UNIVERSITY OF BOTSWANA

ASSESSMENT OF ICT PROJECT SUCCESS/FAILURE IN BOTSWANA USING PROJECT METRICS MODELS

MASTER OF SCIENCE

(COMPUTER INFORMATION SYSTEMS)

BY

OFALETSE MPHALE

ID NO: 201308034

SUPERVISORS:

DR.T.MOGOTLHWANE

DR. E.U.OKIKE

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A Dissertation submitted to the Faculty of Science, Department of Computer Science, University of Botswana, in partial fulfilment of requirements for the degree of Master of Science in Computer Information Systems

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Signature: ……..… Date: …….

Ofaletse Mphale
201308034
Department of Computer science,
University of Botswana

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Abbreviations and Acronyms

ABBREVIATION	MEANING
BoP	Base of the pyramid
CSF	Critical Success factor
CFF	Critical Failure Factors
EWS	Early Warning Sign
ICT	Information and Communication Technology
IT	Information Technology
IS	Information Systems
LITS	Livestock Identification Trace-back System
NAO	National Audit Office
PMI	Project Management Institute
POM	Processes for Organizational Meanings
SGI	Standish Group International
PRM	Project risk management
SIM	Subscriber Identity Module
SME	Small and Medium Sized – Enterprise
UNDP	United Nation Development Programme
ISc	Information System Component
ROI	Return on Investment
PPADB	Public Procurement Asset & Disposal Board

Definition of the key Terminologies

Information Communication Technology: Refers to the technological side of an information system. It includes hardware, databases, software, networks and other devices. As such it can be viewed as a subsystem of an IS. Sometimes, the term IT is also used interchangeably with IS (Khosrowpour, 1999).

Project Management: Is a methodical approach to planning and guiding project processes from start to finish (Tatnall, 2009).

Senior Management: A group of high level executives that actively participate in the daily supervision, planning and administrative processes required by a business to help meet its objectives (Businessdictionary, 2015)

Project management practises: The use of Project management to successfully initiate, plan, execute, monitor, control and close out projects. It can also be referred as the application of knowledge, skills and techniques to execute projects effectively and efficiently (Gopalakrishnan, 2014)

Project Failure: When the IT system does not perform as expected and also does not operate at the particular time or not being used in the way it is intended. The projects may not produce productive gains even when they are used with right intentions (Wilson & Howcroft, 2002)

Project Success: When the IT system brings to its users cold hard measurable benefits, then it's a success. It can be shiny and new, it can meet all documented requirements, and

it can even be under budget. But if users don't see the benefit it is a failure (Wright, 2011).

Information Technology Project: An IT project that meets at least one of the following criteria: The project is planned to run for at least one-and-a-half years or the team comprises at least 150 people and it involves between 50,000 and 100,000 closely interlinked processes. A project with more than $1 million in labour content (Standish Group International, 2014)

Information System: Information System as the academic study of systems with a specific reference to information and the complementary networks of hardware and software that people and organizations use to collect, filter, process, create and also distribute data. The term is also sometimes used in more restricted senses to refer to only the software used to run a computerized database or to refer to only a computer system (Business-dictionary, 2015 (DÁtri, DeMarco & Casalino, 2008).

Organisation of the Dissertation

In order to provide the reader with an overview of the dissertation, the research structure and details below are summarised and presented in the following way:

Chapter One – Introduction:

This is an introductory chapter which covers a general overview of the research.

Chapter Two- Literature review: This chapter explores the concept of information communication technology from the literature, success criteria and failure criteria, classification strategies, factors contributing to success or failure of the ICT projects in Botswana's context and the Knowledge gap to fill.

Chapter Three –Research methodology:

This chapter deals with a thorough clarification the research strategy, design and method to be used in the research.

Chapter Four– The metrics model system design:

This focuses on the system design, which involves software engineering system models, the algorithm design and the system conceptual class diagrams.

Chapter Five – Research findings and discussions:

This chapter presents the study empirical findings and the discussion of the study results.

Chapter Six –Conclusions and Recommendations:

This chapter draws conclusions based of the findings of the study and suggests a series of recommendations regarding the results of the research. This is the final chapter that

summarises the dissertation by bringing together all the highlights and the bottom line results of the work and the suggestion for future research.

Abstract

Recently, there had been an increase in ICT/IT project deployment in public and private institutes in Botswana. However the majority of the IS projects implemented were not so successful. The goals of Botswana government ICT policy are to; create enabling environments, universal service and access to information and communications facilities, and make Botswana a regional ICT Hub. The concept of project management practise in Botswana towards fulfilling this mandates, is based on a wide range of critical success factors that have been used in other countries. This is due to the inability to realise the main protagonist factors contributing to project success/failures in ICT projects embedded in organizations. This has resulted in some numerous projects experiencing implementation challenges and eventually failing. With these cases, this fortifies the belief that the existing system for quantifying project success is somewhat ineffective. Therefore project managers need to measure project success to improve their project management practise.

The purpose of the study was to assess ICT project success/failure in Botswana using project metrics models. The study was confined to ICT Senior managers in the southern part of Botswana, in the city of Gaborone. The study adopted a qualitative research design. Random sampling was used to select the participants. A metrics model tool was developed and used to analyse and interpret the data.

The results of the study attested that majority of IT projects in Botswana could be successful in functionalities and best acceptable. Unfortunately when these projects are evaluated against theoretical success models and success evaluation criteria's in literature they are not up to their full potential, hence unsuccessful. The study also revealed that senior managers are aware of the factors contributing to the project success/failure in their organisations, but

are keen to deliver functional systems. Hence, they tend to forget or choose to ignore other fundamental areas of project management profession which they regard not beneficial. The study argues that Botswana ICT projects would succeed if top managers provide support to all technological and non-technological project initiatives within IT organisations. Therefore, senior management should not sabotage or abandon some projects for being deemed low priority or not important to the benefits of the organisation. The study thus, recommends that Botswana ICT/IT senior managers need to reassess their project evaluation and delivery framework by putting more emphasis on developing top management support process, adequate training of the personnel and project managers experience.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Success or failure of Information and Communication Technology is often associated with the senior management competence and involvement, desire to meet the clients' quality requirements, complexity of the project scope and the desire to meet professional satisfaction for the project team.This chapter focuses on the background of the study, the statement of the problem, purpose of the study, objectives of the study, research questions, limitations of the study and the study delimitations.

1.1 Background of the study

The use of Information and Communication Technology as a human capital empowering agents cannot be over emphasised. The concern is that in today's world nothing can be done without venturing into Information and Communication Technology to improve the life of human-beings (Marnewick & Labuschagne, 2008). This could be in education, health, economic or infrastructure. This seems to be the case because of proper project management processes. Project management discipline has matured through the publication of several standards, best practices, research articles and significant growth in its community of professional practitioners (Crawford & Pollack, 2007; Marnewick & Labuschagne, 2008).The maturity of ICT project management practices may be construed to mean that majority of projects are completed successfully. Some scholars have revealed success in some of the ICT projects (Ke &Wei, 2004). Ke and Wei (2004) study on the success of E-government projects in Singapore revealed that the success of the E-government project is a result of the government strategic vision, commitment and support to make E-government project a reality.

However, some literature suggests on the contrary, especially in Information and Communication Technology (ICT) environment. It emphasises that organisations are continuously experiencing a high IT projects failure rate due to the political barriers and economic challenges (Robertson & Williams, 2006; Kaur & Aggrawal, 2013). The Standish Group International (2012), a US based Information Technology leader in ICT project and project value performance measurement has been publishing an annual reports highlighting the global trends in ICT project performance in recent years. In its 2012 report, it is reported that only 39% of all ICT projects run in the US had succeeded. The report also categorise areas on which success is based. The key finding in the report is that expensive ICT projects had very low success rate. Similar findings were also discovered by earlier studies (Wallace *et al*. 2004; Wright & Capps; 2010).

Taking an in-depth analysis of the statistical evidence from literature and other studies conducted, it is very clear that the rate of ICT projects failure has gradually increased among hi-tech projects (Whittaker, 1999; Gheorghiu, 2006). Checkland and Holwell (1998) earlier on reckoned that the study of information system (IS) remains a crucial but confused field. Gheorghiu (2006) points out that despite the best practice and the defined procedures and methodology applied in project management field, the world is still experiencing failures in implementing information system based projects, especially in developing countries such as those in the Middle East. This implies that ICT project management is a global problem.

Following years of extensive project management exposure and after interacting with a myriad of clients in diverse project environments, Bauer (2010) and Mwai(2012) came up with a list of critical success criterion from their clients which include; satisfied stakeholders, meeting the project's objectives/requirements, meeting an agreed budget, meet the technical

performance specifications, deliver on time, add value to the client organisation, meeting the clients quality requirements and achieving an acceptable sense of professional satisfaction for the project team.

Nevertheless, the major element that differentiates ICT projects from other engineering projects is that ICT project impairment may not be necessarily of technical short-comings. A well-designed, acceptably implemented and technically well-operational ICT project might still suffer from resistance and rejection by the system users and more importantly organization management. This would lead to an under-utilization or even total abandonment of an information system which is regarded as failure. Moreover, the matter of an IS/IT project adaptation might go overboard just the usability and technical qualification of that system - there are also delicate issues of social and cultural aspect of a project organization not to forget politics in management (Yeo, 2002).

Like most ambitious states, Botswana appreciates the potential benefits of successful information technology implementation in alleviating its economic crisis and enhancement of its public services. According to Nkwe (2012), if ICT is properly used, it has the potential to empower people to overcome development obstacles, address social problems, and strengthen democratic institutions. Since 2007 Botswana has been working on strengthening the use of Information and Communications Technologies (ICTs) to fast-track its socio-economic development. Anchored around one of the seven pillars of an 'educated, informed nation' (Republic of Botswana, 1997), a number of ICT initiatives have been started to drive the vision. This pillar advocates for equipping public libraries with computers and internet. Its primary goal is to narrow the digital division within the country and internationally by ensuring all Botswana citizens have equitable access to ICTs.

However the newly introduced concept of project management in Botswana and its development into the paradigm of information and communication technology has put the spotlights on the pervasive causes of failure in this field. This matter has been aggravated by limited academic research and comprehensive clarification on the influential factors, and reasons behind the causes of successes or failures of ICT projects in Botswana. With all these concerns, an investigation on factors that contribute towards the success or failure of ICT projects in Botswana was conducted.

1.2 Statement of the problem

The ultimate goals of Botswana government ICT policy are to; create enabling environments, universal service and access to information and communications facilities, and making Botswana a regional ICT Hub (Republic of Botswana, 1997). The concept of project management practise in Botswana towards fulfilling this mandates, is based on a wide range of critical success factors used in other countries. This is due to the inability to realise the main protagonist factors contributing to project success/failures ICT projects embedded in organizations. This has resulted in some numerous projects experiencing implementation challenges and eventually failing (Mokgoabone, 2004; Tabane, 2011; Ontebetse, 2013). Therefore, if this scenario persists, then all the mandates enshrined in Botswana vision 2016 will not be fulfilled. It is against this background that a research on assessment of ICT/IT project success/failure in Botswana was conducted.

1.3 Research aim

The major aim of the study was to determine and measure the order of dominance of main factors (causes) of ICT project success/failure occurring in ICT projects in Botswana. The

research is also aimed at proposing a series of recommendations meant to inspire the project success using a project metrics model tool.

1.4 Research objectives

The research objectives of the study are as follows;

a) To establish a measure and the ranking of the dominant critical factors contributing to success of ICT projects in Botswana
b) To establish a measure and the ranking of the dominant factors contributing to failure of ICT projects in Botswana
c) To ascertain whether project manager experience affects the success or failures of ICT projects in Botswana
d) To ascertain whether top management support affects the success or failures of ICT projects in Botswana

1.5 Research questions

The following were the research questions that were used to guide the study;

a) What are the rankings of the dominant critical factors contributing to the success of ICT projects in Botswana?
b) What are the rankings of the dominant critical factors contribute to the failure of ICT projects in Botswana?
c) How does project manager experience affects the success/failure of ICT projects in Botswana?
d) How does top management support affects the success/failures of ICT projects in Botswana?

1.6 Significance of the study

This research is a comparative study using data from various IT success/failure contributing factors from literature against data collected from IT senior managers from Botswana. This was to establish factors and cultural aspects which determine the success/failure of ICT projects in Botswana. The relationships between factors and cultural aspects from different types of projects were considered. The study contribution would be to:

- Establish important factors contributing to ICT project success/failure in Botswana.
- Use a project metrics model tool to measure and rank the dominance of success/failure factors of IT projects
- Use a project metrics model tool to determine the successful or failing IT projects in Botswana.
- Establish what IT components a successful IT project must constitute in Botswana.
- Establish what IT components a failed IT project must constitute in Botswana.

The results of the study would benefit ICT/IT senior managers of Botswana to understand the determinants of project success within organizations that are involved with ICT project implementations. The findings of the study shall also act as a reference which can be used by future project managers of Botswana to effectively plan the use of resources and narrow their ICT projects failure costs. Therefore, enhancing the nation's economic, academia and technological development to a more fulfilling and sustainable ICT project management knowledge base.

1.7 Limitations of the study

Due to time and financial constraints the study did not cover all the senior IT managers around the country. So it was confined to those in the Southern part of Botswana, in particular, Gaborone. Another limitation to the study was that some of the IT senior managers seemed to be reluctant to reveal negative information about the IT project failures. It is the researcher's opinion that sometimes data collected based on people's opinion can be tainted by person bias. This was taken into account during the data analysis. However, the researcher kept assuring the participants that the study was conducted for the academic purposes and assured them that the results of the study would be accessible to the organizations studied for their own consumption.

1.8 Delimitation of the study

The survey subjects of this research were confined to ICT Senior managers; IT Chief Officers, IT project managers and IT project team leaders in hosting organizations in Gaborone. The participants were involved in one of the ICT projects in Botswana from the start of the project to the end. As there was not much project management taking place in public institutions, it is worth noting that this research did not intend to make any distinction among the type of organizations in its investigation. There was only 1 interview that was carried out in public institution. Hence, the study studied the organisations collectively regardless of being public or private sector.

1.9 Summary

This chapter acts as an introductory chapter which covers a general overview of the research followed by statement of the problem, research aims, research objective, as well as the significance of the study and the study's delimitation.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

In this chapter, the existing literature on the subject is reviewed. To gain an in-depth understanding of factors that stimulate ICT project success/failure, the ICT concept is viewed from multiple perspectives. General issues concerning ICT projects successes or failures from different author's perspective are also studied. At the end of the chapter a summary is drawn with the intention to expose the research gaps and areas that may require further research. In the literature, both the terms ICT (Information and Communication Technology) and IT (Information Technology) are used interchangeably. Any difference in the terms is insignificance when relating them to this research.

2.1 The concept of Information and Communication Technology

The emergence of information and communication technologies has brought a lot of changes to the way things are done in the world. These changes are across the spectrum; the way private companies do business, the way universities do things, the way governments provide services to their citizens and the way they interact with stakeholders at large (Nkwe, 2012). In the modern-day economy, enterprises find themselves investing in ICT. This is because this investment can aid them to manage their businesses processes much better. Gardner (1998) also showed that ICT investment can be a source of competitive advantage. However, the history of ICT projects still indicates the significant challenges in successfully attaining a return on many of the IT investment projects (Standish Group International, 2010).

McNurlin, Sprague and Bui (2009), had also showed in their study that the changing environment of IS/IT includes numerous issues that strategists must consider as they make IS decisions. In their study they emphasized that some of the trends related to IS include

flattened organizational hierarchies, increasing reliance on intellectual capital, greater reliance on outsourcing and strategic alliances, changing demographics, consumer focus, and a need to organize and control an increasingly complex and turbulent environment. Kaur & Aggrawal (2013) have discussed types of failures that can be seen in Information Systems to be valid from project manager's stand regardless of type of organizations. Kaur & Aggrawal (2013) emphasise that for an organisation to maintain its competitive edge in the global market, it has to improve its business communication system, project manager's experience in the dynamic environment of the IT market. This suggest that it is a requirement for all organizations to have an experienced IT project manager and an information technology system which provides accurate and timely information, which could be beneficial for IS strategic decisions.

2.1.1 What is Information and Communication Technology?

Many scholars have defined the term **'Information and Communication Technology'** in diverse perspectives. Reddy and Sinha (2003) describes Information and Communication Technology as a wide range of the tools of virtual communication. The United Nations Development Programme (2002) defines ICTs as information handling tools - a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. The definition includes the "old" ICTs of radio, television and telephone, and the "new" ICTs of computers, satellites and wireless technology and the internet. These tools combine to form the "networked" world with a massive infrastructure of interconnected telephone services, standardized computing hardware, the internet, radio and television through which people all over the world are connected. Ogbomo and Ogbomo (2008) deduce from their study that the heart of the definition of information and communication technology lies between two main branches of technology, thus; computing

and telecommunication. In their study they emphasized that the technologies embraced were the computer system, Internet or electronic mail (e-mail), mobile phone and fax machine. Celebic and Rendulic (2011) define the concept of ICT to be the transfer and use of all kinds of information technology systems. Their definition presents ICT as the foundation of an economy and a driving force of social changes in the 21st century that affects all aspects of life.

2.2 ICT/IT Projects classification criteria

Computerized information systems are pervasive in all forms of business organizations. Recent studies show that majority of ICT projects have failed, in the combination of budget and/or schedule overruns and/or for not meeting user requirements (Nasir & Sahibuddin, 2011). The Chaos Report by Standish Group, showed that IT project success is very low as illustrated in Table 2.0 (Rubinstein, 2007)

Table 2.0: Standish Group International IT project success performance over a decade

Benchmark/year	**1994**	**1996**	**1998**	**2000**	**2004**	**2006**	**2008**
Succeeded (%)	16	27	26	28	29	35	32
Challenged (%)	53	33	46	49	53	46	44
Failed (%)	31	40	28	43	18	19	24

Source: Rubinstein (2007)

A more recent Chaos report by Standish Group International (2012) revealed a gradual and promising escalation in IT project success rates (see Table 2.1). The report provided a global view of project statistics with heavier concentration on the United States, Europe

and the remaining represented the rest of the world. The CHAOS report emphasizes that IT projects are classified into three distinct outcomes – which are called Resolutions.

- **Resolution Type 1** is a "**Project Success**" – is when IT project are completed on time and within budget, with all features and functions as specified. Only 39% of projects fell in this category.

- **Resolution Type 2** is "**Project Challenged**." - IT projects are completed, but are over cost, over time, and or lacking all of the features and functions that were originally specified. 43% of all studied projects fell into this Resolution Type 2 (Challenged) category.

- **Resolution Type 3** is termed "**Project Impaired/Failed**." These projects are abandoned or cancelled at some point and thus became total losses. A disturbing 18% of all studied projects fell into this category. Table 2.1 below illustrates the CHAOS resolutions IT success trends.

Table 2.1: The Chaos resolutions IT success trends

RESOLUTION

	2004	2006	2008	2010	2012
Successful	29%	35%	32%	37%	39%
Failed	18%	19%	24%	21%	18%
Challenged	53%	46%	44%	42%	43%

Project resolution results from CHAOS research for years 2004 to 2012.

Source: Standish Group International (2012)

From the table 2.1 above at least for the past 8 years IT projects success have gradually increased, but the failed project had been inconsistent. Regarding the challenged projects the

trends depict a decrease in the rates of such projects since 2004. According to Standish Group International (2012) the increase in success was a result of the following factors;

- Improved project environment of processes
- Effective project methods, skilled personnel
- Effective project costing,
- Tools
- Decisions
- Optimization
- Addressing of the project internal and external influences,
- Effective team chemistry

2.3 IT Project Success or Failure criteria

Many of an organization's projects include the use of information technology. If one of these projects succeeds or fails, it is important that every effort should be made to understand the contributing factors. By recognizing and understanding where the breakdown occurred, organizations can provide mechanisms to constrain them and reduce the possibility of similar future failures (Murray, 2001). Toader *et al*. (2010) relate the words success or failure to the words good or bad and perceived differently by the project participants. In their study they mentioned that a project which exceeded the costs and the planned objectives but which offers the results expected by the beneficiary can be considered a success. In other scenarios, a team member who gains experience by working on the project can consider the project as being successful or a contractor which registered some loss working on the project can consider the project as a failure. Toader *et al.* (2010) believe that the ambiguity in IT projects determination of the success or failure relativity can be difficult to realize. Therefore, the

interpretation of the success or failure of an IT project can differ depending on the period from which the determination was realised in the project life cycle.

According to Belassi and Tukel (1996) it is difficult to determine whether a project is a success or failure. When they argued this ambiguity, they mentioned that the reason for this confusion is that the list of suggested criteria varies tremendously in different studies in most of the literature hence they lack a common consensus. Pinto and Slevin (1989) had previously emphasised in their paper that different parties engaged in a project have different opinions about definition of success or failure and in most cases parties evaluate project success differently, therefore give value to the results differently.

According to Horine (2005) lack of a universal harmony to compromise project success or failure metrics, lack of common collective acceptance standards among all key stakeholders engaged in a certain project and the discrepancy between what business companies call for project success are the primary contributing factors that affects success/failure outcome of every ICT projects implementation.

2.3.1 IT projects success factors

According to Goatham (2013) an IT project is successful if it falls in one of the following categories of project success;

- Tier 1 – The project is a success if it delivers all or most of what it said it would (the scope), regardless of schedule or budget performance
- Tier 2 – The project is a success if it delivers what it said it would, on schedule and/or within the agreed budget

- Tier 3 – The project is a success if it delivers what it said it would, on schedule, within the agreed budget and to the expected quality standards
- Tier 4 – The project is a success it delivers on all agreed project objectives, be they scope, schedule, budget, quality or outcomes based (i.e. goals to be achieved or strategic positions to be attained)
- Tier 5 – The project is a success if the product produced by the project creates significant net value for the organization after the project is completed.

