comprises the distribution of gender, job position level and duration on current position. The second set of results has shown the descriptive cross-tabulation analysis which dealt with the deep understanding of the UR context of ICT governance when considering only the job position. The last set of results has shown both the Pearson's correlation coefficient and the regression analysis. To summarize the hypothesis testing as they have been formulated, both the correlation and regression analysis was employed. Findings from the two analyses are summarized in Table 27:

**Table 27: Summary on Hypothesis**

Hypothesis	Results	Status
<b>H1:</b> ICT Strategic alignment has a significant positive influence on ICT Governance.	<b>Correlation:</b> There is a significant positive relationship between ICT strategic alignment and ICT Governance ( $r=.646$ ; <b>sig. <math>p&lt;.01</math></b> ). <b>Linear Regression:</b> ICT Strategic Alignment has a direct positive impact on ICT Governance at $R^2=41.8\%$ and <b>Beta=0.676</b> .	Accepted
<b>H2:</b> ICT Performance Management has a significant positive influence on ICT Governance.	<b>Correlation:</b> There is a significant positive relationship between ICT Performance Management and ICT Governance ( $r=.583$ ; <b>sig. <math>p&lt;.01</math></b> ). <b>Linear Regression:</b> ICT Performance Management has a direct positive impact on ICT Governance at $R^2=34.0\%$ and <b>Beta=0.617</b> .	Accepted
<b>H3:</b> ICT Resource Management has a significant positive influence on ICT Governance.	<b>Correlation:</b> There is a significant positive relationship between ICT Resource Management and ICT Governance ( $r=.689$ ; <b>sig. <math>p&lt;.01</math></b> ). <b>Linear Regression:</b> ICT Resource Management has a direct positive impact on ICT Governance at $R^2=47.4\%$ and <b>Beta=0.607</b>	Accepted
<b>H4:</b> ICT Strategic alignment together with ICT Performance Management and ICT Resource Management they have a significant positive influence on ICT Governance.	<b>Correlation:</b> there was a significant positive relationship between ICT Strategic alignment together with ICT Performance management and ICT Resource Management and ICT Governance ( $r=.730$ ; <b>sig. <math>p&lt;.01</math></b> ). <b>Multiple Regression:</b> ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management have a direct positive impact on ICT Governance at $R^2=56.0\%$ and <b>Beta =.355, .015, .466</b> respectively for ICTSA, ICTPM and ICTRM.	Accepted

# **CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS**

## **5.0. Introduction**

This chapter presents the discussions on the findings in chapter four. This is followed by conclusions and further recommendations. The presentation of the discussion is in line with the objectives of the study. The first part examines the relationship between ICT Strategic alignment and ICT governance. Second is the investigation into the relationship between ICT performance management and ICT governance. Third is the investigation into the relationship between ICT resource management and ICT governance. And fourth is the investigation of the relationship between ICT Strategic alignment together with ICT performance management, ICT resource management and ICT governance. The rest of this chapter deals with the conclusions and recommendations according to the findings of the study.

## **5.1. Discussion**

### **1. To examine the relationship between ICT Strategic Alignment and ICT Governance**

ICT Strategic alignment exists when business organization's goals and activities are in harmony with the information systems that support them. To address the alignment challenges, it is important for an organization to have a clear and in-depth view regarding its business goals and how IT goals and IT processes support those goals (De Haes S. & Van Grembergen W., 2009). The findings do concur with the works of (Steven de Haes et Al, 2010) who said that; the organization with the lower business-IT alignment results clearly had a lower IT governance implementation status, compared to the organization with the highest business-IT alignment. Extract from literature has shown that ICT strategic alignment have identified success factors that are: mutual understanding of both business and ICT strategies between business and ICT managers and incorporation of this understanding into ICT planning and development (Shankar B. C. at Al, 2013). ECAR, on the other hand, his key findings revealed that respondents were largely positive about IT alignment with the goal of the institution (Ronald Y. & Judith B. C., 2008). The results showed that aligning IT goals with institutional goals and promoting an