Hastie (2006) defines project success as a measure of the effectiveness of the organisations processes for implementing new IT projects, up to the point of deployment of the new system to the end user community. This incorporates all the project related activities to ensure; project delivery on time, project delivery on budget, project delivery of required features and functions and project delivery to the requisite quality standard. Kerzner (2003) described a successful project with seven characteristics as 'critical success factors' (CSFs); within the planned time, within the predicted budget, aligned with expected performance and specification level, accepted by the client, minimum or mutually agreed on scope alterations, minimum disturbance of the main stream of work flow in the host organization, and finally the least effect on the corporate culture.

According to Thong *et al*. (1996) project success is the extent to which an IT project actually contributes to achieving organizational goals. According to Day and Bobeva (2003) project managers have a great influence on the success of an IT project, by performing a multitude of roles according to the project situation. Krahn and Hartman (2004) emphasize that the combination of a changing organizational environment and changing project characteristics make the role of the project leader difficult. As such, a competent project manager is

frequently regarded as having a significant impact on overall project success as well as being critical to other project elements, such as the success of the project team, including team member motivation and creativity.

In a study by Archibald (1976), some of the skills that a successful IT project manager should acquire are;

- Flexibility and adaptability
- Preference for significant initiative and leadership
- Aggressiveness
- Confidence,
- Persuasiveness
- Verbal fluency
- Ambition
- Forcefulness
- Effectiveness as a communicator and integrator,
- Broad scope of personal interests
- Able to balance technical solutions with time,
- Well organized and disciplined, a generalist rather than a specialist,
- Able and willing to devote most of his or her time to planning and controlling,
- Able to identify problems and willing to make decisions.

This strong link with success ensures that project manager competencies are of particular interest.

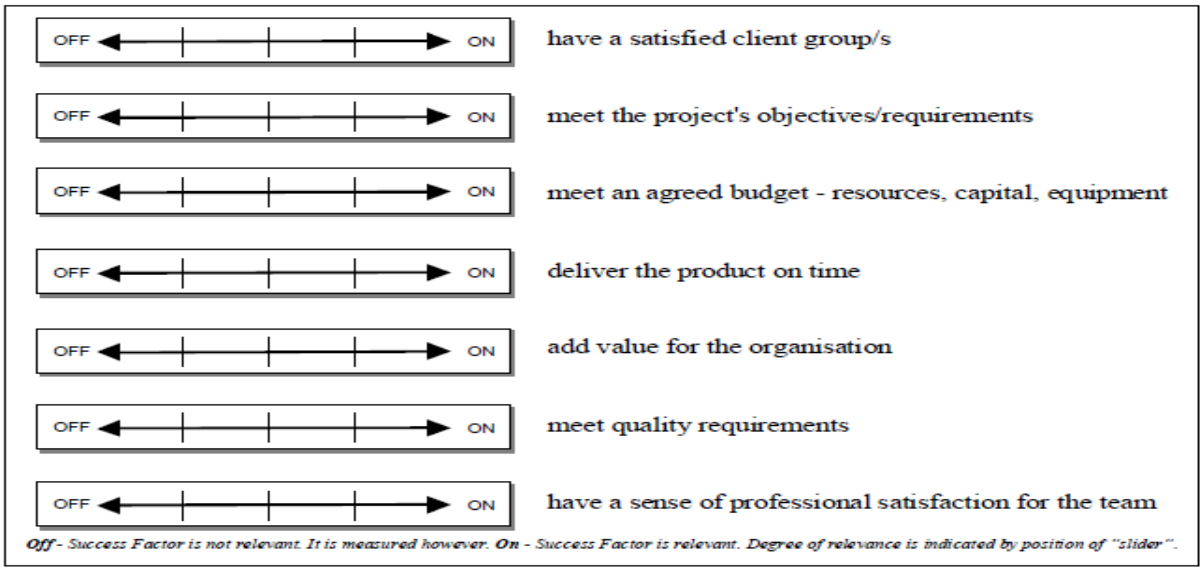
Morris and Hough (1987) have added some new perspectives to the criteria of success. In their study they argued that as a project generally should deliver its pre-stated functionality

and objectives, it should commercially be profitable to its contractor and also should get terminated sensibly and effectively if it is sensed that it is destined to failure. Wateridge (1995) had looked into the success criteria from the IT project management perspective. In his study; being on time, constrained budget, meeting the users' requirements and functionality were crucial factors that would ensure a successful project.

Wateridge (1995) had also shown in his study findings that, there is great a disagreement on how different role-players such as project users or project managers are weighing success/failure definitions. According to his findings, when it comes to project managers' point of view, while they believe in 'meeting user requirements' as both a success/failure criterion, they prioritize 'meeting timescales and budgets' as to avoid project failures and 'meeting expected quality' and 'organization's commercial prosperity' as significant signs for a successful project. On the other hand, from project users' perspective, where 'meeting user requirements' and 'staying in the planned budget' are recognized as criteria for both success /failure, they specifically identify their own 'happiness' as a success criterion and 'achieving project purpose' as a failure criterion. This clearly suggest that definition of success/failure is still a complicated issues, therefore everyone defines success/ failure of the IT project differently depending on their IT project level of satisfaction.

Thomsett (2002) had developed a framework for establishing and running an IS project. The framework has seven dimensions which need to be considered and balanced when implementing and running a project. Figure 2.0 illustrates Thomsett framework for achieving success in IT projects.

Figure 2.0: A Framework for achieving success in IT projects



Source: Thomsett (2002)

Thomsett (2002) argues that project stakeholders need to assess these seven elements and decide which must be placed where relative to the others. The primary rule is that only one slider can be fully "on" – this will be the dimension that drives decisions, traded-offs and actions on the project. He further argues that project success is determined by the element of overall Information Technology success. Provided the project does deliver a working product, the delivery of value to the organisation is dependent on the successful integration of the new product into the organisation's business processes.

In another study by Brocke *et al*. (2009), an in-depth analysis and summary of various sources from literature on project success factors was conducted. Their findings are shown in Table 2.2. The table shows that the top 4 most critical success factors includes; effective top management support, effective project management, change management and effective project team communications.

Table 2.2: A broad the literature summary on critical success factors in IT projects

Success Factor / Reference	(Thite 2000)	(Hyvärt 2006)	(Turner 2004)	(Collins 2007)	(Baccarini et al. 2004)	(Teo and Ang 1999)	(Ashrafi and Hartman 2002)	(Legris and Collerette 2006)	(Tesch et al. 2007)	(Kauppinen et al. 2004)	(Nah and Delgado 2006)	(Loonam and McDonagh 2005)	(Kappelmann et al. 2006)	(Fui-Hoon Nah and Lee-Shang Lau 2001)	(Mendoza et al. 2006)	(Plant and Willcocks 2007)	Sum
Top management support					x	x	x	x	x	x	x	x	x	x	x	x	12
Project management			x				x			x	x	x	x	x	x	x	9
Change management							x		x		x	x	x	x	x	x	8
Communication			x			x	x				x		x	x	x	x	8
Management of requirements				x				x	x	x			x		x	x	7
User training, education and support						x		x		x		x			x	x	6
Project team composition, skills, & commitment									x		x		x	x	x	x	6
Resources								x	x			x	x			x	5
Business process reengineering										x		x		x		x	4
Stakeholder involvement										x			x		x		3
Project champion												x		x		x	3
Management of expectations					x				x							x	3
Software development, prototyping and testing				x										x			2
Business plan and vision											x			x			2
Commitment		x														x	2
IT function capabilities						x					x						2
Technology and technical issues					x										x		2
Use of consultants												x				x	2
Cultural change										x							1
Leadership style	x																1
Cooperation																x	1
Vendor capabilities																x	1
Security strategy															x		1
Outsourcing management															x		1
Implementation strategy															x		1
Sum	1	1	2	2	3	4	4	4	6	7	7	8	8	9	12	15	

Source: Brocke et.al (2009)

A study by the Standish Group International (2010) have cited the top ten (10) most contributing factors towards project success to be; top Management support, user Involvement, clear business objectives, emotional maturity, optimization, agile process,

project management expertise, skilled resources, tools and good IT infrastructure. Moreover, top management support has been shown to be the important factor for IT project success (Coley, 2007; Boettcher, 2007; Young & Jordan, 2008).Some of the issues and the activities that managers must give serious attention to, are shown in Table 2.3 following.

Table 2.3: Issues of project management success

Issues	Description	Activities
Project focus	Time, budget and quality.	Focused on achieving these broad goals.
Planning	Engage in planning – detailed and systematic.	Planning and re-planning
Sense of urgency	Limited time, money, and other resources.	Regular status checks, meetings, and reminders are essential.
Use a time-tested, proven project life cycle	Use standard models to build into project plans.	Identify the best project life cycle.
Visualised and communicated in vivid detail	Avoid vague descriptions.	Focused in the same direction.
Evolve gradually to succeed	Involvement of users in cost and time estimation and risk Management	Maintain a controlled evolution.
Clear approvals and sign-off by sponsors	Clear approval points.	Examine and approve.
Fight for time to do things right	Do it right the first time.	Demonstration and why it is necessary?
Matched by equivalent authority	Project outcomes.	Acquire and coordinate resources, request.
Project sponsors and stakeholders must be active participants, not passive customers	Most project sponsors and stakeholders rightfully demand the authority to approve project deliverables, either wholly or in part.	Helping to define deliverables. Keeping the project moving.
Acquire the best people	Get the most skilled, experienced and best qualified	Identify the right team members.
Actively set priorities	Strategies, establishes criteria	Choose the right leader to prevent multi-project log jams.

Source: (Coley 2007; Boettcher, 2007)

In a study conducted by Horine (2005), from an idealistic perspective, he summarized a comprehensive score of qualities and traits common among those most successful projects.

From an academic point of view he believes that although no two projects are completely identical and each has its own set of unique challenges, there exists always a shared core of principles lying at the heart of any project success. Horine (2005) emphasize that a project is considered successful if it encompasses the following factors;

- Be aligned with organizational objectives
- Have effective top-management support
- Have effective and competent leadership
- Address all key stakeholders' agreement on the purpose, goals, and scope of the project
- Address all key stakeholders' shared common vision on the project results
- Address all key stakeholders' shared realistic expectations for the project results
- Have results that meet the expectations of the key stakeholders
- Be able to manage and validate stakeholders' expectations constantly all the way to the end
- Make an investment in proper planning
- Have clearly defined and agreed upon scope, approach, and deliverables during planning
- Communicate clearly each stakeholder's and team member's role(s) and responsibilities
- Place a high priority on accurate and complete work effort estimates
- Develop and agree upon a realistic schedule
- Make the project team to have a strong results-focus and customer-orientation
- Provide consistent, effective, and focused on 'understanding' project communications

- Measure project progress consistently from the current baseline
- Pursue aggressively project issues and subsequent action items
- Foster a strong sense of collaboration and teamwork
- Manage closely expectations and changes surrounding scope, quality, schedule, and cost
- Provide skilled project resources when needed
- Identify proactively risk and determine mitigation strategies to reduce project exposure

Research in Information and Communication Technology has shown that higher level of user participation in IT projects leads to a higher chance of system success (He & King, 2008). User participation improves the system quality by providing a more and complete assessment of user information requirements, avoiding development of unacceptable or unimportant features and improving user understanding of the system (Heeks, 2002; He & King, 2008).

However, Zink, Steimle and Schroder (2008), claim that there is no standard or a predetermined model that organisation must follow to implement a successful ICT project. Management should take into consideration the elements of the project environment that play a major role within the organisation (Zink, Steimle & Schroder; 2008). Therefore, a full understanding of the conditions and factors that contribute to failure and those which result in success is vital and it is the key to reducing the risk of failure.

2.3.2 IT projects failure factors

Recent studies define an IT project failure as when the IT system does not deliver what was required, in line with expectations, within the expected time and expenditure (Standish Group International, 2013; Beals, 2012). Flowers (1996), defined an IT project as a failure if any of these following factors occurs:

- When the system as a whole does not operate as expected and its overall performance is sub-optimal;
- If, on implementation, it does not perform as originally intended or if it is so user-hostile that it is rejected by users and underutilized;
- If, the cost of the development exceeds any benefits the system may bring throughout its useful life
- Or due to problems with the complexity of the system, or the management of the project, the information system development is abandoned before it is completed.

The key reasons for ICT project failure includes; lack of project management expertise, ineffective leadership style, lack of support from the IT department, changed user requirements, and the project size and complexity (Huang *et al*. 2004; Gottschalk and Karlsen 2005).

In a global research conducted by Gheorghiu (2006) showed that around 70 – 80% of all the information communication technology and information systems fail. Furthermore, a study by Ernest and Young (2009) cited in Nawi, Rahman and Ibrahim (2012) revealed that more than 50% of ICT projects were not completed on time or on budget. 5% of the projects were stopped before they were even completed. According to Wright and Capps (2010) most large

ICT projects will exceed their original budgets and timelines by more than 50% and this occurs much more often in the government than in the private industry. In addition to that, there are evidence that “runaway” projects occur frequently, and new empirical evidence suggest that they occur more often in government organizations (Wright & Capps, 2010; Keil et al, 2000).

Coley (2007) pointed out the three most critical failure factors which they believe contribute to IT project management failures to be as follows;.

- **Planning and Estimation factor**

  This factor refers to initial cost and schedule estimates are not revised when more information becomes available as a project progresses. Also plans are not used correctly or used to guide the project forward, thus causing the project to fail.

- **Implementation factor**

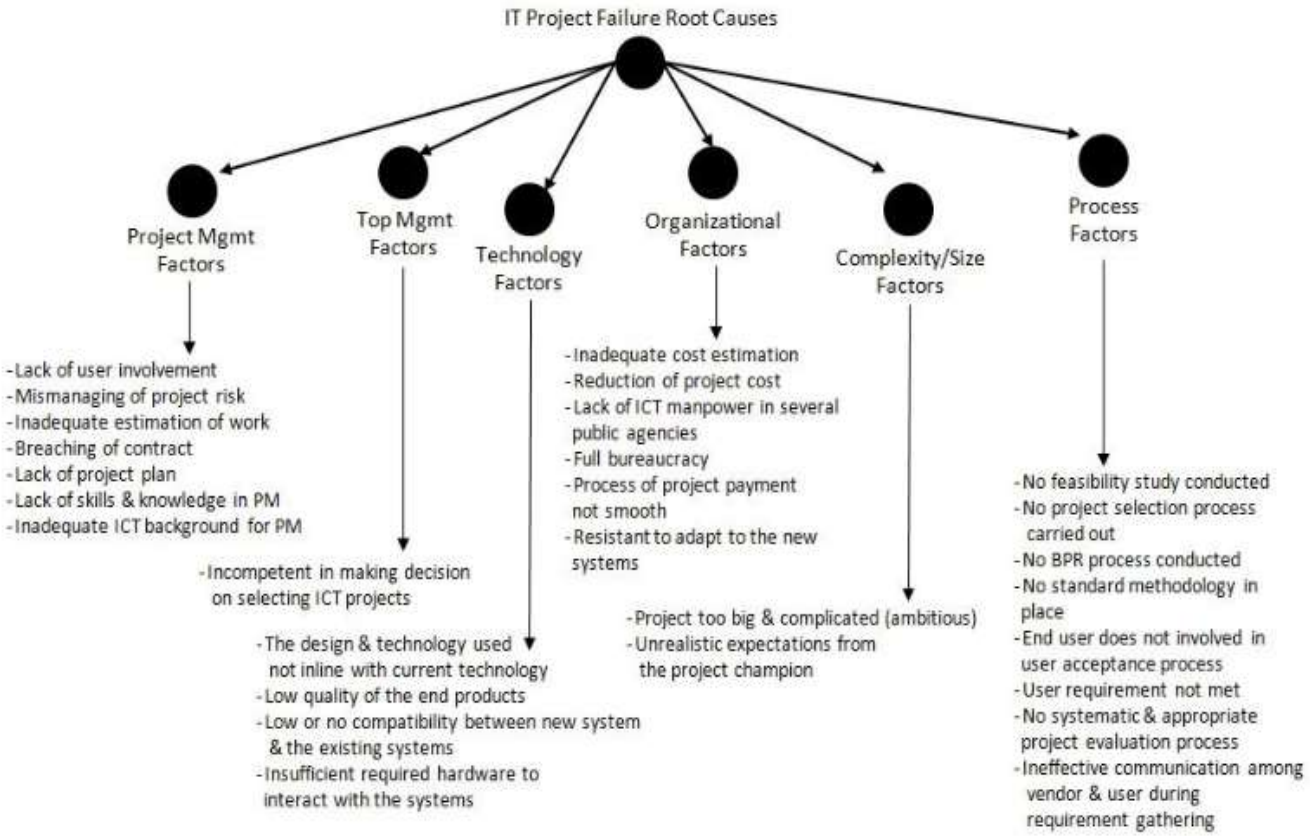
  This is caused by project scope changes, incorrect use of project methodology, major changes in the requirements and testing, and/or inspections are poorly done.

- **Human factor**

  Project managers are not trained to acquire the necessary management skills. Also, some managers are not able to apply and put the theory of project management into practice. Poor communications are also one of the human factors that cause a project to fail.

In a study by Al-Ahmad (2009) the root causes of IT project failures could be categorised in to 6 generic types. Figure 2.1 illustrates the 6 generic types of project failure root causes.

Figure 2.1: IT project Failure root causes



Source: Al-Ahmad (2009)

In a more recent study by Ibrahim *et al*. (2013), the project failure factors were aggregated from various sources from literature by the scholars. Table 2.4 illustrate their findings.

Table 2.4: Summarized IT failure factors from literature

Iyer & Jha, (2006)	Tsun Chow & Dac-Buu Cao (2007)	Yeo (2002)	Wong & Scarbrough (2005)	Yongyi Shod & Ying Ying, (2005)	Kaur; Aggarwal & Singh (2004)
Conflict Among Project Participants	Lack of executive sponsorship	Underestimate of timeline	ERP system misfit	Weak definition of requirements and scope	Poorly stated project goals
Project Manager's Ignorance	Lack of management commitment	Weak definitions of requirements and scopes	High turnover rate of project team members	Reactive and not proactive in problem solving	Poor project team composition
Hostile Socioeconomic Environment	Organizational culture too traditional	Inadequate project risk analysis	Poor consultant effectiveness	Poor or lack of business process reengineering	Lack of project management and control
Owner's Incompetence	Organizational culture too political	Incorrect assumptions regarding risk analysis	Poor IT infrastructure	Underestimate the gap between technology and ability	Little technical know-how
Indecisiveness of Project Participants	Organizational size too large	Ambiguous business needs and unclear vision	Poor knowledge transfer	Unrealistic expectation of the information system	Poor technology base or infrastructure
Harsh Climatic Condition at Site	Lack of agile logistical arrangements	Lack user involvement and inputs from the onset	Poor project management effectiveness	Ineffective internal communication	Lack of senior management involvement
Project Specific Factor	Lack of necessary skill-set	Top down management style	Poor quality of Business Process Reengineering	Involvement of high degree customization	
Project manager's ignorance and lack of knowledge	Lack of project management competence	Poor internal communication	Poor quality of testing	Organizational rigidity and bureaucracy	
Aggressive competition during tender stage	Lack of team work	Absence of an influential champion and change agent	Poor top management support	Insufficient authority of the project manager	
	Resistance from groups or individuals	Reactive and not pro-active in dealing with problems	Too tight project schedule	Lack of support from middle-level function managers	
	Bad customer relationship	Consultant/vendor underestimated the project scope and complexity	Unclear concept of the nature and use of ERP system from the users perspective		

Ali-Mohammad (2007)	Nasir & Sahibuddin (2011)	Winters (2003)	Marchewka T. (2006)	Garg, (2010)	Umble (2003)
Lack of commitment from organizational top management to support IS/IT projects	Support from top management	Lack of User Involvement	Incomplete requirements	Lack of top management commitment	unclear Goals
General senior management's lack of knowledge about structures and functions of IS/IT	User/client involvement	Long or Unrealistic Time Scales	Lack of user involvement	Poor middle management commitment	top management commitment
Conflicting decentralized decision-making systems in organizations for IS/IT projects	Committed and motivated team	Poor or No Requirements	Lack of resources	inadequate functional requirements	poor Project Manager
Cultural issues in acceptance and making proper use of IS/IT systems in organizations	Unclear requirements and specifications	Scope Creep	Unrealistic expectations	Over-reliance on heavy customization	Organizational resistance
Lack of expertise in terms of project management and IS/IT knowledge & techniques	Unrealistic schedule	No Change Control System	Lack of executive support	Inaccurate data	inadequate training
Conflicting goals and miscommunication between department managers and project managers	Unfrozen requirement	Poor Testing	Changing requirements & specifications	Poor quality of testing	poor team
Overlaps of planning, design, implementation, controlling and operation phases in IS/IT projects	Inadequate resources		Lack of planning	Poor consultant effectiveness	wrong Data
Dysfunctional implementation & operation phases in IS/IT projects	Poor quality management		Didn't need it any longer	Poor IT infrastructure	technical difficulties
Long term investment to reach economic efficiency	End-user training provision		Lack of IT management	Users" resistance to change	
Lack of expertise in terms of project management and IS/IT experience	Supporting tools and poor infrastructure		Technology illiteracy	High Attrition rate of project team members	
				Inadequate resources	

Source: Ibrahim *et al*. (2013)

Based on the summarised table 2.3 above by Ibrahim *et al*. (2013), IT project failure factors are categorised into five main categories, which are; factors related to the project, factors related to the project manager, team member, organization and environment.

- **Factors related to project**: Size and value, Uniqueness of project activities, Density of a project, Life cycle and Urgency.

- **Factors related to the project manager**: Inability to delegate authority, inability to trade off, inability to coordinate, Perception of his role and responsibilities and incompetent Commitment.

- **Project team members**: poor technical background, poor communication, weak trouble shooting and Commitment

- **Factors related to the organization**: Lack of top management support, weak project organizational structure, lack of functional managers' support and Project champion.

- **Factors related to the environment**: Political environment, Economic environment, Social environment, Technological environment, Nature, Client, Competitors and Subcontractors.

According to Kappelman *et al*. (2006) project failure factors can be associated with a concept of 'Early Warning Signs' (EWSs). EWS is an event or indication that predicts, cautions, or alerts one of possible or future problems. They are noteworthy symptoms showing up long before occurrence of a failure – mostly in the first 20 percent portion of the project's life-cycle.

Kappelman *et al*. (2006), further emphasize that the prevailing EWSs are divided into two main groups, which are; people-related and process-related

- **People related:** The people-related to EWSs of IS project failure formed around five groups of people, thus, top management, project management, project team members, subject matter experts (SMEs) – experts proving guidance to the project team and stakeholders (users)

  The people related EWSs includes;

  - Lack of top management support,
  - Weak project manager,
  - No stakeholder involvement and/or participation,
  - Weak communication of project team,
  - Team members lack of requisite knowledge and/or skills

- **Process related**: The process-related EWSs of IS/IT project failure revolve on five project management processes namely: - requirements (including a business case), change control, schedule, communications and resources

  - The process related EWSs includes;
  - Lack of documented requirement and/or success criteria,
  - No business case for the project,
  - No change control process,
  - Ineffective schedule planning and/or management,
  - Communication breakdown among stakeholders and resources allocated to a higher priority project.

Amoako-Gympah (2005) constructed a table to depict the major IT project failures in IT organisation in recent years. Table 2.5 illustrate his findings.

Table 2.5: Major Failures of IT in various organizations

Year	Organization	Outcome (Cost USD)
2010	New York City	$700 million-plus to modernize its payroll system
2008	Waste Management Co.	$100 million-plus of legal case against SAP ERP
2005	Hudson Bay Co.(CANADA)	Inventory System Problem contribute $33.4 in Losses
2004	Hewlett Packard Co	Problems with ERP contribute $160 in losses
2000	Nike Co.	A $400 Million upgrade to Nike's ERP resulted in $100million lost sales

Source: Amoako-Gympah (2005)

Bentley and Whitten (2007) argue that the most critical factors that could harm the IT project outcome must belong to some of the following factors;

- Lack of top management commitment to the project,
- Poor user commitment,
- Inadequate user involvement,
- Requirements not well understood, failure to manage the expectation of users,
- Changing scope,
- Lack in skills, new technology,
- Insufficient Staffing,
- Lack of organizations' commitment to a systems development methodology,

- Poor estimation techniques,
- Inadequate people management skills,
- Failure to adapt to business change and failure to manage the plan.

There is evidence from literature that IT failures were covered up, ignored, and/or rationalized by ICT/IT personnel (Standish Group International, 2007). Sauer (1993) takes a general system standpoint approach and argues his point that a project should be considered a failure only if it is abandoned at any point in development or operation stages. This criterion for determining failure would explain the behaviour of a system that translates to the goal of survival. This means that a system acts on its environment to obtain resources that will maintain the system's continuous operation. Thus, a system is not a failure as long as it will be able to attract the necessary resources for survival.

2.4 IT Project critical Success or Failure factors

In this section of the literature, success factors and failure factors were compared by several scholars to draw a deeper understanding of the subject matter. Linberg (1999) has developed a framework with intent to challenge the idea that the project success or failure definition should be based only on project completion or project cancellation. Table 2.6 describes different levels of project success or failure from software developer perspective.

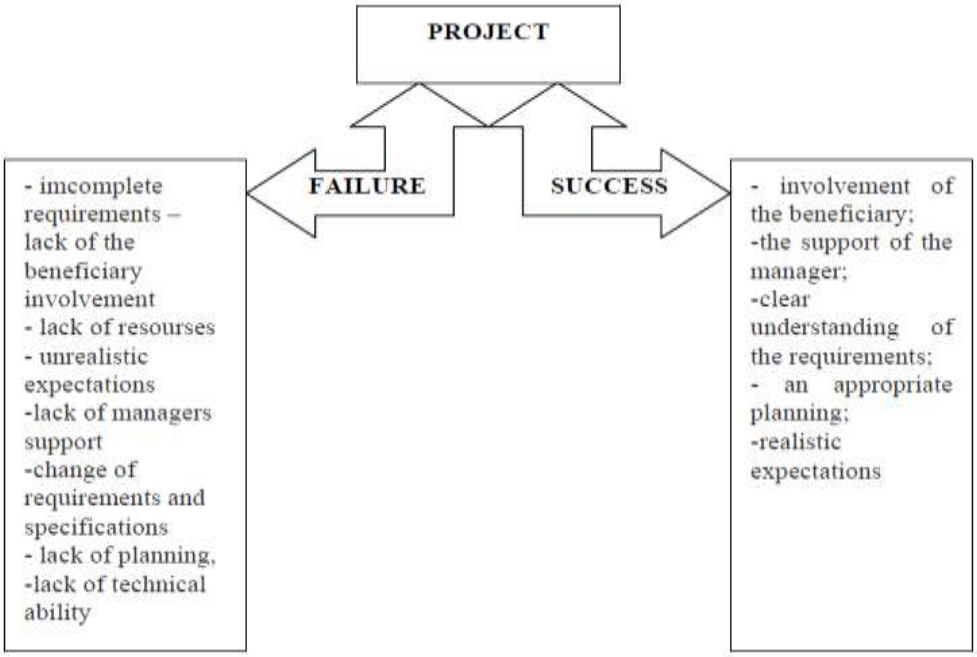
Table 2.6: IT Project success or failure degrees

Project Outcome	Failure	Low Success	Successful	High Success	Exceptionally Successful
Project Completed	Developing a product that causes customer discontent (not meeting quality expectations)	Below average cost, effort, and schedule performance compared to industry AND meeting quality expectations	Average cost, effort, and schedule performance compared to industry AND meeting quality expectations	Better than average cost, effort, and schedule performance compared to industry AND meeting quality expectations	Meeting all quality, cost, effort and schedule expectations
Project Cancelled	Not learning anything that can be applied to the next project	Learning can be minimally applied to future projects	Learning can be applied to future projects. Some artifacts from the canceled project can be directly used on a future project	Substantial learning can be applied to future projects. Significant numbers of artifacts from the canceled project can be directly used on a future project	A canceled project can not be called "exceptionally successful"

Source: Linberg (1999)

Baker *et al.* (1983) introduced the concept of 'perceived performance' factor to be measured rather than absolute performance as the measures for project outcome quality and proposed ten discerning factors. Hughes (1986) research suggested inappropriate basic managerial principles and faulty communication of project objectives are major success or failure reasons. The Standish Group International (2001) outlined factors contributing to the success or failure of project and had illustrated its study findings in Figure 2.2.

Figure 2.2: Factors contributing to success or failure of the IT project



Source: Standish Group International (2001)

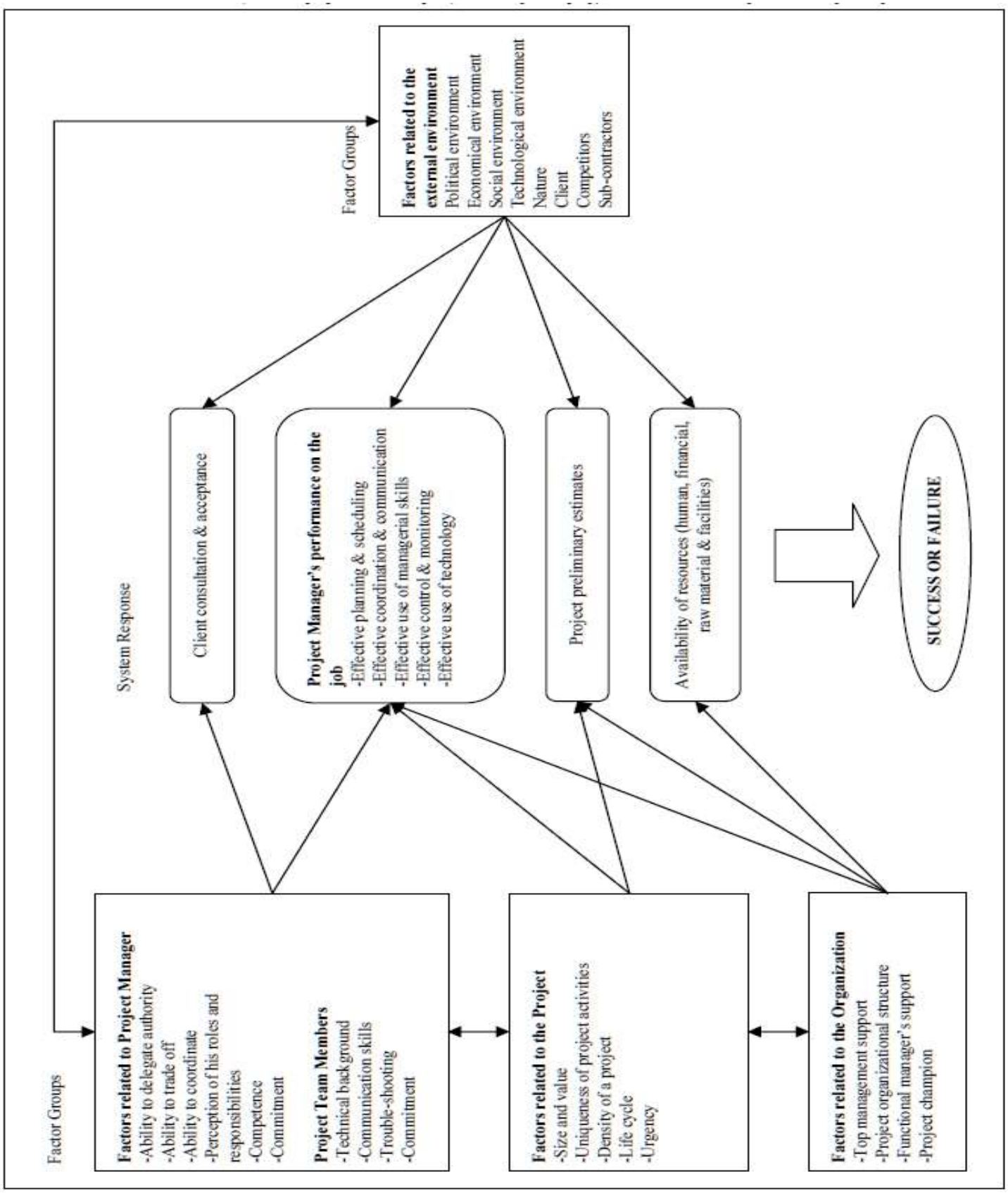
It is significant to anticipate whether a project is successful or failure in the initial phases of project planning. From the project manager's perspective project success factor is the realization of the planned objectives, the delivery of results in accordance with deadlines and budget. The project success factor functionality should fit to the mission, objectives and purpose of the organization. A project is said to be a failure when the planned results were not delivered according to the expectations. However, if the results of the project are accepted by the beneficiary then the higher cost and the delays must be tolerable (Toader *et al*. 2010).

2.4.1 Classification of IT project success or failures factors

Belassi and Tukel (1996) noticed lack of classification of individual success or failure factors according to some criteria making it impractical to conclude any kind of cause-effect relationship between them. Moreover, many of these factors do not directly influence the success or failure of a certain project. Normally a combination of factors at various levels of

project life-cycle might lead to success or failure which would emphasize more the need of categorizing these factors. These two scholars by introducing a new framework for project success or failure factors try to identify the categories these factors belong. This would put project managers in a position to comprehend better which aspects of projects might be more crucial for their acceptable accomplishment and understand the interrelationship amongst different factors in different groups. While this framework is considered to be a general scheme, it is also very adaptable to diverse situations and professional project managers can easily include the elements critically related to their specific project's success. This framework groups the success/failure factors into four categories concerning; project, project manager and team members, organization hosting the project and external environment. Figure 2.3 illustrates the study findings.

Figure 2.3: Classification of IT project success or failure factors



Source: Belassi and Tukel (1996)

Cookie-Davies and Arzymanow (2002) in a different but holistic approach studied 136 European projects and pinpointed 12 ‘real success factors’ categorized under 3 titles related to:

- **Project management success**: Issues related to project risk management (PRM), for example; PRM education, ownership of risks, a maintained risk register and a PRM plan; documented organizational responsibilities; project stage duration; mature scope change management process; and maintenance of the performance measurement baseline

- **Individual project success**: Issues related to collaboration between project managers and operational/line managers in a business

- **Consistent successful projects:** Issues related to program management to support projects matching business strategy, metrics linking project performance with expected future success, and finally an effective lessons-learned system

2.5 Other factors contributing towards IT project success /failure

2.5.1 Planning-related Success or Failure Factors

The relationship between project planning aspect and the degree of success or failure in projects is quite a controversial matter. Where there is a vast amount of positive ideas in favour of a concrete planning for a project to ensure the success, the literature reviewed has brought to the scene some opposing opinions.

Dvir *et al.* (2003) argue that even though a decent level of planning for a successful project is vital, there is no an essential positive correlation between planning and success – if not

negative all together. Kippenberger (2000) pointed out earlier on that in reality being able to perform a project according to what has been planned is an exception rather than a norm. He showed that too much emphasis on planning and trying to stick to it would decrease the chances of success for a project. The two important points related to excessive attachment to the plans he presented were that;

- Firstly. financial planning focuses more on the cost than the time, so spending excessive efforts to save money to avoid cost overruns, will create delays which result in time overruns that are more costly than what was planned for.

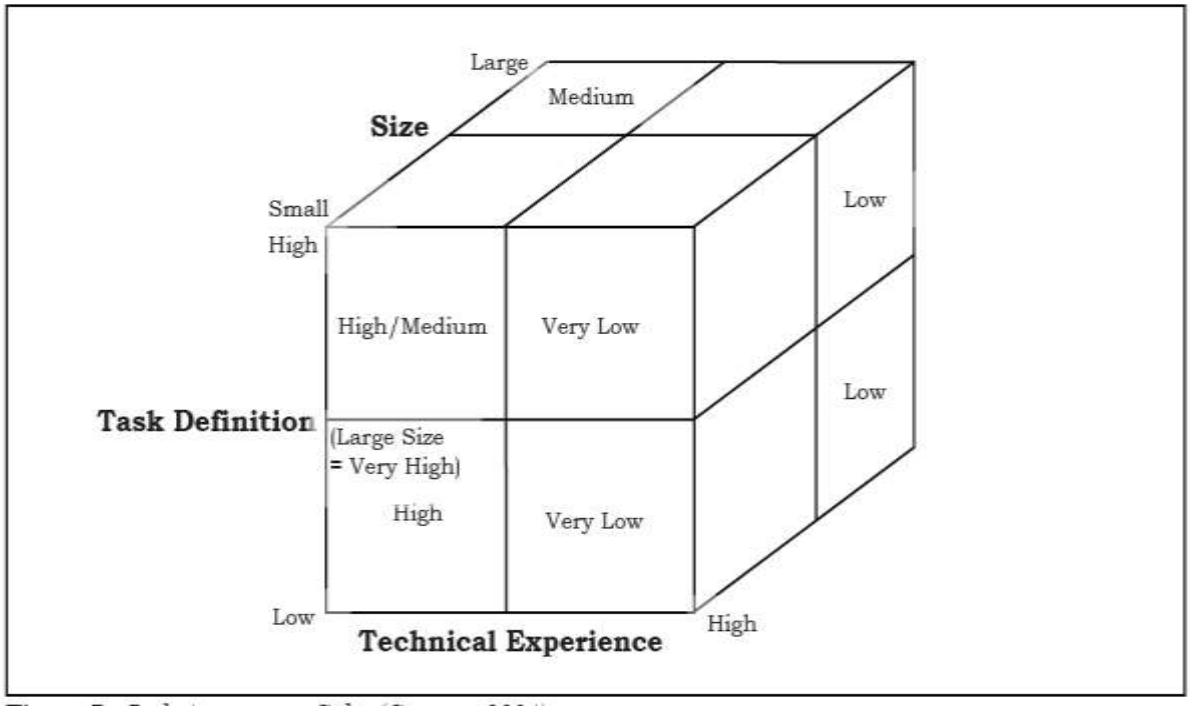
- Secondly, when it comes to time planning (scheduling), project managers either constantly look backwards or so fixed at the present moment to compare the progress according to the plan which consequently prevents them from looking forward and anticipating changes and doing corrections in time.

2.5.2 Risk Management-related Success or Failure Factors

Remenyi (1999) discusses that in the field of IT projects, there is surprisingly an excessive amount of lip service regarding risk management where organizations either totally disregard the assessment of likelihood and impact of imminent risks or do not at all sufficiently accredit it and consider it as a redundant add-on to the project life-cycle. He believes that risk management should be seen as an integral and dispensable ingredient of fulfilling IT project management. In his opinion, the risks in IT projects can fall into any of three classes of: business, development or architecture. Additionally, the significance of risk management's role is entirely proportionate with the size of the organization. The research confirms that the larger the organization, the greater the influence of risk management as a factor in IS/IT project failure (Whittaker, 1999).

Cannon (1994) from a series of case studies extracts three new dimensions of: size of the project, experience of the technology and degree of the specificity of the end result as the major sources for an IT project's risk. On this basis, as the size of the projects increases, specificity of the requirements/objectives of the project (task definition) plummets or the experience of the employed technology and the competence of its executive people (technical experience) are kept low, the probability of failure soars. This is the perspective that brings to the scene what Cannon (1994) calls 'risk assessment cube' and opens up the involvement of risk management as a major factor in project that contributes to the success or failure of ICT projects. Figure 2.4 illustrates how these dimensions would affect the degree of risk in a project success.

Figure 2.4: Risk Assessment Cube



Source: (Cannon, 1994)

Kumar (2002) introduces a very intriguing framework relating well known IT projects risks to their proper resolutions under risk reduction and risk hedging strategies. In his study

findings he deduced that traditional methods such as checklists of risks and their probability analysis for risk reduction strategy and 'options' approach based on instead of 'decision tree' approach for risk hedging strategy. He emphasized that these two strategies complementing each other could contribute a lot to IT projects risk management. Table 2.6 demonstrates some risks and their related remedy strategies:

Table 2.7: Risk reduction and hedging strategies

Risk	Risk reduction strategies	Options-based risk hedging strategies
Change requests due to business changes	Interview multiple people to understand different types of uncertainties and impact on different stages of the project	Option to defer stages of the project affected by uncertainties. Option to contract scale of the project
Change request due users lack of knowledge of their own requirements or overlooked requirements	High degree of feedback and user interaction through diagrams, and prototypes training	Option to defer stages of the project affected by uncertainties. Option to contract scale of the project
Hardware or software price risk	Clauses in contracts (if possible)	Option to defer commitment to hardware purchases
Hardware or software technology change risk	Clauses in contracts (if possible)	Option to defer hardware decisions
Technical performance risk	Use of experienced consultants	Option to expand. Option to contract or abandon
Managerial support risk	Explain costs and benefits of the project including option values	Option to expand. Option to contract or abandon

Source: Kumar (2002)

2.6 Information and Communication Technology in Botswana

Due to the implication of the poor policy ICT project implementation in Botswana the tendency by government is to vaguely admit guilt and state that poor project implementation leads to cost overruns due to delays in implementation. The amount of loss in terms of the country's macroeconomic prospects, social development, finance, life opportunities, service

delivery, social well-being and the general quality of life accruing from poor implementation are increasing daily (Mmegi-Online, 2008).

According to Nkwe (2012), Botswana has established a robust government data network that connects government offices countrywide. Yet, the country has seen limited progress so far in its goal of becoming a software and ICT-based service exporter, like Ireland, India and Indonesia, despite serious efforts in this respect. Nkwe points out that the government of Botswana still perceive ICT as a key driver of its developmental agenda: economic growth, poverty reduction and global competitiveness. He further on elaborates his view by stating the adoption of the Botswana government ICT policy in 2007, named Maitlamo and in its Vision 2016 approved in 1997, the ICT is well pronounced in the “Informed and Educated Nation” pillar. The Maitlamo has the following goals; Create enabling environment, Universal service and access to information and communications facilities, Making Botswana a Regional ICT Hub.

2.6.1 Botswana ICT project Success Factors

It should be appreciated that project management as a profession, if adopted, should be embraced with a developmental objective like any other profession. That is, it has to grow through knowledge generation. A contemporary dispensation of project management takes into account issues of procurement, ethics, stakeholder expectations, communication, integration, and other equally important parameters that all add up to what could be termed "project critical success factors". It is this consideration of project success aspects that Botswana should move towards and begin to address the completeness within which government-funded projects should be viewed, and subjected to (Maruapula, 2007).

According to Nkwe (2012), the government of Botswana should play a leading role in developing the ICT infrastructure as this is a requirement for successful e-government implementation. This can be making sure that the nation's internet backbone and the International Gateway are managed effectively. Further, the government should encourage developing of fibre-optic network for efficient broadband communication, reducing the rates for internet access through ISPs (Alshehri & Drew, 2010).The government should create an enabling environment for the adoption of ICT in everyday lives of its citizens as this is the start-point of e-government.