institutional view of IT were the most cited as drivers for pursuing IT governance; while the barrier is the lack of participation of all parties among others (Ronald Y. & Judith B. C., 2008). Our results from the chapter four in Table 12 also disclosed that 100% of top and senior manager confirmed that the university direction to which ICT should be aligned is effectively articulated and communicated. This implies that there is an involvement and a support from top and senior authorities. These findings are in line with those from literature stating that to get the support and the involvement of senior management, can be achieved by instituting a senior management role in the IT decision making and monitoring process, demonstrating viable business value proposition from IT to gain the support of senior management, and motivating senior management to use IT actively (Nkufa E. & Rusu L, 2010). But from the same results in Table 12 and Table 13, 54.3% strongly disagreed, disagreed or don't know about the direction to which ICT should be aligned on one hand; and on the other hand, 88.88% of respondent confirmed that the ICT strategy is not visible nor communicated across the university and from Table 14 results indicated that 90.12% strongly disagreed, disagreed or don't know whether the ICT strategy and policies are communicated to internal or external stakeholders. Thus more efforts should be put in place to engage all stakeholders in the development and implementation of ICT strategy and policies as it concurs with results that revealed that the stakeholders involvement can be achieved by establishing key stakeholders' responsibilities in the IT decision making and monitoring process and developing a common understanding among key stakeholders on shared IT/business goals and imperatives (Nkufa E & Rusu L., 2010). Therefore connected and integrated planning not only makes explicit what is important for both UR and ICT, but also helps to see how ICT can support future UR strategies and how future ICT developments can enable business decisions.

## **2. To examine the relationship between ICT performance management and ICT governance**

Findings in chapter four, have disclosed the existence of a significant positive relationship between ICT performance management and ICT governance as demonstrated in section 4.4.2. This implies that existence of ICT Performance Management at the University will result into an effective ICT Governance and lack of ICT Performance Management results into poor ICT Governance.

Results from the survey have shown that 100% of top authorities, 60% of senior authorities and 56.5% of ICT staff forming 35.8% of total respondents agreed or strongly agreed that senior management obtain regular progress reports on major ICT projects. These results show that more efforts have to be made to institute an ICT performance measurement framework where project management methodology should guide the university to evaluating and monitor ICT projects implementation. This is in line and supported by the conclusion that there is a benefit to organizations for implementing a tailored project management methodology and suggests that the greater the level of project management methodology tailoring, the greater the level of project success (Sean Whitaker, 2014). (Sean Whitaker, 2014) continue arguing that using the data gathered, the following key points were observed: Projects managed without a defined project management methodology reported project success only 66% of the time while projects managed with a defined project management methodology reported project success at an average of 74%; while organizations using a fully tailored, or customized, methodology reported an 82% project success rate. Literature has also revealed that project success is measured based on “the triple constraints” or “the iron triangle” of time, cost and scope of objectives. These elements are mutually dependent; therefore, a change in one will have a resultant effect on at least one other element (Karessa C. & David W., 2014). Furthermore (Karessa C. & David W., 2014) continue arguing that; project success should be measured in terms of completing the project within the constraints of scope, time, cost, quality, resources, and risk as approved between the project managers and senior management. Therefore ICT performance management should impact budget allocation. UR need to monitor and measure the performance of their ICT investments and use this as a guide for ICT budget allocation decisions.

### **3. To examine the relationship between ICT resource management and ICT governance**

Findings in chapter four, have disclosed the existence of a significant positive relationship between ICT resource management and ICT governance as demonstrated in section 4.4.3. This implies that existence of ICT resource management at the University will result into an effective ICT Governance and lack of ICT Performance Management results into poor ICT Governance. IT budget refers to IT spending or investment where with low investment, organizations do not expect immense progress in IT governance. The size of an IT function is characterized by number of IT employees. As Demonstrated in the IT innovation literature, size of an IT department predicts IT adoption and the need to effectively manage IT resources so that they

can enhance the business value of firms makes of ITG an important issue and yet an uneasy task (Van Grembergen, 2010). Results from Table 16 have shown that 53.1% of respondents confirmed that there is a sufficient financial support from executive while results from Table 17 have revealed that 83.9% strongly disagreed, disagreed or don't know whether skilled staff and infrastructure are made available to meet the required university strategy. Furthermore findings from literature also have confirmed that the most highly rated barriers to ICTG include lack of resources, lack of knowledge and skills and lack of awareness. Lack of time, human and financial resources remain the most salient factor among all organizations. The lack of knowledge and skills are more apparent in public sector organizations (Mohd Fairuz & Taizan Chan., 2013).

#### **4. To examine the relationship between ICT Strategic alignment together with ICT Performance management and ICT resource management and ICT governance**

Findings in chapter four, have disclosed the existence of a high significant relationship of the combination of ICT strategic alignment together with ICT performance management and ICT resource management and ICT governance as demonstrated in section 4.4.4. This implies that existence of ICT Strategic Alignment together with ICT Performance Management ICT Resource Management at the University will result into an effective ICT Governance and lack of them results into poor ICT Governance.