Apart from the already outlined project success factors, it is crucial that project rationalisation and optimisation be done from the start. This should entail the realistic planning and anticipation, coordination, communication and leadership attributes of chief project leaders and the project management structures adopted by the organisation to nature ICT project success (Maruapula, 2014).

According to Nkwe (2012), to achieve successful implementation of IT projects in Botswana, the project must be acknowledged by all stakeholders that implementation is not a simple matter. It is exceedingly difficult. It requires not only financial resources but also special expertise and skills to carry out. Implementation has a wide range of intellectual and theoretical resources that could be mobilized to achieve maximum outcomes. Furthermore, Busani (2015), have outlined some contributing factors which are key to the success of any project in Botswana and these factors are a result of proper project planning and risk management done during the initial phase of any project. Hence cannot be done during implementation or any other phase of the project.

2.6.2 ICT project Failures in Botswana

There are a number of cases of failed IT project in Botswana. One of such cases is the MALEPA system. MALEPA system was a web based examination programme intended to process and release the Botswana General Certificate of Secondary Education (BGCSE), Junior Certificate Examinations (JCE) and Primary School Living Examination (PSLE). MALEPA system experienced technical problems and quality was compromised to keep alignment to the product schedule constraints. The 'contraption' was installed only two months prior to the release of the candidate results (Kayawe, 2012). Hence the consultant, who designed the programme, allegedly skipped the testing stage and went on to the implementation stage (Ontebetse, 2013).

According to Ontebetse (2013) it was discovered that the new web based system was riddled with errors which could have been detected at the testing stage. This resulted in Botswana Examination Council paying the consultant more than P40 million to "fix the system now and again" instead of the P1.7 million that it had budgeted for the tender. The reason behind the MALEPA system failure factors was all articulated to the poor estimation techniques, poor project planning, poor project consultancy and failure to manage the changing scope.

The failure of a Livestock information technology System agricultural project (LITS) was another example stipulated by poor understanding of user requirements by the vendor and poor user expectation management factors that contributed to the ICT project failure. The contractor hired to maintain the equipment used for LITS activities such as bolus insertion, cattle movements and change of ownership permits did not deliver the required quality

service to Botswana government. Serviced equipment was not accompanied by a test report, making it difficult to establish if the repaired equipment was fully functional (Tabane, 2011).

This affected Botswana beef market in EU countries. Botswana Meat Commission projected a half billion Pula loss in revenue for the first three quarters of 2011 and an almost 50 percent drop in throughput from 187,000 head in 2010 to less than 100,000 head in 2011. According to Tabane (2011) government value for money is a concern after another P137 million and a P23 million was spent on the development budget and pilot project, respectively. The Department Veterinary Services management was blamed for the LITS IT project's failure

The Botswana Telecommunication Communication (BTC) billing system failure was due to improper project planning techniques and failure to adapt to business change factors (Mokgoabone, 2004). The BTC group lost market share due to the subsequent entry of mobile operators in 2000 and the billing system introduced created doubts which also tarnished the BTC image. According to Mokgoabone (2004), the appointment of the IDI consultancy firm followed the purchase of the controversial P60 million billing system, led to customer exodus and substantial losses that the company made. The market share loses were exacerbated by the liberalisation of the telecommunication industry in 1998, which led to the entrance of two mobile phone operators in the market. This compelled the BTC group to adopt a multi-million pula restructuring exercise, which involved the retrenchment of about 600 employees from the corporation.

2.6.3.1 ICT project Contributing Failure factors in Botswana

Beside the government endeavour to nature ICT project success outcome, factors contributing to the failures do prevail. Discussed below are some of the contributing factors that hinder the Botswana nation from achieving its desired result in term of ICT project management and successful implementation in the country:

a) **Telecommunications infrastructure constraints:** The government is experiencing problems regarding infrastructure such as obsolete equipment, infrastructure in few better developed towns and villages. High cost of telecommunications services and lack of an adequate civilian telecommunications "backbone" network nationwide is another concern of promoting e-government implementation (Al-Omari, 2006).

b) **Poor institutional framework supporting ICT**: Botswana has poor institutional framework which supports ICT project initiatives. There are few high-level steering committees, monitoring implementation activities, ICT investment reviews, and established clear mandates and responsibilities for implementing e-government. The Maitlamo policy is not coming out strongly on the framework to support ICT. Therefore, there is a need for clear mandates and responsibilities to allow effective IT development and ensure proper co-ordination across government agencies (UNDP Evaluation Office, 2005)

c) **Inadequate budget for ICT deployment:** According to Republic of Botswana Budget Speech (2014) Matambo indicates that Botswana government will promote "development of ICT facilities including broadband and backbone infrastructure at P300 million." This might seem the allocation being sufficient. But ICT systems require considerable financial resources: to developing and managing systems,

building up technical infrastructures, and coordinating systems and initiatives (UNDP Evaluation Office, 2005). Therefore adequate funds are required for the development, managing the programmes and erection of technical infrastructures.

d) **Digital divide:** The digital divide is always described in terms of the difference in the number of telephones, internet users or computers per head between rich and poor countries (Fink & Kenny, 2004). This is another aspect where Botswana has limitations. Ownership of PCs and disparities in internet access are among the most important challenges faced by Botswana in implementing e-government. Mutula (2008) points out that the digital divide's size and importance is actually shrinking, not growing.

2.7 Information system project success metrics development trends

There is a saying: "If you can't measure it, you can't manage it". With reference to the proverb if a company is unable to measure an IS project success, how will it know how to improve? How will it know when they have improved? And how will it know what's the real value added to a change introduced in to the process?

In order to effectively measure the success or failure of any IS project, a reliable, more dependable and precise project metrics and measurements must be developed. In recent years, research has revealed that the most common challenges that IT senior managers face are determining whether or not a project is successful and which specific metrics to use within each selected criteria to measure the project success (Reyes, 2014). Some of the questions that may arise are; is the project successful once the scope of work is completed, or only if

it’s completed on time and on budget? Does success simply depend on getting sign-off from a satisfied client, even if the scope expanded well beyond the original commitment?

The assumption is that, since everyone involved in a project is likely to have a personal perception on defining IS/IT project success or how project success might look like once the project is completed, it is therefore essential to have project success metrics developed based on a set of guidelines in order measure the project success.

Project metrics are objectively measurable parameters pertaining to the project (Chittoor, 2012). Project success metrics play a major role in project control. Traditionally the project metrics were focused on the project deliverable success measurement alone (Justyn, 2015). But this outlook is gradually changing as is based not only on project justification, but also on the project acceptance by the user community and the resulting return on investment. This also signifies that metrics for project success should also be identified as to how an implementation will benefit the core business directives or mission statement and consequently how success of the project will actually be measured once implemented.

2.7.1 Realization of IS project success benefits

In constructing the desired and precise IS/IT project success measurement metric, it is essential to draw a comprehensive view and realisation of the IS/IT benefits an organisation might expect to attain from successful implementation of IS. Shang and Seddon (2002) had done a tremendous work in classifying the IS benefits reported in IT project success stories and clustered them into the five domain dimension as shown in a summarized table 2.8

Table 2.8: IT project success benefits dimension

Dimensions	Sub dimensions
Operational	1.1 Cost reduction
	1.2 Cycle time reduction
	1.3 Productivity improvement
	1.4 Quality improvement
	1.5 Customer service improvement
Managerial	2.1 Better resource management
	2.2 Improved decision making and planning
	2.3 Performance improvement
	3.1 Support for Business growth
	3.2 Support for business alliance
	3.3 Building business innovations
	3.4 Building cost leadership
	3.5 Generating product differentiation
	3.6 Building external linkages
IT infrastructure	4.1 Building business flexibility for current and future changes
	4.2 IT cost reduction
	4.3 Increased IT infrastructure capability
Organisational	5.1 Changing work patterns
	5.2 Facilitating organisational learning
	5.3 Empowerment
	5.4 Building common vision

Source: Shang and Seddon (2002)

2.7.2 Three levels of Project Success metrics

Cooke-Davies (2004) discussed IS project success metrics aligned to three success levels namely; Project management success, Project success and Consistent project success. Table 2.9 illustrates a summarized Cooke-Davies (2004) three levels of project success metrics and their measurements.

Table 2.9: Three levels of IS project success metrics summarised

Success "Level"	Typical criteria for success at this level	Possible factors critical success at this level	Organisational level accountable
Level 1: **Project management success** **"Was the project done right?"**	Time Cost Quality Technical performance Scope Safety	Clear doable project goals Well selected capable and effective project team Adequate resourcing Clarity about technical performance requirements Effective planning and control Good risk management	Project manager Project team
Level 2: **Project success** **"Was the right project done?"**	Benefits realized Stakeholder satisfaction	Clear and doable project goals Stakeholder commitment and attitude Effective business management and realization process Appropriate project strategy	Project sponsor Client, owner or operator (recipient of benefit)
Level 3: **Consistent project success** **"Are the right projects done right, time after time?"**	Overall success of all the projects undertaken Overall level of project management success Productivity of key corporate resources Effectiveness in implementing business strategy	Continuous improvement of business, project and support process Efficient and effective portfolio, programme and resource management process Comprehensive and focused suite of metrics covering all three levels	Shareholder (or equivalent) Top managers Directors of project management Business unit managers Portfolio managers

Source: Cooke-Davies (2004)

2.7.3 Willard's project success measurement metrics

Willard (2006) developed project success metrics and measurement from various sources (Basili *et al*. 2001; Cooke-Davies, 2004; Bernthal, 2005; McConnell, 2006). Willard's key emphasis was to refine the project success metrics and enrich the project implementation justification. Table 2.10 below illustrates a summarized Willard's findings and suggestion of project success metrics and their measurement.

Table 2.10: Project success metrics and measurement

Category	Metrics
Project Management	Project Time
	Project Cost
	Project accuracy (specifications met)
	Change requests
	Quality
	Safety (if applicable)
Project Success	Benefit(s) to the organization
	Stakeholder satisfaction
	Users satisfaction
	Number of issues recorded since implementation
	Ease of use/quantity of use
	Happiness/willingness of end users
	Solved problem(s) project was intended to solve
	Un-intentional improvement/complication to processes/procedures
Business Success	Cost savings/cost reductions
	ROI (Return on Investment)
	Return on expectations
	Competitive advantage
	Improved operating efficiencies
	Opportunities in the future
	Expanding or improving core competency
	Enhance productivity
	Reducing paperwork
	Reducing manual processes
	Real time processing/real time reports
	Increased accuracy / quality improvements
	Customer service improvements
	Resource management improvements
	Support business growth
	Building external linkages
	Increased flexibility
	Empowerment

Source: Willard (2006)

2.7.4 Chittor project success metrics and their measurement

Chittor (2012) developed success metrics based on project metrics by Willard (2006). Chittor believed that project success metrics and measures were not enough to verify whether a system works or not, or how well the system is being used by the user community. Therefore his emphasis was to develop the project metrics that will ascertain measures based on the

system usability and functionality as a key step to enhance the future project success measure. Table 2.11 below depicts Chittor's project success metric and their measures.

Table 2.11: Chittor's refined project success metrics and measurement

Category	**Project Metrics**
Project Management	Project Time, cost, ability to meet the project specifications, change request, quality standards
Project Success	Benefit accrued to the organisation, stakeholder satisfaction, user satisfaction, number of issues raised since go live, usability measure, end user feedback, problem resolution, process case/improvement/compilation
Business Success	Cost saving and reduction because of the project, ROI, Return on expectations, competitive advantage gained, opportunities identified, core competency enhancements, process efficiency improvement ,reduction of manual intervention/process, real time access to data, reports, tighter integration, enhanced flexibility, user empowerment

Source: Chittor (2012)

2.8 Summary of the literature and research gaps

Recent researchers and earlier scholars have put forward various, aggregative empirical and theoretical research evidence with an effort to underpin all the factors that complements the success or failure of the ICT projects outcome. However, no single research claims to have exhausted all the factors contributing to the project success or failure. Furthermore, even where researchers have primarily focussed their studies in the area of IT, no two researches have produced the same project success factors and even where the same researcher

conducted the exact same study in different time periods they have consistently come up with different project success or failure factors. This shows the complexity of the subject and it will be indiscreet for the researcher to claim that the conclusions drawn by this study shall be exhaustive. Besides, most of the quoted researchers have approached the subject from within their countries by collecting primary data from the project managers, this might in a way be biased reporting since the success or failure of IT project management could be indirectly influenced by socio-economic factors, political factors which do not necessarily apply across all countries.

2.8.1 Summary of IT project success factors and their emerging trends

To simplify the literature which has been discussed earlier, a modified table of Brocke *et al.* (2009) and an in-depth analysis of various scholars' findings on factors contributing towards IT projects success were explored by the study. The research findings were presented in Table 2.12 as the summary of IT project success factors and their emerging trends in literature as shown.

From the literature summary, the emerging trends of IT success factors were categorised based on the information system components categories. The results from the literature reveal that the most critical success factors which senior managers should consider when nurturing the project success should include; top management support, project management, management of requirements, team capability and team commitment. These are human related factors .Therefore it can be concluded that the success of IT projects is more dependent upon human capacity, management and the style of leadership.

Table 2.12: Summary of the critical success factors and their emerging trends

IS Categories	Success Factors	Dennison (2014)	Lewis (2013)	Nkwe(2012)	Chaos report, 2012)	Chaos report, (2010)	Brooke et. al (2009)	Zink (2008)	Collins (2007)	Tesch et.al (2007)	Coley (2007)	Plant & Willcocks (2007)	Nah & Delgado (2006)	Hyvari (2006)	Legris & Collerette (2006)	Hastie (2006)	Horine (2005)	Baccarini et al. (2004)	Turner (2004)	Philip(2003)	Thomsett (2002)	Asmafi & Hartman (2002)	Fui-Hoon Nah & Lee-Shang Lau (2001)	Standish group (2001)	Thite (2000)
Technological	IT function capabilities												✓							✓					
	Technology and technological issues	✓				✓											✓	✓							
	Implementation strategy	✓				✓					✓						✓			✓					
	Software development, prototyping and testing		✓		✓	✓			✓	✓													✓		
Human resource	Project Management		✓		✓	✓					✓	✓	✓				✓		✓	✓		✓	✓		
	Team capability	✓	✓		✓					✓	✓	✓	✓				✓						✓		
	Communication		✓	✓								✓	✓				✓		✓			✓	✓		
	Commitment	✓			✓	✓				✓		✓	✓	✓			✓			✓			✓		
	Cooperation	✓	✓		✓					✓			✓				✓						✓		
	Use of consultants											✓													
	User training, education and support	✓				✓						✓			✓										
Organisational	Top Management support	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓		✓	✓				✓	✓	✓	
	Financial Resources	✓			✓					✓	✓	✓			✓		✓				✓				
	Business process re-engineering		✓			✓					✓	✓											✓		
	Leadership style		✓	✓								✓					✓			✓					✓
	Clear goals			✓		✓					✓						✓							✓	
	Management of requirements			✓		✓	✓		✓	✓		✓			✓		✓				✓	✓		✓	
	User/ Stakeholder involvement	✓					✓				✓						✓				✓			✓	
	Project progress schedule															✓	✓				✓	✓	✓		
	Management of expectation											✓				✓	✓	✓						✓	
	Change management		✓					✓		✓		✓	✓							✓					
	Project Champion											✓											✓		
	Process quality		✓		✓	✓										✓					✓				
	Business plan and vision											✓	✓			✓				✓			✓		
	Security strategy	✓															✓								

2.8.2 Summary of the IT project failure factors and their emerging trends

The study also analysed and aggregated IT project failure factors based on the modified table of IT project failure by Ibrahim *et al*. (2013). The findings were presented in Table 2.12 as the summary of IT projects failure factors and their emerging trends.

From a broader analysis and review of various IT project failure factors from literature, the study had drawn a conclusion by recommending most critical IT project failures which project managers should address at all times to avoid project failures. The study revealed that factors contributing to project failure are the management and skill related human factors. These factors involve; lack of top management support, poor project management, poor management of requirements and lack of user training and support. Therefore a conclusion can be drawn that the failures of IT projects can be dependent upon the project management and the availability of skilled human resource.

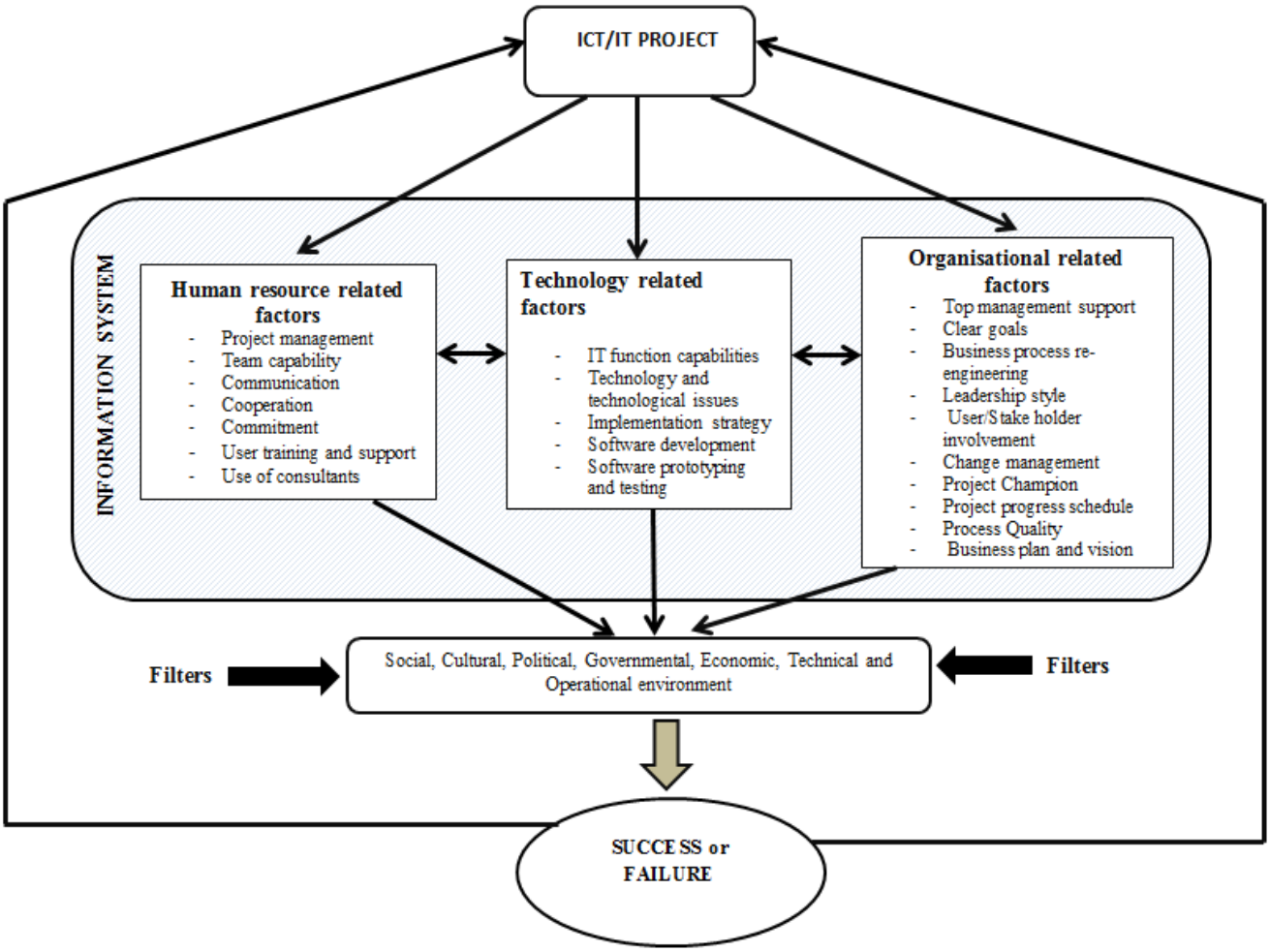
Table 2.13: Summary of the critical failure factors and their emerging trends

IS Categories	Failure Factors	Authors																		
		Ramos &Mota (2014)	Ibrahim et al (2013)	Nasir & Sahibuddin (2011)	Garg (2010)	A-Ahmad et al (2009)	Bently et al. (2007)	Coley (2007)	Kappelman et al (2006)	Wong & Scarbrough (2005)	Gottschalk & Karlsen (2005)	Yongyi Shod & Ying Ying (2005)	Kaur, Aggarwal & Singh (2004)	Umble (2003)	Krezner (2003)	Winters (2003)	Yeo (2002)	Standish group (2001)	Wastell (1999)	Linberg (1999)
Technological	Ineffective IT function capabilities										✓									
	Technology and technological issues		✓			✓	✓			✓		✓	✓	✓				✓		
	Poor Implementation strategy		✓	✓		✓	✓	✓		✓										
	Poor Software development, prototyping and testing															✓				
Human resource	Poor Project Management	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓				✓		
	Poor Team capability			✓									✓	✓						
	Lack of Communication	✓	✓					✓	✓			✓					✓			
	Lack of Project Champion																✓			
	Insufficient Staffing			✓	✓		✓													
	Lack of Commitment		✓	✓			✓							✓						
	Lack of Cooperation		✓			✓														
	Incompetent consultants																			
	Lack of User training, education and support	✓	✓	✓	✓		✓		✓				✓	✓						
Organisational	Lack of top Management support		✓	✓	✓	✓	✓		✓	✓	✓		✓	✓				✓		
	Poor financial resources			✓	✓													✓		✓
	Poor business process re-engineering											✓			✓					
	Poor leadership style										✓					✓	✓			
	Unclear goals			✓		✓		✓					✓	✓			✓			✓
	Poor management of requirements	✓		✓	✓		✓	✓			✓	✓				✓	✓	✓		
	Lack of User/ Stakeholder involvement			✓		✓	✓		✓							✓	✓	✓		
	Poor Project progress schedule			✓						✓										✓
	Poor Management of expectation					✓	✓					✓						✓	✓	
	Poor Change management	✓			✓		✓							✓		✓	✓			
	Poor Process quality			✓	✓					✓					✓					
	Poor Organisational work culture	✓				✓														
	Poor Business plan and vision						✓	✓		✓							✓		✓	
	Poor Security strategy			✓		✓														
	Poor outsourcing Management		✓		✓					✓		✓								

2.8.3 Project Success/ Failure Conceptual Framework

According to Smyth (2004) a conceptual framework is basically a set of broad ideas and principles taken from various schools of thought in relation to field of inquiry. Similarly Svinicki (2010) describe conceptual framework as an interconnected set of ideas about how a particular phenomenon functions or is related to the parts. As such, conceptual framework assists the researcher to develop awareness and understanding of the topic or situation under scrutiny (Smyth, 2004). Considering the various variables of project success/ failure from literature and the limited academic research on Botswana, a conceptual framework from the by Ofori (2013) for project success/failure was modified. Figure 2.5 shows the modified Project Success or Failure Conceptual Framework.

Figure 2.5: Project Success or Failure Conceptual Framework



From figure 2.5, the conceptual framework expresses that the success or failure an IT project can be associated with its information system components related factors, of which their expected outcomes are influenced by factors related to the socio-cultural, political, governmental, and economic, technical and operational environments. The socio-cultural factors for example can influence a project design, and implementation may consider peculiar cultural factors germane to particular beneficiaries.

2.8.4 The research Gap

The significance of identifying and filling knowledge gaps in literature has been recognized to be an important factor in the survival and growth of any IT project success. According to Haider and Mariotti (2010) identifying and filling these knowledge gaps, organisations put in place a series of organisational knowledge processes which lead them to socially interact with their alliance partners and improve their business processes.

Diverse sources from literature and the limited academic research in Botswana have identified significant factors contributing towards the success or failure for ICT/IT projects (Horine, 2005; Coley, 2007; Nkwe, 2012; Ontebetse, 2013). However, from the literature it is clear that most scholars have less interest in going beyond just outlining these success or failure factors, proposing success criteria and giving a series of recommendation to address them. It is known that project success/failure lies in the eyes of the beholder. This implies that project success/failure as defined by one scholar may not necessarily be the same as viewed and defined by another scholar. Hence this indicates that by simply stating and outlining contributing factors towards success/failure in projects may be beneficial but still lack further justification. If project management methodologies and practices are to be developed to boost project success, then IT project managers must come to consensus as to what and why some

factors are mandatory and should not be left out in any case when conducting a project. According to Linberg (1999) cited by Van Der Westhuizen and Fitzgerald (2005), a new theory of project success measure may be necessary as project success may be too narrowly defined.

In another study where success was measured, Standish Group International (2012), suggested factors on project management techniques and success measurement methods that hundreds of firms are adopting but results are still disappointing. These results fortify the belief that the existing system for measuring the success of projects is somewhat also ineffective, hence the need for further improvement. This clearly indicate that there is a compelling need for the development of a success measuring tool that does not only measure the success of the project, but provides a strong justification as to why some factors are valid and their dominance impact the project success/failure outcome. To address this knowledge gap a project metric model tool was developed by the study and used to assess the project success as well as rank the dominance of the success/ failure factors (See section 4.1).

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

The credibility of the research findings and conclusions extensively depends on the quality of the research design, data collection, data management, and data analysis. This chapter deals with the research methods and procedures which centered on research design, population of the study, sample (sample size) and sampling technique, instrumentation and administration of the instrument, and techniques for data analysis.

3.1 Research Design

A research design is viewed by scholars as a plan of strategy or investigation, which serves the purpose of collecting data and provides answers to the researcher (Wiersma & Jurs, 2005). Creswell (2003) defines research design as "the general strategy that outlines the way in which the research project is to be undertaken and, among other things, the methods to be used in it. These methods…define the means or modes of data collection or, sometimes how a specific result is to be calculated." (p. 134-140).

The research design could be quantitative or qualitative. Quantitative research portrays that there is a reality out there which is tangible, stable and apprehensible; and can be investigated on a large number of participants resulting in the finding that can be analysed statistically and pruned for the purpose of generalisation (Gay & Airasian, 2000). On the other hand qualitative approaches are typically more flexible – that is, they allow greater spontaneity and adaptation of the interaction between the researcher and the study participant (Sutrisno, 2011). This enables the participants to have the opportunity to respond more elaborately and in greater detail than is typically the case with quantitative methods. The base line of this

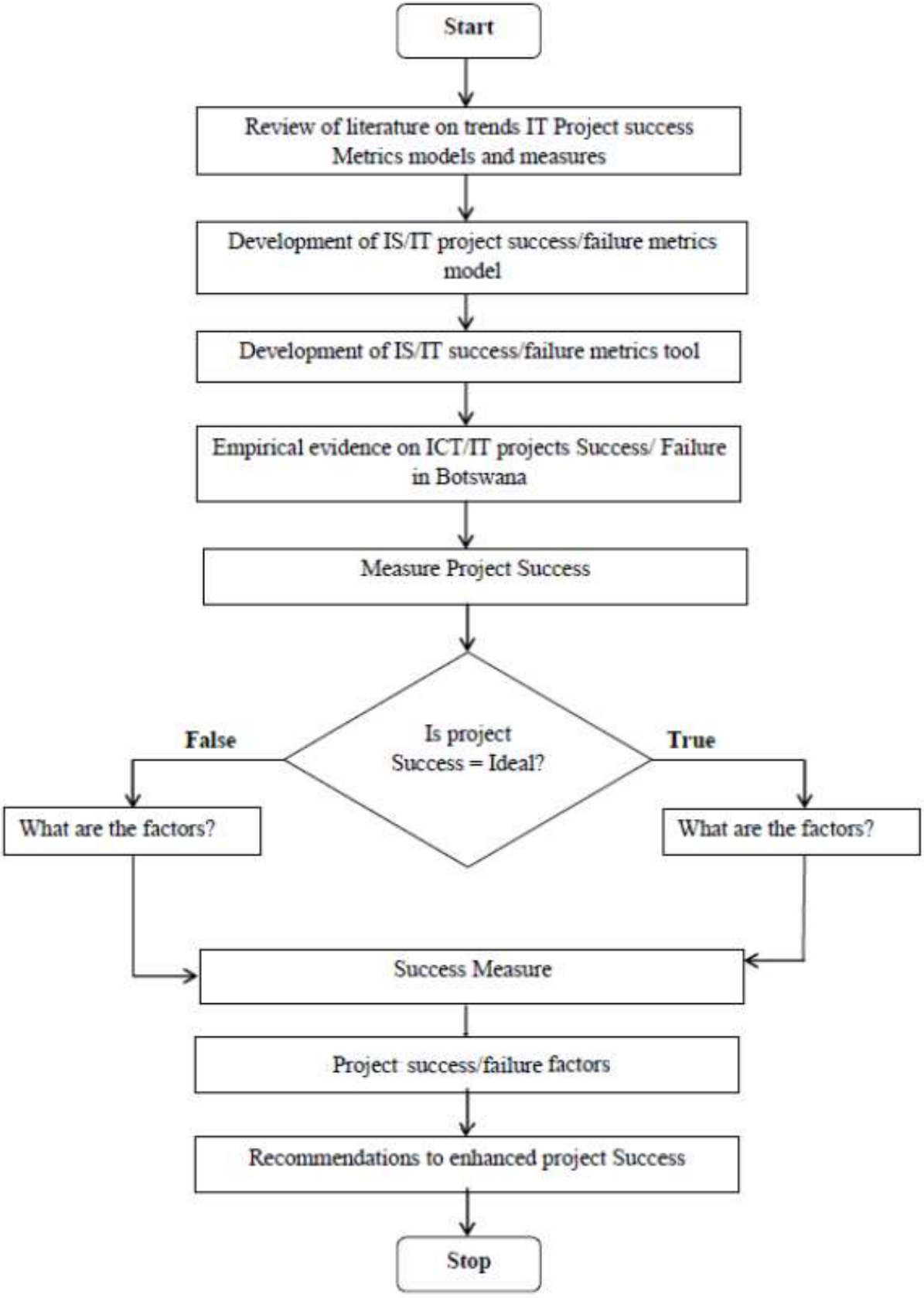
research was to find out ICT experts believes and feelings about the most influential factors contributing to failure or success of ICT projects in Botswana. Since the study investigated ICT senior managers believes and feelings about the most influential factors contributing to failure or success of ICT projects, a qualitative research design was adopted. The main reason for choosing qualitative research design over other research designs is that qualitative research design is not only concerned with describing the way things are, it also wishes to provide insights into what people believe and feel about the way things are and how they got to be the way they are (Sutrisno, 2011). The other reason is that qualitative research design typically maintains a lengthy physical presence in the chosen setting, in order to achieve the detailed understanding of the subject matter (Sutrisno, 2011). This allows the opportunity to uncover more subtle, less overt understandings about the subject being studied.

The nature of the study required face-face interaction between the researcher and the researched. The use of a qualitative research had assisted the researcher to ascertain factors contributing to successes or failures of the above projects. The respondents in the target organizations were chosen for ease of access. The researcher used the project participants' memory and experiences of ICT projects they had been involved in to find answers as to what led to particular outcomes of their IT projects. This was then extrapolated using the project metric tool which determined the success measure and the ranking of the dominant project influential factors in Botswana setting.

3.1.1 Flow chart of the study

This section outlines the flow chart of the study. It shows details of the processes utilised in the research design in order to provide a deeper understanding of the subject being studied. The flowchart is illustrated in Figure 3.0.

Figure 3.0: Flow chart of the study



3.1.2 Target population and justification

The scope of this study was confined to ICT projects undertaken in Botswana between January 2010 and October 2014 .The reason for this cohort is the fact that multiple ICT projects had already been completed in Botswana since 2010 and some with very successful closure and others not so successful. The participants were involved in at least one of these IT project from the beginning to the end. This was meant to get their experiences, believes and feelings about the success or failures of Botswana ICT projects. The researcher restricted the survey to a population of IT senior managers, thus; IT chief officers, IT project managers, IT team leaders drawn from ICT industries based in Gaborone, the main hub for ICT business activity in Botswana. The participants were interviewed using the same research tool regardless of being public or private sector. However, the organizations selected had genuinely perceived the significance of integrating IT systems both in their business processes and the way they deliver their services and products.

3.1.3 Sample and justification

Owing to the size of the target population, the researcher had made a sample out of the total population to make the research manageable. A sample according to Ary, Jacobs and Sorenson (2010) is a portion of the population or small group that needs to be observed. Accessing all ICT senior management managers in Botswana was impossible because it would be time consuming and expensive; therefore the researcher used a sample drawn from the southern district of Botswana in Gaborone. Black (1998) affirms that a sample is vital because it is cost effective in terms of time and money and it is the only option if accessing the population is impossible. The details of the host IT organisation; thus the physical address and their nature of service were obtained with the help of the Public Procurement Asset and Disposal Board (PPADB).

3.1.4 Sampling procedures

Best and Kahn (2006) described sampling as a procedure of selecting few representatives from a large population. The study used a simple random sampling procedure to select the respondents. This was to give all members of the target population equal chances of been selected to participate in the study. Dikinya, Lesetedi, Ntuma, Seeletso and Tlotleng (2008) describe random sampling as a process that affords members of the population equal chances to be included in the sample. The sample comprised of 57 participants. Of the 57, 15 IT Chief Officers, 15 IT project managers and 27 team leaders as shown in table 3.0 below.

Table 3.0: Target sample

PROJECT MEMBERS	**NO. OF STAFF**
IT Chief Officers	15
IT Project Managers	15
IT Team Leaders	27

3.2 Data collection procedures

The data was collected through in-depth, open-ended semi-structured interviews. The open-ended questions were favoured because they convey a strong interest in what the other person has to say on the topic (Cohen, Manion, & Morris, 2007). The questions were designed by the researcher. There were 2 pilot tests which were carried out by the study. There was the initial departmental pilot test, which involved colleagues from the department of Computer Science. The second pilot test was carried out on the industry practitioners who did not participate in the study. The valuable feedback from the pilot exercises was then incorporated in to the final interview questions used on the respondents. The open-ended questions were carefully constructed to reduce biasness and achieve validity and reliability (Macintyre, 2000). The

researcher took notes and audio-taped the interviews. The interviews were approximately one hour.

3.2.1 Validity and Reliability of the Research Instrument

The process of ascertaining worthiness of a research instrument is a vital component in a study. It is impressing to produce a research instrument that once used over and over again yield the same results and be able to measure what is designed for. The credibility of such instruments is measured by their reliability and validity. Golafshani (2003) says reliability and validity are tools for a quality study. According to Cresswell (2005) reliability refers to "the extent to which a test or technique functions consistently and accurately by yielding the same results" (p.202). When addressing validity Cresswell (2005) says "validity is concerned with the extent to which the materials collected by the researcher presents a true and accurate picture of what is claimed is being described" (p. 105). The fact that the study was a qualitative approach the need for reliability and validity of the instrument was necessary. The initial pilot test was sought by asking 8 colleagues from the department of Computer science to ascertain the readability, flow and the aim of the instrument. The second pilot test was carried out on 3 industry practitioners (one from each of the strata who are not going to participate in the study). This was to ascertain the reliability and validate the instrument. Finally, the valuable feedback from this pilot exercises such as; categorisation of the research tool by information system components categorise, was then incorporated as modifications into the final research tool that was used on the respondents.

3.2.2 ICT/IT Project Success Factors

In order to establishing the prognostic success factors embedded in IT projects in the organisations, the participants were requested to focus on projects which they had been

involved in and regard them as the most successful. The senior managers were then requested to reveal only success factors that had played a critical role towards the overall project success. The researcher then aggregated these success factors, and arranged them in accordance with their metric model respective measures. The main inquisitiveness was to validate the organisations embedded success factors against the metric model success measurement requirements. The assumption was that if an IT project was regarded successful then it must fully satisfy all the metric model measures and a qualitative summary rating of (✓) for "valid factor" was used. Factors that did not fulfil or partially fulfilled the metric model measures then were denoted as dissatisfactory. These were given a qualitative summary rating (×) "not a valid factor". Table 5.2 (Appendix D) illustrates how the organisation's success factors are stacked against the metric model measures. In addition to the summary ratings, a factual data is induced from the participants to enrich clarity on the subject matter.

3.2.2.1 Validity level of the success factors

The validity level of the success factors in accordance to this study refers to the success factors that fulfilled the metric model success requirements, and also appear concurrently in each organisation. The success factors were denoted as high impact level project success factor. As shown in Table 5.3 the rating of (✓) was used to denote a high impact level success factor across organisations. The factors were also further categorised by using the project metrics model categories.

3.2.3 ICT/IT Project Failure Factors

In an endeavour to establish the predominant project failure factors, the senior managers were subsequently requested to divulge only the project factors that had played a critical role (high

impact) in contributing to failure of the project they had been involved in. These factors were then aggregated and arranged in accordance with their metric model measures. The project failure factors that fully satisfied the metric model measures requirements were given a qualitative summary rating of (✓) for "valid factor". Factors that did not fulfil or partially fulfil the metric model measures were given a qualitative summary rating (×) "not a valid factor". Table 5.10 (Appendix E) shows how the organisation failure factors are matched against the metric model measures. In addition to the summary ratings, a factual data obtained from participants was also used to improve clarity of the subject matter.

3.2.3.1 Validity level of the Failure factors

The validity level of the failure factors accordance to this study refers to the most concurrent failure factors appearing in each IT project in each organisation and that entirely fulfil the failure requirements of the metric model measurement. Hence, they were denoted as high impact level failure factors. As indicated in Table 5.11 the rating of (✓) was used to denote a high impact level failure factors across organisations

3.3 Data Analysis and Presentation

Data can be analyzed in many ways which often include carrying out calculations or summarizing the collected data in order to get the results that can generate conclusions (Rubin, 2008). The data was analysed by categorising, synthesising, identifying key themes and patterns and summarising data (See section 5.1.1and 5.1.2 under Findings). The data was then constantly compared for themes and patterns purposes using the success metrics model tool. The data collected by note-taking and audio-taped were transcribed. The notes were read repeatedly to make meaning of what the researchers have heard. Regarding the recorded data the tape was played several times to get familiar with the information given. Transcriptions

were coded, categorised and labelled from which themes, patterns and ideas emerged (Welman, Kruger & Mitchell, 2012).

3.4 Ethical considerations

Primary research involved collecting data about a given subject directly from their natural setting. A sound research should be a moral and ethical endeared and should be concerned with ensuring that the interest of those participating in the study are not harmed as a result of being researched. According to Cohen, Manion and Morris (2007) any successful research must pay close attention to issues of ethical concern. Therefore, permission was sought from management of the designated areas of research and the University of Botswana department of research. After permission has been granted, the researcher wrote letters to the concerned groups explaining the purpose of the research. The respondents were assured of anonymity, confidentiality and voluntarism. An approval letter from the University of Botswana department of research was provided which approves all the research ethical consideration before data collection. The researcher promised that a final report will be submitted to all the host organizations for their own consumption and review. The research findings were also presented exactly as reported by respondents without any alterations being made by the researcher.

3.4.1 Other ethical considerations

Other ethical considerations included:

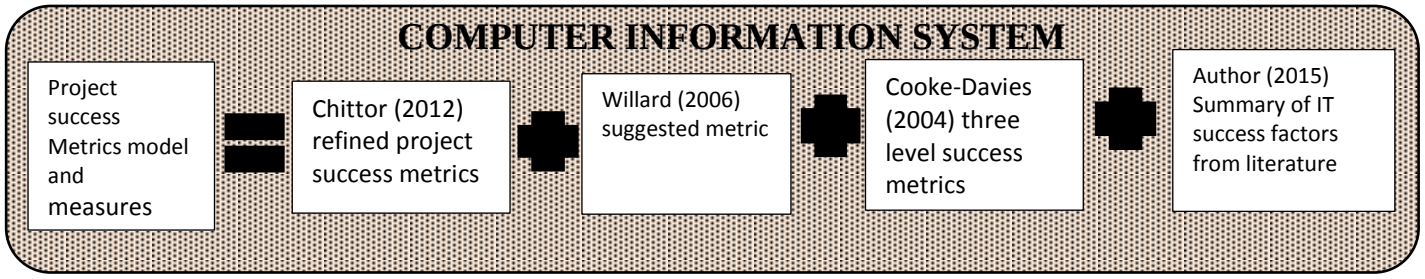
- Asking respondents' consent.
- Confidentiality of information from respondents.
- Assuring respondents anonymity.
- Voluntary – participants not coerced to take part in the study.

3.5 Project success metrics model initial design

While not signifying that project managers should eliminate traditional project management success metrics, there's nevertheless a need that additional metrics and measurements need to be developed to supplement the project managers' toolbox. The metric scope precision needs to be further refined to quantify the Return-On-Investment (ROI) and project justification. This establishes new quality management process for the organization and delivers the processes that address the specific business needs. This is the real measure of success.

The initial phase of the success metrics model design studied, analysed and integrated the summarised IS/IT success factors from various scholars in literature. The figure below shows the IT project success metrics that was developed by the study.

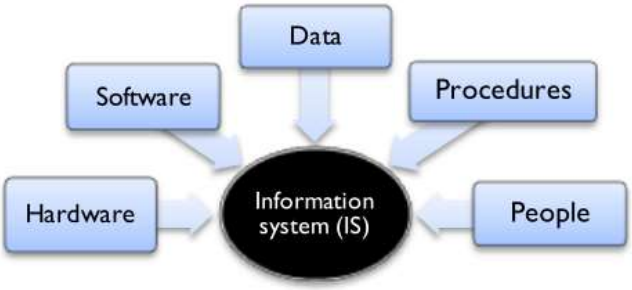
Figure 3.1 Project success metrics model



3.5.1 Project success metrics design and measures

The second phase of the project success metrics model design was to relate the project metrics model with the major components of Information System (IS). Kroenke (2007) had illustrated a model to define the major component of IS. The figure 3.2 shows his results.

Figure 3.2: The five major Components of IS



Source: Kroenke (2007: p. 5)

Using the summary of the reviewed literature and Kroenke (2007) five major components of Information System, the study derived a mathematical equation to define IS;

IS = procedures + data + network +hardware +software + people + organisation - (x1)

The equation *(x1)* was refined to;

IS = Information {*procedures + data****} + network + hardware + software + people + organisation - (x2)***

To incorporate other major components of IS equation *(x2)* was further refined;

IS = Technology {*information + network + hardware + software****} + Organisational {****organisation****} + Human resource {****people****} - (x3)***

The final equation to define IS was then summarised to the equation as shown;

IS = Technology + Organisational + Human resource - (x4)

3.5.1.1 Integrating IS components and the metrics model

The third phase of the IS metrics model development was to categorise the metrics measures based on the IS components. Table 3.1 shows the refined IS project success metrics and measures.