As isolated component, results from chapter 4 have shown that each (ICT strategic alignment together with ICT performance management and ICT resource management) has a significant influence on ICT governance. Thus the University has to find ways to allocate ICT-related resources and to ensure ICT alignment for increased business value (Luftman, 2010).

## **5.2. Conclusion**

This study was undertaken to examine the relationship between ICT strategic alignment, ICT performance management, ICT resource management and ICT governance at the University of Rwanda. It was also intended to investigate the relationship between the combined effect of ICT strategic alignment together with ICT performance management and ICT resource management and ICT governance. The related literature review was carried out under the study objectives and not only a conceptual framework was developed, but also hypotheses were formulated. The methodology adopted a survey design. Stratified purposeful sampling was used as sampling

procedure and technique. Data from both primary and secondary sources were collected using a questionnaire and analyzed using SPSS. The measurement of variables relied on 5 point Likert-scale. The reliability test was performed using Cronbach's alpha tests on the Likert scales. The validity was measured following the three types including; Instrument Validity, Construct Validity and Content Validity. The researcher employed the factor analysis using principal component analysis extraction method and varimax rotation method to determine the Eigen value and factor loading matrix of each item of the instrument to measure the Construct and Content Validity. The techniques of analysis used include descriptive statistics analysis, descriptive cross-tabulation analysis, Pearson's correlation coefficient analysis and regression analysis.

The findings revealed the correlation coefficient of **.646** at a significant level of **.000** proving that there is a significant positive correlation between the ICT strategic alignment and ICT government. The correlation coefficient of **.583** at a significant level of **.000** proving that there is a significant positive correlation between the ICT performance management and ICT government. The correlation coefficient of **.689** at a significant level of **.000** proving that there is a significant positive correlation between the ICT resource management and ICT government. Finally the correlation coefficient of **.730** at a significant level of **.000** proving that there is high significant positive correlation between the combination of the ICT strategic alignment together with ICT performance management and ICT resource management and ICT government.

Findings also from regression analysis proved that ICT Strategic Alignment has a direct positive impact on ICT Governance at **R<sup>2</sup>=41.8%** and **Beta=0.676**. Therefore, the first hypothesis (H1) of the study was accepted. The regression analysis proved that ICT Performance Management has a direct positive impact on ICT Governance at **R<sup>2</sup>=34.0%** and **Beta=0.617**. Therefore, the second hypothesis (H2) of the study was accepted. The regression analysis proved that ICT Resource Management has a direct positive impact on ICT Governance at **R<sup>2</sup>=47.4%** and **Beta=0.607**. Therefore, the third hypothesis (H3) of the study was accepted. Therefore, the second hypothesis (H3) of the study was accepted. The regression analysis proved that ICT Strategic Alignment together with ICT Performance Management and ICT Resource Management have a direct positive impact on ICT Governance at **R<sup>2</sup>=56.0%** and **Beta=.355, .015, .466** respectively for **ICTSA, ICTPM and ICTRM**. Therefore, the fourth hypothesis (H4) of the study was accepted. Furthermore results have indicated that ICT resource Management (**Beta=.466, sig<.05**) is a

better predictor of ICT governance than the ICT Strategic Alignment (**Beta=.355, sig<.05**) and ICT Performance Management (**Beta=.015, sig<.05**).

### **5.3. Recommendation**

The UR needs to focus on putting in place ICT governance structures and respect them: to ensure that plans are developed and priorities set collectively; to ensure that all ICT related actions taken are consistent with university wide shared values, strategies and objectives; to ensure that risks are properly mitigated; and to ensure that investments made return the value expected. ICT governance should involve policies, plans, projects and priorities. ICT governance structures define roles, who does what in ICT and when, who advises those who make decisions and how and where that advice is provided. As a strategic and critical resource, ICT governance should be situated at multiple levels in the UR. On strategic level where the board and top as well as senior authorities are involved, on management level with involvement of middle managers and operational level with ICT and University management. This implies that at all these levels, UR community and ICT people need to be involved in the ICT governance process and be made to understand their individual roles and responsibilities. ICT performance measurement should include activities to ensure that the University's goals are consistently being met in an effective and efficient manner. Balances Scorecard is the appropriate one as it focuses not only on financial perspective but also on the customer perspective, internal operations and Innovation and learning. Last but not least, monitoring and assessing the adequacy of ICT resources (people, applications, technology, facilities and data) to ensure that they are capable of supporting the current and proposed ICT strategy is a key aspect of IT Governance at the University. Therefore, to achieve the above, the university should not only get the support from top, senior and middle managers but also involve all key stakeholders.