Table 3.1: Refined IS/IT project success metrics and measures

Category	Metrics (measures)
Technology	IT functionality/ Capabilities
	Ease of use/ quantity of use
	Happiness/ willingness of end users
	Technology and technological issues
	Software development
	Software prototyping and testing
	IT vendor capabilities
	IT outsourcing strategy
	IT implementation strategy
	IT solved problem(s) that was intended to solve
	Software quality improvements
	Safety (if applicable)
Organisational	Top management support
	Project Schedule
	Project Time
	Project cost
	Project accuracy(Specifications met)
	Management of requirements
	Change management
	Cultural management
	Quality management
	Business process re-engineering
	Financial resource
	Management of expectations
	Business plan and vision
	Leadership style
	Stakeholder involvement
	Security strategy
	Benefit(s) to the organization
	Un-intentional improvements
	Reduction of manual intervention /process
	Improved operating efficiencies
	Issues recorded since implementation
	Resource management improvement
	Support business growth
Human resource	Use of consultants
	IT project management
	User training, education and support
	IT project Champion
	Commitment
	Cooperation
	Enhanced productivity
	Empowerment
	Expanding/Improving core competency
	Increased flexibility
	Empowerment

3.5.1.2 IS project success or failure evaluation

3.5.1.2.1 Definition of IS project success /failure in the refined metrics model

In order to make IS project metrics model more inclusive, it was essential to define project success or failure measurement and its evaluation. The equation *(x4)* was then modified to;

- Success/failure of an IS project can be estimated by the rate of IS components to the Total IS components elements.

$$|\textbf{SUCCESS/FAILURE}| = \frac{(Technology_1 + Organisational_1 + Human\_Resource_1)}{Total\_origional\_metric\_0} * 100\ \%$$

- ✓ $Technology_1$: Total number of metrics elements available in the Technology component of IS during IS project success evaluation
- ✓ $Technology_0$: Total number of metrics elements available in the Technology component of IS in the original metrics.
- ✓ $Organisational_1$: Total number of metrics elements available in the Organisational component of IS during IS project evaluation
- ✓ $Organisational_0$: Total number of metrics elements available in the Organisational component of IS in the original metrics
- ✓ $Human\_Resource_1$: Total number of metrics elements available in the Human resource component of IS during IS project evaluation
- ✓ $Human\_Resource_0$: Total number of metrics elements available in the Human resource component of IS in the original metrics
- ✓ **$Total\_origional\_metric\_0$**: Total number of the metric elements in the original metrics

$$\textbf{Total\_origional\_metric\_0} = Technology_0 + Organisational_0 + Human\_Resource_0$$

Assumptions:

- For a successful **IS/IT** Project all the IS components and their metric measurement must be available
- If some metric elements or some components are missing then the concept of acceptable failure is used.
- Acceptable failure is when some components are missing and their absence considered insignificant by the project manager.

3.5.1.2.2 Metrics components weighting

In order to evaluate and measure the IS/IT project success, some weights were assigned to the developed IS project success metrics. According to Chittoor (2012) metrics should be measured both during and after the project execution. The metrics weighting of IS components was the number of the metrics measures in each components. Thus in the Technology category of IS metrics, there are 12 metric measures, hence it was given a weight of the value 12. For Organisational component of IS metric there are 23 metric measures and as such it was given the value 23. Finally the Human resource component of IS was given the weight of 11 for 11 metric measures it constitutes. The metric comprised of 46 measures was given the total weight of 46.

3.5.1.2.3 Critical scores evaluation

Each metric measure is a critical score. If during project evaluation some metric measures are available there would be assigned a value 1, otherwise 0 to symbolise unavailability of the metric measure. Assuming the Technology component of IS has 11 metric measures, then critical score is 11.

The following assumptions defined the success measure of IS into two major categories;

- **Success** = 100 % critical score (all metric measures available) – this is the Ideal case category of success
- **Failure** = less than 100 %, but greater than 0 % critical score (Partial metric measures available)

3.5.1.2.4 Acceptable Failure definition and categories

The typical IT project may be subject to review by a host of stakeholder groups, including the project sponsor, system users, project team, maintenance and support personnel, internal and external auditors, and top management. At any point in time, a project may receive an entirely different opinion on success definition and the rate of failure acceptability.

Acceptable failure is when the user is aware and understands that the IS/IT project success is in a failure category but they are still satisfied with the level of success to carry on with the project.

Acceptable failure = Success – **n**

When **n** equals partial metrics measures available/ not 100% metric elements

3.5.1.2.5 Acceptable failure categories

Acceptable failure is categorised in to two broad categories of success which are;

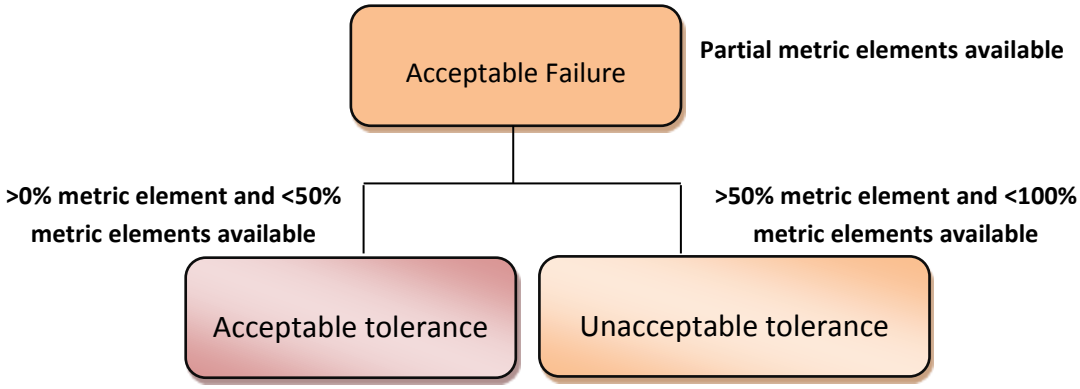
- **Acceptable tolerance** = less than 100% metric measures, but greater than 50% of the metrics measures.
- **Unacceptable tolerance** = greater than 0% metric measures, but less than 50% of the metric measures.

Assumption:

- Acceptable failure cannot be equal to 0% otherwise you have not implemented IS system in your organisation.

Acceptable failure categories are shown in Figure 3.3

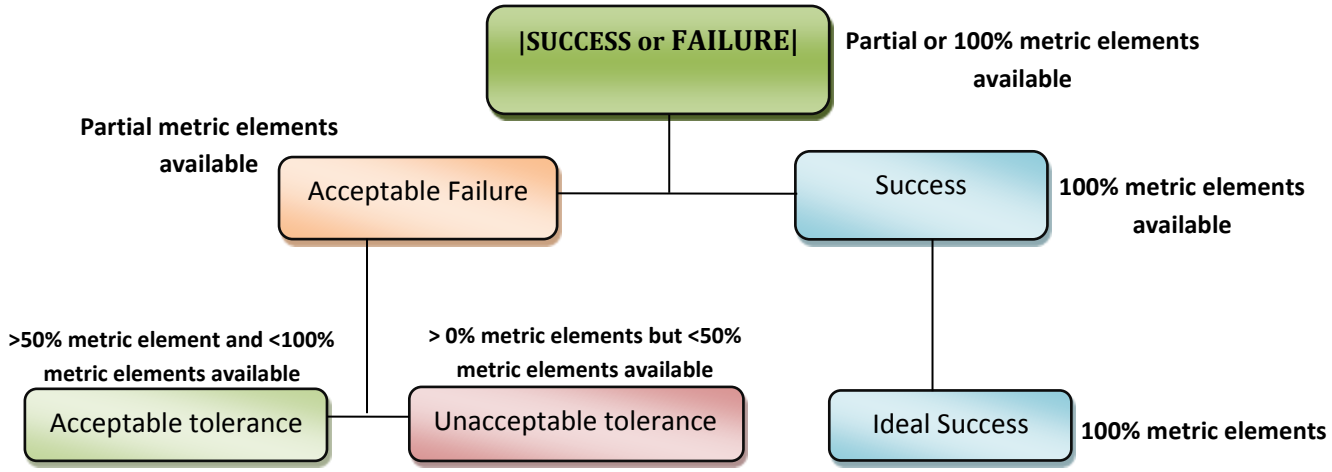
Figure 3.3 Acceptable Failure main categories



3.5.1.2.6 Relationship between Success and Acceptable failure

The relationship between success measurement and acceptable failure is illustrated in Figure 3.4 following.

Figure 3.4 Success vs. Acceptable Failure relationship

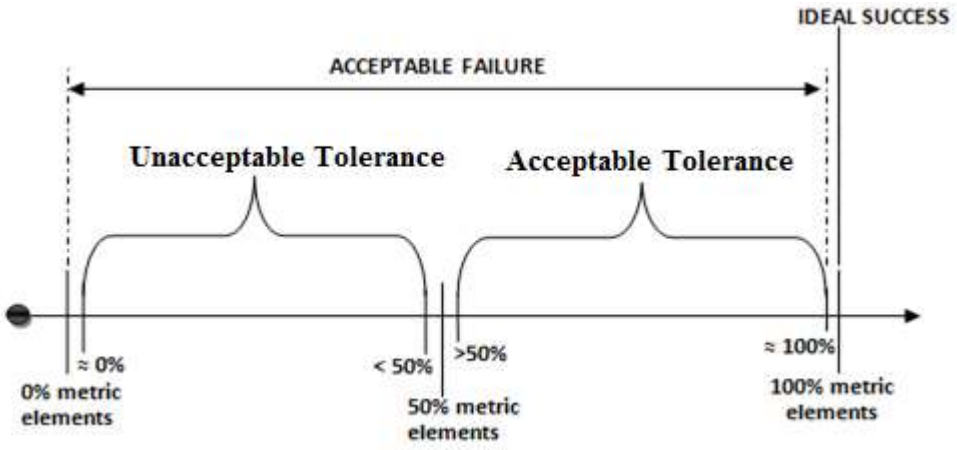


NB: Failure = Acceptable Failure, **Success** = Ideal success

3.5.1.2.7 Success measurement number line

IS project success measurement was further illustrated in success measurement number line to exhibit and clarify different categories of success and the measures that satisfy them. Figure 3.5 shows the detailed success measurement number line and its categories.

Figure 3.5: Success measurement number line



3.5.1.2.8 Discovering more critical scores within the success measurement number line

An experiment to vary different metric measures inside the IS metric component was carried out. This was to explore various metric measures combinations with the intention to discover possible unique combinations that can lead to discovering new critical values. The critical values would then represent the critical scores that further sub-divide the IS success measurement number line to enhance its accuracy and precision.

To determine the critical value, first the metric score in percentage must be calculated. Thus the summation of the metric measures during IS project evaluation over the total number of the metric measure in the original metrics. The difference in critical score is obtained by finding the difference between the current score and the initial score. Difference in critical scores is used to determine the consistence between the scores and the critical values.

- ✓ A critical value is a metric score that has no relative pair and its difference is not the same as other scores.

3.5.1.2.8.1 IS success critical score discovery experiment tables

- Important calculations in the tables:
  - ✓ **Score** = ∑(Technology metric elements**,** Organisational metric elements, Human resource metric elements) / Total metric elements from the original metric * 100 per cent)
  - ✓ **Diff. in scores =** current score – previous score

Assumption:

- ✓ Scores which have relatively insignificant difference may be combined to be represented by only one score.
- ✓ A score that does not belong to a pair is our critical point.

3.5.1.2.8.1.1 Variations of one IS component while the others are kept constant

In a bid to discover the IS success balance and the critical value, some IS components were varied while keeping others constant.

i. Varying the IS Technology component while keeping the Organisation and Human resource components constant

Table 3.2: Technology vs. Organisational and Human resource

Categories	**Total number of metrics elements varied**											
Technology	1	2	3	4	5	6	7	8	9	10	11	12
Organisational	23	23	23	23	23	23	23	23	23	23	23	23
Human Resource	11	11	11	11	11	11	11	11	11	11	11	11
Score in (%)	76.09	78.26	80.43	82.61	84.78	86.96	89.13	91.30	93.48	95.65	97.83	100.00
Diff. in Scores	2.17		2.17		2.17		2.17		2.17		2.17	

From Table 3.2 above, the scores increased at a constant rate. The constant rate is shown by the difference in scores which is 2.17 throughout the entire experiment. This implies that success is balanced. Hence no critical value was discovered.

ii. Varying the IS Organisational component while keeping the Technology and Human resource IS components constant

Table 3.3: Organisational vs. Technology and Human resource

Categories	Total number of metrics elements varied																							
Technology	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Organisational	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
Human Resource	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
Score in (%)	52.17	54.35	56.52	58.70	60.78	63.04	65.22	67.39	69.57	71.74	73.91	76.09	78.26	80.43	82.61	84.78	86.96	89.13	91.30	93.48	95.65	97.83	100	
Diff. in Scores	2.17		2.17		2.17		2.17		2.17		2.17		2.17		2.17		2.17		2.17		2.17			

Critical value

Table 3.3 above shows that no critical value was discovered. The difference in the critical score was constant, thus; 2.17. This implies that IS success is still balanced at this level of

experiment. Even though 100 % did not belong to a pair, it was ignored because it was mentioned in the IS success measures assumptions

- Varying the IS Human resource component while keeping the Organisational and Technology IS components constant

Table 3.4: Human Resource vs. Organisational and Technology

Categories	**Total number of metrics elements varied**										
Technology	12	12	12	12	12	12	12	12	12	12	12
Organisational	23	23	23	23	23	23	23	23	23	23	23
Human Resource	1	2	3	4	5	6	7	8	9	10	11
Score in (%)	78.26	80.43	82.61	84.78	86.96	89.13	91.30	93.48	95.65	97.83	100
Diff. in Scores	2.17		2.17		2.17		2.17		2.17		

Critical value

Table 3.4 reveals that no critical value was discovered. The 100% which was discovered was ignored, as it was already stated in the success measurement assumptions. The success was still balanced at this level of the experiment variation.

3.5.1.2.8.1.2 Variations of one IS components with relative percentage proportions

i. Varying IS components in ratios of 2.5 per cent

Table 3.5 represent the results of varying metric components in the ratios of 2.5 percent as shown.

Table 3.5: Varying IS components by the ratio of 2.5 per cent

Variation in (%) / Categories	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40	42.5	45	47.5	50
Technology	1	1	1	1	2	2	3	3	3	3	4	4	4	5	5	5	6	6	6	6
Organisational	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	10	10	11	11	12
Human Resource	1	1	1	2	2	2	2	3	3	3	3	4	4	4	5	5	5	5	6	6
Scores in (%)	6.52	8.70	8.70	15.22	15.22	17.39	19.57	23.91	26.09	26.09	30.43	32.61	34.78	36.96	41.30	43.48	45.65	47.83	50.00	52.17
Diff. in Scores (%)											2.17		2.17		2.17		2.17		2.17	

Combining same values to be represented by a single value

Refine Score in (%)	6.52	8.70	15.22	17.39	19.57	23.91	26.09
Diff. in Scores (%)	2.17		2.17			2.17	

Critical value

Variation in (%) / Categories	52.5	55	57.5	60	62.5	65	67.5	70	72.5	75	77.5	80	82.5	85	87.5	90	92.5	95	97.5	100
Technology	7	7	7	8	8	8	9	9	9	9	10	10	11	11	11	11	12	12	12	12
Organisational	12	13	14	14	15	15	16	17	17	18	18	19	19	20	21	21	22	22	22	23
Human Resource	6	6	7	7	7	8	8	8	8	9	9	9	10	10	10	10	11	11	11	11
Scores in (%)	53.35	56.52	60.87	63.04	65.22	67.39	71.74	73.91	73.91	78.26	80.43	82.61	82.61	89.13	91.30	91.30	97.83	97.83	97.83	100.00
Diff. in Scores (%)	2.17		2.17		2.17															

Combining same values to be represented by a single value

Refined Scores in (%)	71.74	73.91	78.26	80.43	82.61	89.13	91.30	97.83	100.00
Diff. in Scores (%)	2.17			2.17			2.17		

Critical value

Critical value

Critical value

From Table 3.5, the following critical values were discovered; 19.57%, 78.26% and 89.13%. The value of 100% was ignored as it was already given in the success measure assumptions. This implies that IS success is not balanced at these stated critical value measures. Therefore those critical values are noted.

ii. Varying IS components in relative ratio of 1.25 per cent

The metric elements were varied with relative ratios of 2.5percent. The results are presented in Table 3.6 below.

Table 3.6: Varying IS components by ratio of 1.25 per cent

Variation in (%) / Categories	1.25	2.5	3.75	5	6.25	7.5	8.75	10	11.25	12.5	13.75	15	16.25	17.5	18.75	20	21.25	22.5	23.75	25	26.25	27.5	28.75	30
Technology	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4
Organisational	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	8
Human Resource	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4
Score in (%)	6.52	6.52	6.52	8.70	8.70	8.70	8.70	15.22	15.22	15.22	17.39	17.39	17.39	19.57	21.24	23.91	23.91	26.09	26.09	26.09	28.26	30.43	32.61	32.61

Combining same values to be represented by a single value →

Refined Scores (%)	6.52	8.70	15.22	17.39	19.57	21.24	23.91	26.09	28.26	30.43	32.61
Diff. in scores	2.17		2.17			2.17		2.17		2.17	

Critical value

Variation in (%) / Categories	31.25	32.5	33.75	35	36.25	37.5	38.75	40	41.25	42.5	43.75	45	46.25	47.5	48.75	50	51.25	52.5	53.75	55	56.25	57.5	58.75
Technology	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	6	7	7	7	7	7	7	7
Organisational	8	8	8	8	9	9	9	10	10	10	10	11	11	11	12	12	12	12	13	13	13	14	14
Human Resource	4	4	4	4	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	7	7	7
Score in (%)	34.78	34.78	34.78	36.96	41.30	41.30	41.30	43.48	43.48	45.65	45.65	47.83	47.83	50.00	52.17	52.17	54.35	54.35	56.52	56.52	58.70	60.87	60.87
Combining same values to be represented by a single value →																							
Refined Scores (%)	34.78			36.96	41.30			43,48		45.65		47.83		50.00	52.17		54.35		56.52		58.70	60.87	
Diff. in scores (%)	2.17				2.17					2.17				2.17			2.17				2.17		

Variation in (%) / Categories	60	61.25	62.5	63.75	65	66.25	67.50	68.75	70	71.25	72.5	73.75	75	76.25	77.5	78.75	80	81.25	82.5	83.75	85	86.25
Technology	8	8	8	8	8	8	9	9	9	9	9	9	9	10	10	10	10	10	10	10	11	11
Organisational	14	14	15	15	15	16	16	16	17	17	17	17	18	18	18	19	19	19	19	20	20	20
Human Resource	7	7	7	7	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	10	10	10
Score in (%)	63.04	63.04	65.22	65.22	67.39	69.57	71.74	71.74	73.91	73.91	73.91	76.09	78.26	80.43	80.43	82.61	82.61	82.61	82.61	86.96	89.13	89.13
Combining same values to be represented by a single value →					2.17							2.17										
Refined Scores (%)	63.04		65.22		71.74		73.91		50.00		82.61			86.96		89.13						
Diff. in scores (%)	2.17				2.17				2.17					2.17								

Table 3.6 continues from previous page…

Table 3.6 continues from previous page…

Variation in (%) / Categories	87.50	88.75	90	91.25	92.50	93.75	95	96.25	97.50	98.75	100
Technology	11	11	11	11	12	12	12	12	12	12	12
Organisational	21	21	21	21	22	22	22	22	22	22	23
Human Resource	10	10	10	10	11	11	11	11	11	11	11
Score in (%)	91.30	91.30	91.30	91.30	97.83	97.83	97.83	97.83	97.83	97.83	100
Combining same values to be represented by a single value →											
Refined Scores (%)	91.30				97.83						100
Diff. in scores (%)	2.17										

Critical value

From Table 3.6, no new critical values were discovered. Even though 19.57% and 100 % were discovered critical values, there were ignored because they were already been discovered or known. This implies that success at this level of experiment is balanced.

3.5.1.2.8.1.3 Discovered critical values and categorisation

The discovered critical scores from the conducted experiments are shown in Table 3.7 below.

Table 3.7: Discovered critical values

Experiment no:	Experiment Name	Critical values (%)
1	Technology vs. Organisational and Human resource	No new critical value
2	Organisational vs. Technology and Human resource	No new critical value
3	Human resource vs. Technology and Organisational	No new critical value
4	Variation of IS components by 2.5% relative ratios	19.57%, 78.26%, 89.13%
5	Variation of IS components by 1.25% relative ratios	No new critical value

From Table 3.7 above the following success categories were defined; the ideal success, best acceptable, least acceptable, worse acceptable and unacceptable failure. The success categorisation strategy follows the Success vs. Acceptable failure diagram illustrated earlier in this study (See Figure 3.3). Table 3.8 shows success categories and its acceptability levels.

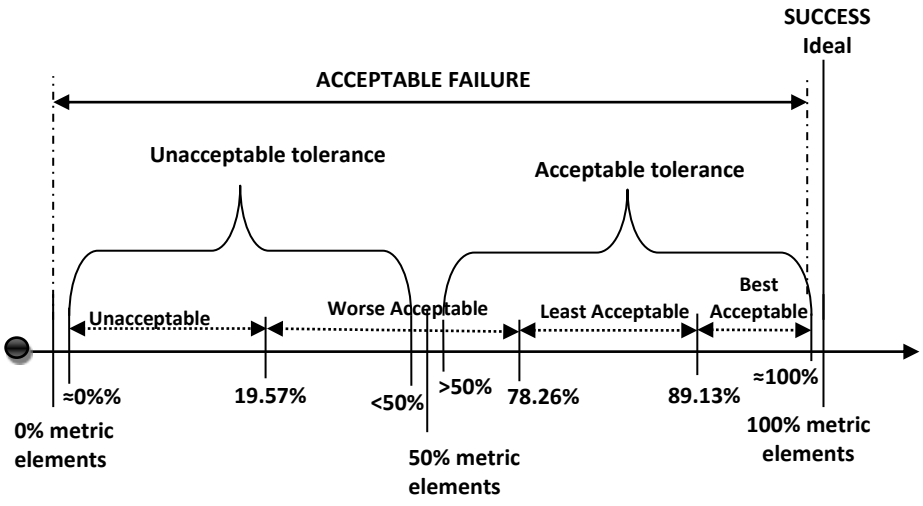
Table 3.8 Success categorisation and Acceptability levels

Category	Acceptability	Critical values (%)
Ideal Success	Ideal	100%
Acceptable tolerance	Best Acceptable	>=89.13%, and <100%
	Least Acceptable	>=78.26%, and < 89.13%
Unacceptable tolerance	Worse Acceptable	<78.26%, and >=19.57%
	Unacceptable	> 0%, and <19.57%

3.5.1.2.8.1.4 Success measurement number line revisited

From the Table 3.8 results, there was a need to revisit the success measurement number line to define the precise success categories and acceptability levels. The discovered critical values were used to highlight the boundaries and ranges of the success acceptability. Figure 3.6 illustrates the success boundaries, categories and success acceptability levels.

Figure 3.6: Refined success measurement number line



The refined success measurement number line and its defined categories forms a framework for the evaluation of success/failure which will be incorporated in the success/failure metrics model tool that was modelled and developed in Chapter 4.

3.6 Summary

One of the most substantial components of project management is the person at the centre of the operation – the Project Manager. A project manager is expected to manage and be fully responsible for the planning, control and monitoring of a project all within a specific time frame and to a pre-determined budget to stipulate the project success. A project that is of a considerable scale can leave a project manager under pressure with budget, resource and time constraints.

Traditionally project metrics were designed to boost the project manager's success tool box. The assumption is that if project managers know what to measure in an IS/IT project, then they will know how to improve, or when they have improved and the real value added to a change introduced in to the process.

This chapter situated the study within a particular methodological tradition, thus; qualitative approach was perceived appropriate for the study. Qualitative approaches are typically more flexible as they allow greater spontaneity and adaptation of the interaction between the researcher and the participant. This provide insights into what people believe and feel about the way things are and how they got to be the way they are. Two pilot tests were used to seek the reliability and validity of the instrument. Valuable feedback from the pilot test exercises was then incorporated in to the modified research tool used on the respondents. Since the primary research involved collecting data about a given subject directly from their natural

setting, permission was sought from management of the designated areas of research and the University of Botswana department of research to address any issues of ethical concern. Confidentiality and anonymity of information from respondents was also assured to the designated participants.

The chapter furthermore, illustrated the step by step development of a project metrics model. The metrics measures had been considerably given some weighting to aid in the success evaluation. The success measurement number line had also been refined to give a more clarified pictorial view of how success looks like, its categories and the acceptability levels. The project success metrics and measures developed is used to model and develop an IS/IT project metrics model tool in Chapter 4. (See page 85 – 104).

CHAPTER FOUR: THE METRICS MODEL SYSTEM DESIGN

4.0 Introduction

This chapter focuses on the development of the metrics model tool which is established to assist in data analysis and interpretation of the study. The metrics model system design approach is deemed the vital technique as it provides users with a better conception of the system tool being modelled, as well as what to expect once the final product is put in place.

4.1 Preliminary metrics model system design

The system design is a process for defining the architecture, components, modules, interfaces, and data for the system to satisfy specified requirements (Jeffery, 2014). The preliminary metrics model tool design was guided by the following software engineering modelling disciplines, thus; non-functional requirements, system activity diagram, the algorithm design, flow chart modelling, data flow diagrams and class diagram model.

4.1.1 Functional requirements

The hardest single part of building a software system is deciding precisely what to build. No other part of the conceptual work is as difficult as establishing the detailed technical requirements (Weigers, 2003). The significance of a clearly defined functional requirements system is not only to define system success by extrapolating on what the system should do or provide for users, but also to outline comprehensively the required functions, associated reports or queries associated with system data. Below are the major system functionalities discussed as input, process and the output of the details of data to be held in the system.

4.1.1.1 Sign in

- **Input:** username, password
- **Process:** verify user credentials
- **Output:** Password successful otherwise password invalid re-enter password

4.1.1.2 Compute Success

- **Input:** Technology, Organisation, Human resource
- **Process:** Compute success and retrieve recommendations from recommendation database
- **Output:** Recommendations report

4.1.1.3 View Recommendations

- **Input:** Success ID
- **Process:** retrieve recommendations from recommendation database
- **Output:** Recommendations report

4.1.1.4 Save recommendations

- **Input:** recommendation
- **Process:** saves recommendations and stores it in the report database
- **Output:** saved recommendations report

4.1.1.5 Sign out

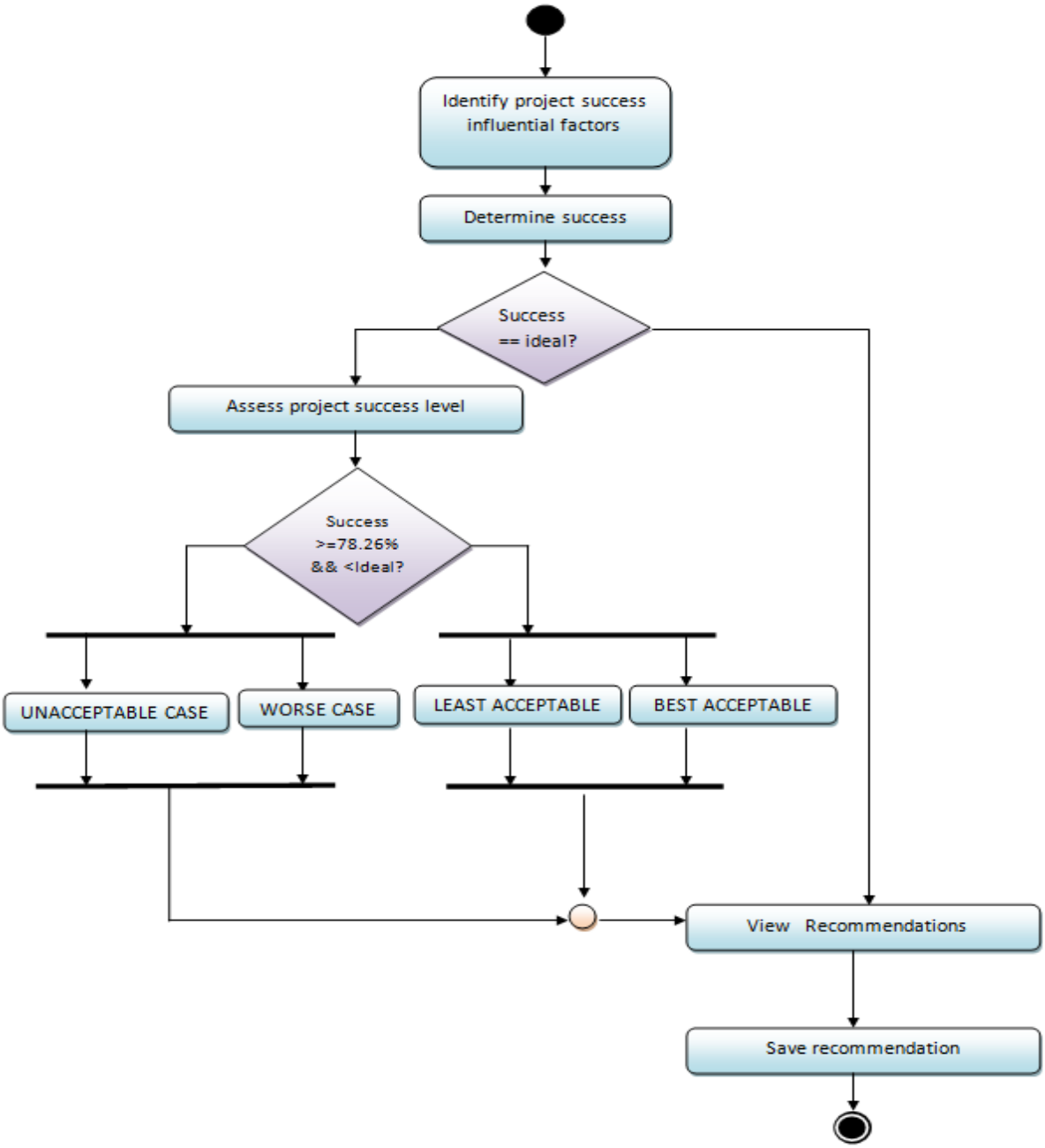
- **Input:** sign out button
- **Process:** Compute success and retrieve recommendations from recommendation database
- **Output:** sign out

4.1.2 Activity diagram

An activity modelling was the second phase of the software design. Activity diagram was favoured for the project metrics model tool development for its capability to conceptually visualise the system workflow from a start point to the finish point detailing the many decision paths that exist in the progression of events contained in the activity. Activity

diagrams provide more understandable system model where there is a need to detail the processes involved in system activities the internal logic of a complex operation involved in the system (Sparx-systems, 2015).

Figure 4.0: IT project evaluation system activity diagram



4.1.3 Algorithm design

Algorithms are powerful known system methods to create a mathematical process in solving problems (Goodrich & Tamassia, 2002). The system algorithm was designed to provide a deeper understanding of the conceptual steps that were involved to arrive to the main functionality of the project metric tool, which was; to evaluate and measure the project success. The algorithm for the success metrics model tool is illustrated as follows;

STEP 1: Start

STEP 2: Declare variables Success, Tech, Org, HR

STEP 3: Initialize variables Success←0 Tech←0 Org← 0 HR← 0 metric_total← 46

STEP 4: PRINT "Please identify IS project Success Factors"

STEP 5: Compute Success

5.1 Declare variable count, array

5.2 Initialise variable count ← 0 Tech_Stop←12 Org_Stop←23 HR_Stop←11 array [i]

5.3 PRINT "Please identify Project success Factors under IS Technology component"

5.3.1 Read Tech

5.3.2 Sum all the elements inside an array until count equal to Tech

```
for ((count <= Tech) && (count <= Tech_Stop), count++){
    for (int i = 0; i < array. Length; i++) {
        Tech += array[i];}}
```

5.4 PRINT "Please identify Project success Factors under IS Organisational component"

5. 4.1 Read Org

5.4.2 Sum all the elements inside an array until count equal to Org

```
for ((count <= Org) && (count <= Org_Stop), count++){
    for (int i = 0; i < array. Length; i++) {
        Org += array[i];}}
```

5.5 PRINT "Please identify Project Success Factors under IS Human Resource component"

5.4.1 Read HR

5.4.2 Sum all the elements inside an array until count equal to HR

```
for ((count <= HR) && (count <= HR_Stop), count++){
    for (int i = 0; i < array. Length; i++) {
        HR += array[i];}}
```

5.6 RETURN Tech, Org, HR

STEP 6: Compute Success← ((Tech + Org + HR)/ metric_total)*100%)

STEP 7: Determine Success

7.1 If Success is equals to 0%

7.1.1 PRINT "Success must not have ZERO Components…Please try again!!"

7.1.2 GO TO Step 5

7.2 If Success is equals to 100%

7.2.1 **PRINT** "You are in the ideal success category"

7.2.2 **RETRIEVE** recommendation

7.2.3 **PRINT** report

7.2.4 **SAVE** recommendation

7.2.5 **STOP**

STEP 8: Measure Success

8.1 Declare the variable critical_score

8.2 Assign critical_score ← Success

8.3 Determine the critical points

8.3.1 If critical_score is greater or equals to 78.26%

8.3.1.1 If critical_score is in the range less than 100% but greater or equals to 89.13%

8.3.1.1.1 PRINT "You are in the **Acceptable Tolerance success category**"

8.3.1.1.2 PRINT "You are in the **best acceptable case**"

8.3.1.1.3 RETRIEVE recommendations

8.3.1.2 Else

8.3.1.1.1 PRINT "You are in the **Acceptable Tolerance success category**"

8.3.1.2.2 PRINT "You are in the **least** acceptable case"

8.3.1.2.3 RETRIEVE recommendations

8.3.2 If critical_score is less than 78.26%

8.3.2.1 If critical_score is between the range 78.26% and greater or equals to 50%

8.3.2.1.1 PRINT "You are in the **Unacceptable Tolerance success category**"

8.3.2.1.2 PRINT "You are in the **worse acceptable case**"

8.3.2.1.3 RETRIEVE recommendations

8.3.2.2 Else if critical_score is between the ranges equal 19.57% and less than 50%

8.3.2.2.1 PRINT "You are in the **Unacceptable Tolerance critical success category**"

8.3.2.1.2 PRINT "You are in the **Unacceptable case**"

8.3.2.2.3 RETRIEVE recommendations

8.3.2.2 Else

8.3.2.2.1 PRINT "You are in the **Unacceptable Tolerance success category**"

8.3.2.1.2 PRINT "You are in the **Unacceptable case**"

8.3.2.2.3 RETRIEVE recommendations

8.3.3 RETURN recommendation

8.4 PRINT recommendation

8.5 Assign Success ← critical_score

8.6 RETURN Success

4.1.4 System Flow chart

Flowcharts divides the system or process into events/activities and presenting the logical relationship between them. It is a comprehensive way of analysing, designing, documenting

or managing a process or program in various fields. Flow charts use flow lines, to indicate the flow of control through the program, process or system (Sevocab, 2008). Flow charts model designs are used to show the systems main methods, their functionalities and the integration with each other to attain the system overall objective (See figures 4.1 – 4.5).