### **5.4. Limitations**

This study is a research project, in partial fulfillment of a Master of Science in Information Technology Management of the University of Nairobi. The research has been limited to issues related to the knowledge about how ICT Strategic Alignment, ICT Performance Management ICT Resource Management are related to ICT Governance at the University of Rwanda. The research was conducted in the only public higher learning institution in Rwanda where top and senior authorities, middle managers as well as academic and ICT staff were

considered as our target population of investigation. Therefore it cannot be generalized to the entire education system in Rwanda.

Secondly, we did not analyze how the ICT governance can be influenced by organization culture, organization change strategy and external environment. These aspects could be analyzed into further research.

Despite these limitations, the researcher believes that the findings of this study will be useful in filling the knowledge gap that the study set out to fill.



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## Appendix A: Data collection tool

# QUESTIONNAIRE

## DATA COLLECTION TOOL

I am Ndushabandi Jean Bosco an MSc student under the supervision of Dr. Agnes Wausi at School of Computing and Informatics, College of Biological and Physical Sciences, University of Nairobi, Kenya

We would like to invite you to be a part of this research study. This research entitled: *“EXAMINING THE RELATIONSHIP BETWEEN ICT STRATEGIC ALIGNMENT, ICT PERFORMANCE MANAGEMENT, ICT RESOURCE MANAGEMENT AND EFFECTIVE ICT GOVERNANCE AT THE UNIVERSITY OF RWANDA”*. This questionnaire is intended to obtain feedback on your experience with ICT Governance (ICTG) at the University of Rwanda. We would appreciate you taking the time and complete the following questionnaire. Our study follows the definition that states that *“ICTG is the responsibility of the board of directors, executive management and ICT Management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization’s ICT sustains and extends the organization’s strategies and objectives”*

### SECTION A: RESPONDENTS PROFILE (PLEASE TICK WHERE APPROPRIATE)

#### 1. Gender

Female

Male

#### 2. Your Job Position at UR

a. Board Member

d. Middle manager<sup>1</sup>

b. Top Authority (VC or DVCs)

e. Academic Staff

c. Senior Authority (Principals)

f. ICT Staff

#### 3. For how long are you in that Position?

0 to 1 Year

1 to 2 years

2 to 3 years

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<sup>1</sup> Middle manager includes Deans, Directors, Project and Program Coordinator

4. Have you worked in any Higher Learning Institution Before? Yes  No

**5. If yes; what was your Job Position?**

- |                                  |                          |                   |                          |
|----------------------------------|--------------------------|-------------------|--------------------------|
| a. Board Member                  | <input type="checkbox"/> | d. Middle manager | <input type="checkbox"/> |
| b. Top Authority (VC or DVCs)    | <input type="checkbox"/> | e. Academic Staff | <input type="checkbox"/> |
| c. Senior Authority (Principals) | <input type="checkbox"/> | f. ICT Staff      | <input type="checkbox"/> |

**6. For how long have you occupied that Position?**

0 to 3 Years  3 to 5 years  5 to 10 years  More than 10 years

**1. ICT Strategic Alignment**

		1= Strong Disagree	2=Disagree	3= Don't Know or N/A	4=Agree	5= Strong Agree					
		<b>1.1. Clear ICT strategy, principles and policies</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
1	I understand that ICT is a strategic asset for the University										
2	I agree that the University should have an ICT strategy, or equivalent document.										
3	I am aware about the University ICT Strategy or equivalent document.										
4	The ICT strategy has been approved by the appropriate institutional ICT governance committee and by the Senior Management.										
5	The ICT strategy includes a clear articulation of the institutional objectives for ICT.										
6	I agree that the University should have ICT Policies, principles and procedures.										
7	I am aware about the University ICT Policies, principles and procedures.										
8	I participated in developing ICT strategy										
9	I was consulted in the development of ICT strategy										
		<b>1.2. Effective alignment and communication between ICT strategy and UR strategy</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
1	I agree that ICT is to support the University attaining his goals.										
2	Senior management articulates and communicates the University direction to which ICT should be aligned via different channels e.g. Web, Brochures and Flyers.										
3	ICT strategy is visible and clearly communicated across the institution to all personnel responsible for its deployment e.g. Meetings, Mail...										
4	The University and ICT objectives are linked and synchronized.										
5	Senior ICT manager is visible and active advocate for ICT & strategic planning like regular reports and meetings.										
6	ICT solutions meet specific University requirement.										
		<b>1.3. Getting Adequate Top and Middle management support and</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	

<b>ownership</b>						
1	The Senior Management communicates ICT issues effectively to all members of the management team.					
2	Senior Management articulates and communicates the UR direction to which ICT should be aligned.					
3	The board has a clear view on the major ICT investments from a risk perspective.					
4	The board has a clear view on the major ICT investments from a return perspective.					
5	The board has a clear view on how the University invests in ICT.					
6	The board has a clear view on how much the University invests in ICT.					
<b>1.4. Adequate stakeholders' involvement</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	ICT Strategy and Policies are communicated to internal as well as external stakeholders					
2	At all level, stakeholders are involved in the success of ICT strategy and Policies.					
3	ICT services communicate well with customers, as appropriate for the delivery of customer services.					

## 2.ICT Performance Management

	<b>1= Strong Disagree</b>	<b>2=Disagree</b>	<b>3= Don't Know or N/A</b>	<b>4=Agree</b>	<b>5= Strong Agree</b>
<b>2.1.Good project management methodology</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	Senior Management obtains regular progress reports on major ICT projects.				
2	ICT Management regularly reports to the board on key outcomes and targets that flow directly from the strategy.				
3	Information about ICT Performance is integrated with financial reporting.				
4	Senior management provides a thorough analysis of performance against budget, targets and key outcomes, and discusses any necessary remedial action.				
5	The board takes collective responsibility for the performance of the organization.				
<b>2.2.Effective performance management strategy</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	I am aware about the performance measurement model or tools that are used at the UR.				
2	To track and demonstrate success, the University has introduced ICT performance measures and ICT benchmarks.				
3	ICT projects achieve desired University results.				
4	ICT projects are delivered on time and on budget.				
5	ICT services and solutions are delivered without failures.				

## 3.ICT Resource management

	<b>1= Strong Disagree</b>	<b>2=Disagree</b>	<b>3= Don't Know or N/A</b>	<b>4=Agree</b>	<b>5= Strong Agree</b>
<b>3.1.Sufficient Financial Resource</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>



1	ICT projects are getting sufficient financial support from Executive.					
2	I agree that the greater the financial and human resource support, the greater the ICTG success.					
3	ICT services and infrastructure can resist and recover from failures due to error, deliberate attack or disaster.					
4	ICT resources (hardware, software, personnel) are adequate to support UR applications.					
5	ICT services and infrastructure are optimized.					
	<b>3.2.Adequate IT skills and Staff</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	Suitable ICT resources, infrastructures and skills are made available to meet the required University strategic objectives.					
2	ICT capabilities are well aligned with the University needs.					
3	Skilled ICT resources are successfully attracted to the University.					
4	Skilled ICT resources are successfully well maintained within the University.					
5	I agree that the University is empowering its ICT staff for the entire ICT performance of the University.					

#### 4. ICT Governance Mechanisms

The following ICT Governance Mechanisms are used at the University

	1= Strong Disagree	2=Disagree	3= Don't Know or N/A	4=Agree	5= Strong Agree				
	<b>4.1. Structure Mechanisms</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	The University has instituted structures that ensure accountability and flexibility to the ICT organizational needs.								
2	The CIO is on Board.								
3	The CIO is on executive committee and report to one of the DVCs.								
4	An ICT audit committee is at level of Board of Directors.								
5	There is an ICT leadership councils established at the UR.								
6	There is an ICT organization structure at the UR.								
7	There is an ICT project steering committee at the UR.								
8	There is an ICT steering Committee at the UR.								
9	There is an ICT strategy committee at the UR.								
	<b>4.2. Processes Mechanisms</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	The University is emphasizing on Strategic Information Systems planning								
2	Service Level Agreement are well managed.								
3	ICT Performance Measurement using ICT Balanced Scorecard.								
4	ICT budget control and reporting.								
5	ICT Governance Frameworks like COBIT or ITIL are implemented								
6	ICT Governance maturity is assessed after a certain period								
	<b>4.3. Relational Mechanisms</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	There is an active participation and collaboration between all stakeholders.								
2	Sharing understanding of University/ICT objectives.								
3	Executive/Senior management give the good example.								

4	There is a use of informal meeting between University and ICT executive/senior management about general activities and directions.					
5	Trainings are given to UR staff about ICT services.					
6	Trainings are given to UR ICT staff about the UR direction.					
7	Campaigns are used to explain to UR and ICT Staff the need for ICT Governance.					
8	Systems are in place to share and distribute knowledge about ICTG framework and responsibilities.					
	<b>4.4.ICT Infrastructure</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	I understand that ICT infrastructure is part of overall ICT governance					
2	ICT governance at UR reflects organizations' commitment to allocate appropriate ICT infrastructure for UR's current and future development.					
3	Standardized and integrate ICT infrastructure and systems are in place to optimize costs and information flow across the UR.					