Figure 4.1: Main function

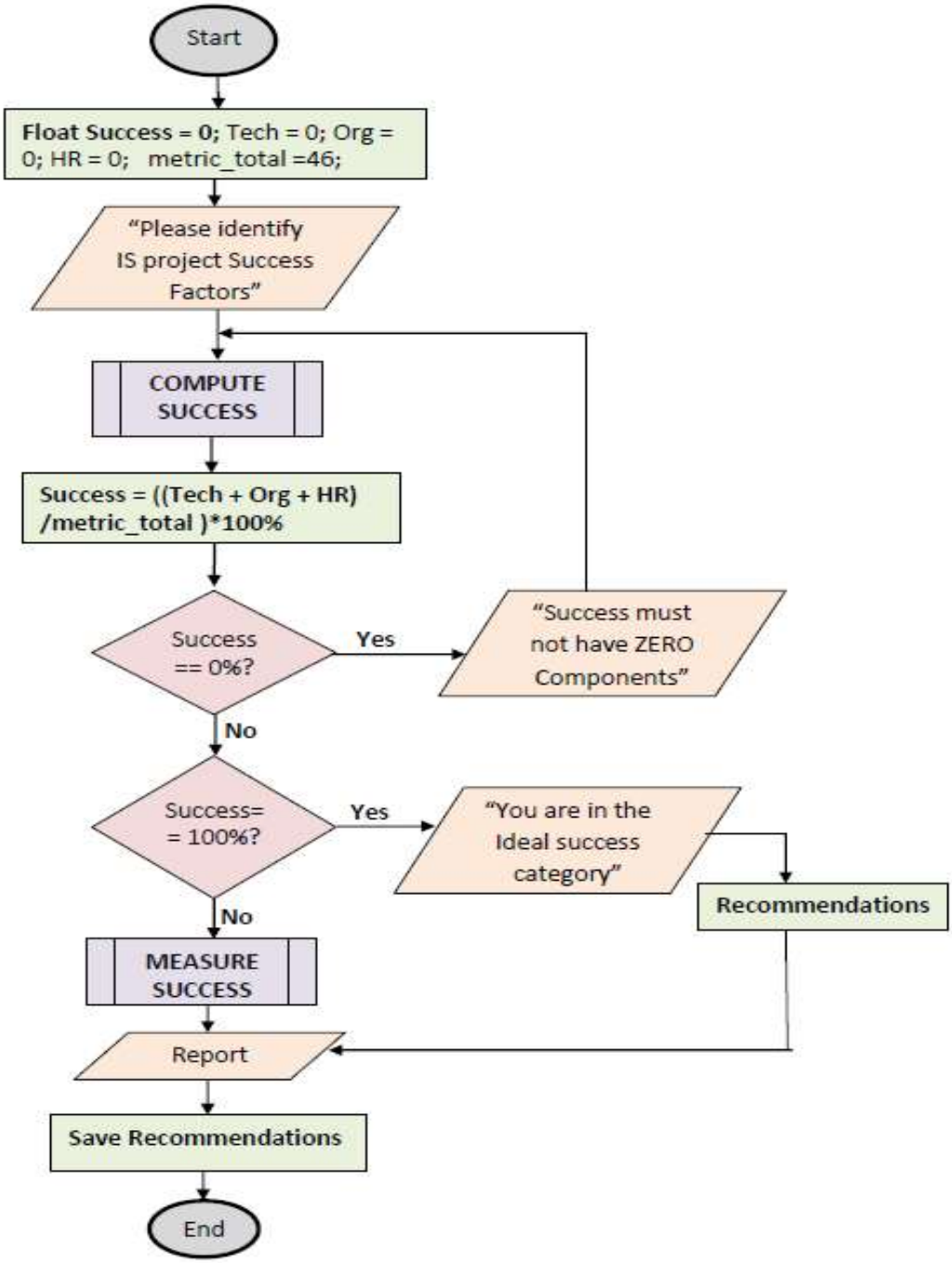


Figure 4.2: Compute success

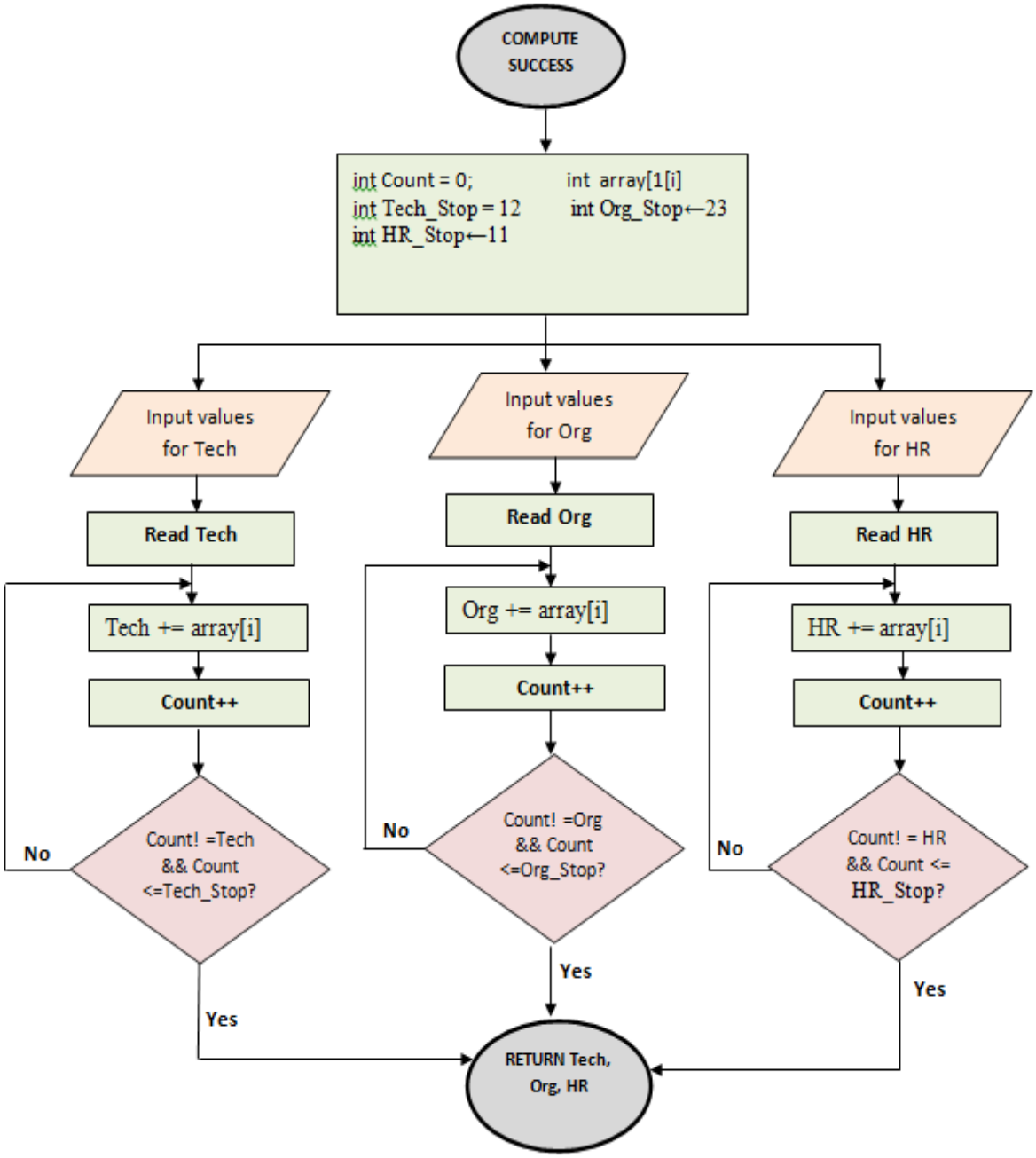


Figure 4.3: Measure success

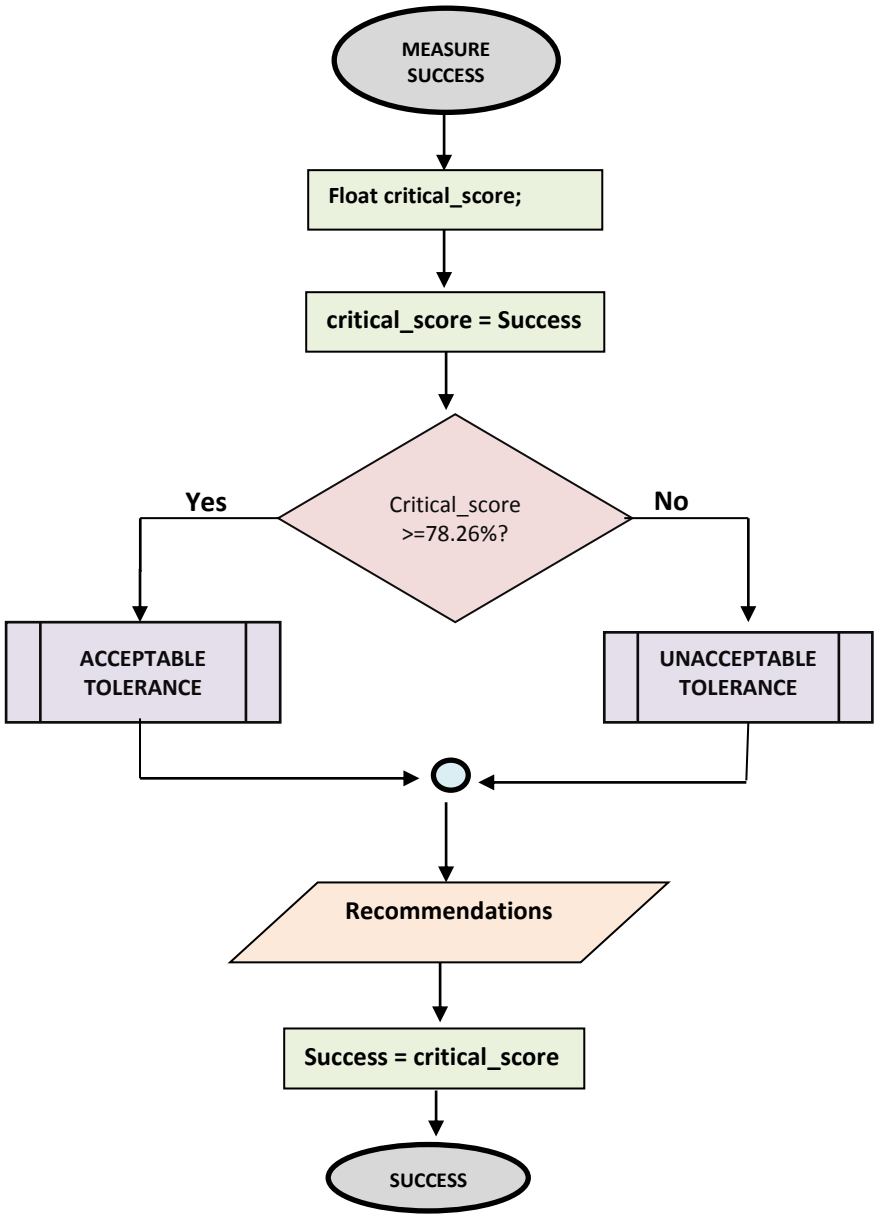


Figure 4.4: Acceptable Tolerance success

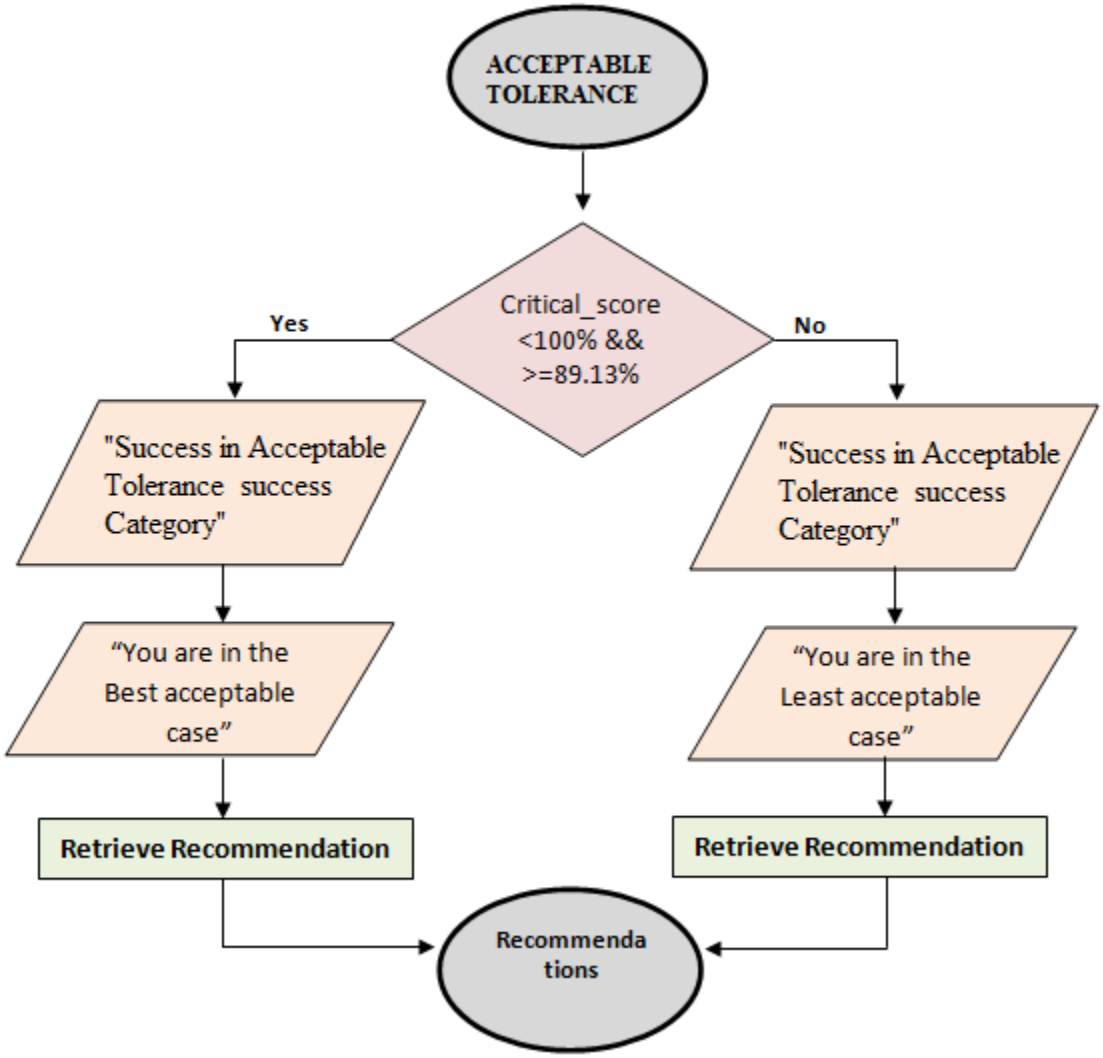
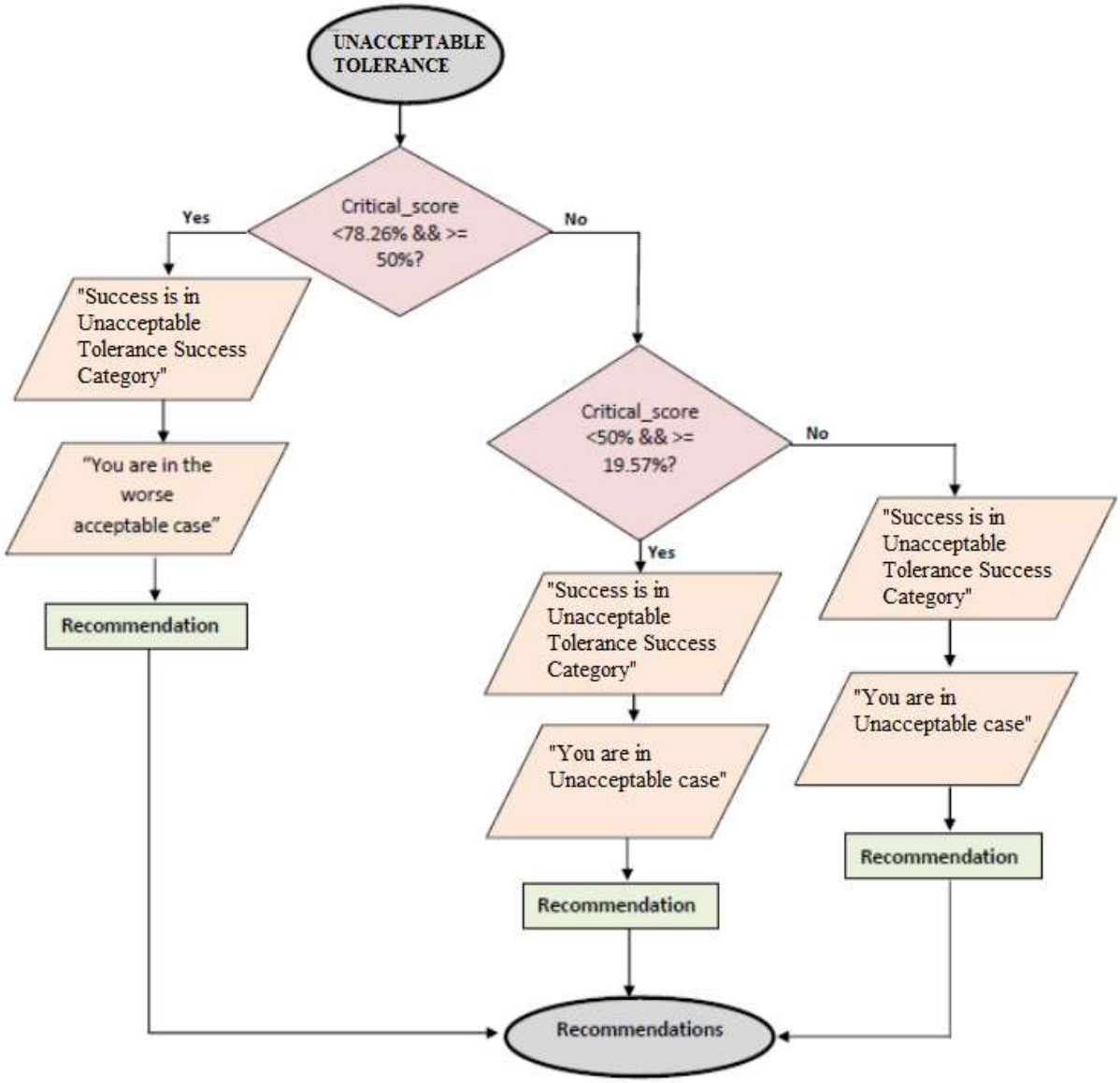


Figure 4.5: Unacceptable Tolerance success



4.1.5 Data flow diagrams

A data flow diagram is a graphical representation of the "flow" of data through an information system, modelling its process aspects and is often used as a preliminary step to create an overview of the system, which can later be elaborated (Bruza & Van der Weide, 1993). Data flow diagrams (DFD) were used to illustrate the kind of information that was related to input and output from the system; where the data comes from and it goes, and where the data would be stored.

The DFD system modelling began with a context diagram which was a simple representation of the whole system. To elaborate further, level 1 diagram with additional information about the major functions of the system was provided.

4.1.5.1 Context diagram

Figure 4.6: Context diagram – IT Project Evaluation System

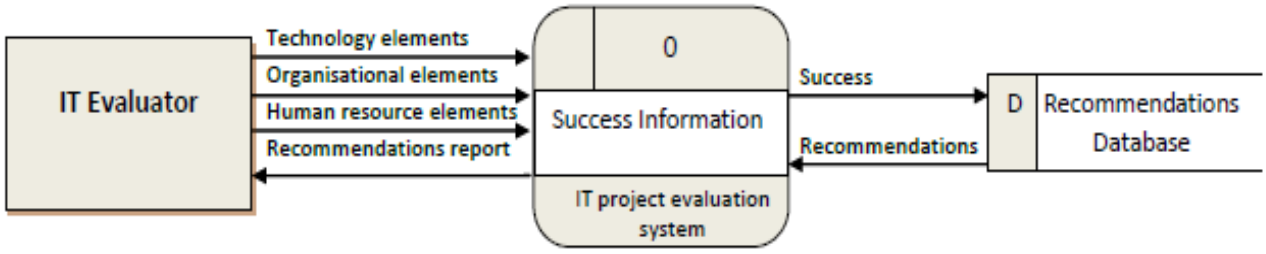
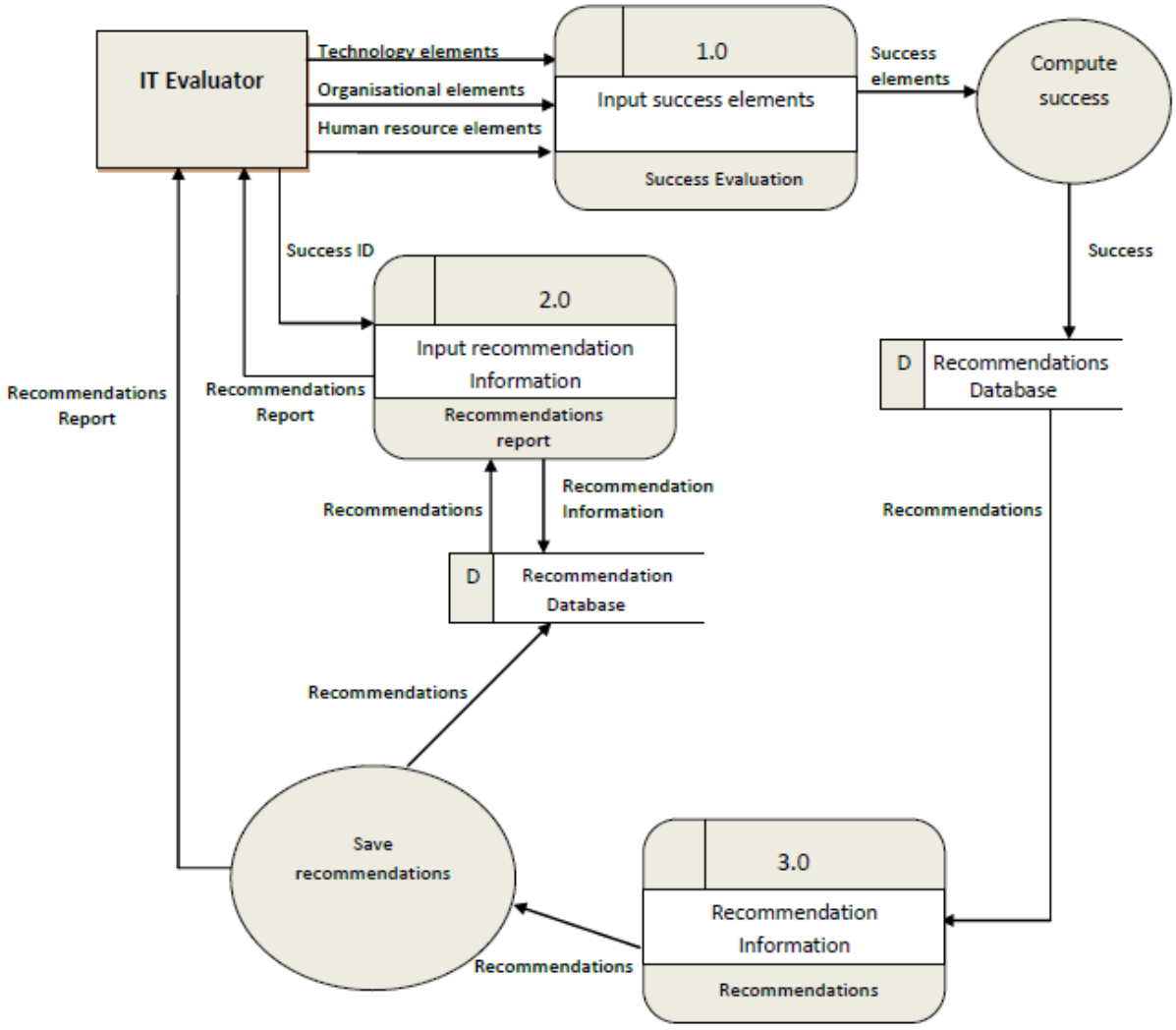


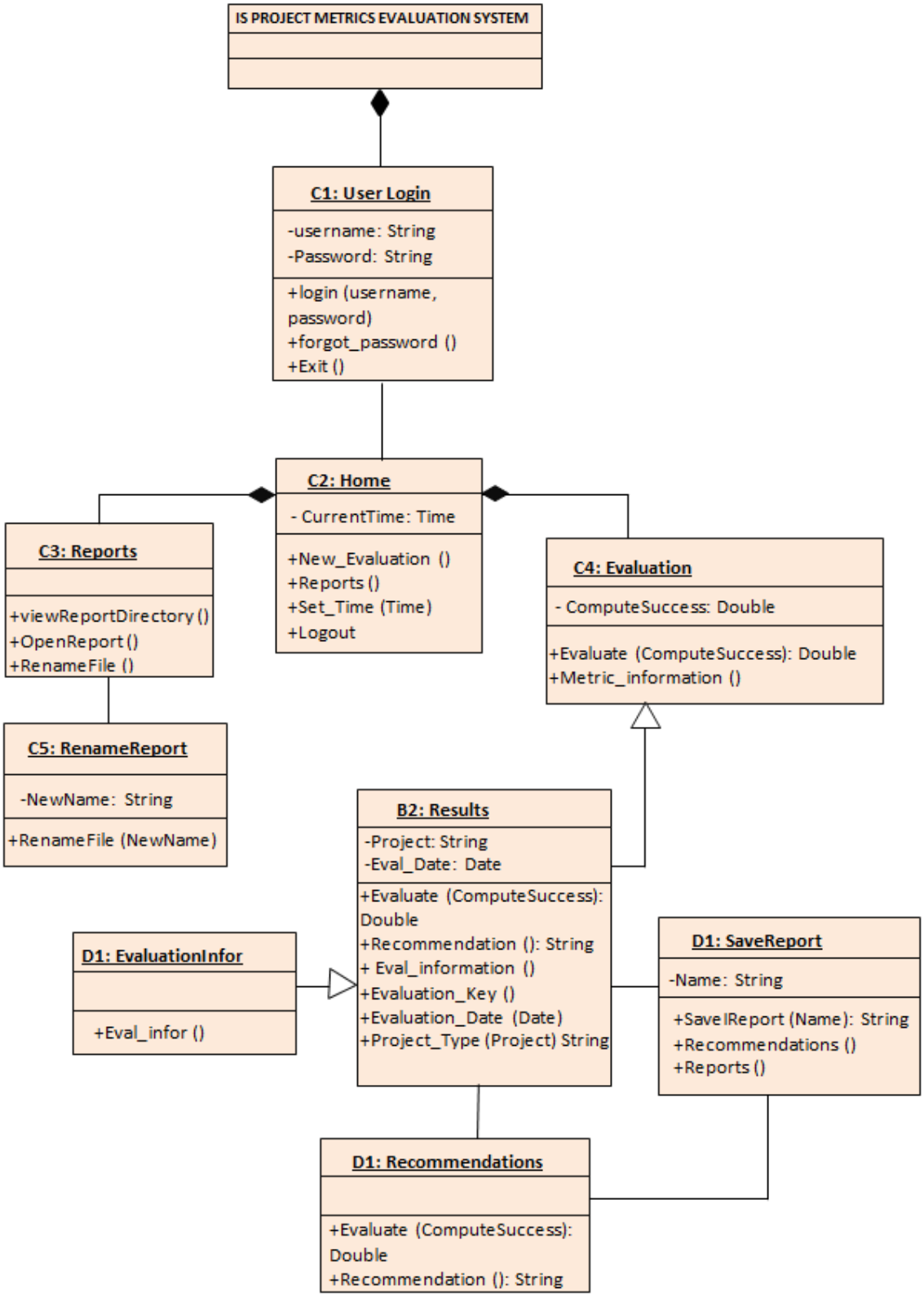
Figure 4.7: DFD level1 – IT Project Evaluation System



4.1.6 Class diagram

Class diagram is a graphical representation of the static view of the system and represents different aspects of the application. So a collection of class diagrams represent the whole system (Kusumarini, 2013). Class diagram was also a preferred system data modelling to conceptually define the classes, attributes and methods involved in the system. Class diagrams are considered the foundation for component and deployment diagrams (Mondal, 2014). They are not solely used to visualize the static view of the system but they are also used to construct the executable code for forward and reverse engineering of any system. The system class diagram is shown in Figure 4.8

Figure 4.8: System Class diagram



4.2 Summary

System development models are becoming popular in software design. This provides customer requirements at an early stage of development. A valuable feedback from the customer and can assist software designers and developers understand what exactly is expected from the product under development. This chapter had illustrated the development of the metric model system design using popular software engineering models such as activity diagram model, algorithm design, flowcharts, data flow diagrams and the class diagrams. It is the end product of this chapter that the actual metric tool design and coding began. This metrics model system was used in data analysis and interpretation of the study (See section 5.1 Findings).

CHAPTER FIVE: RESEARCH FINDINGS AND DISCUSSIONS

5.0 Introduction

The importance of Information and Communication Technologies as a tool for every organization success cannot be over emphasised. A focused Information and Communication Technology project (ICT) supports company's productivity, management effectiveness and quality service to the nation (Gichoya, 2005). The assessment, measurement and the rakings of the dominant success or failure factors were based on the project metrics tool which was established in Chapter 3 and 4 of this study. The findings in this study have revealed challenges faced by Botswana ICT projects. This chapter presents the empirical findings and the discussion of the study findings.

5.1 Findings

The findings in this study have revealed enormous challenges that ICT project managers in Botswana are faced with in their effort to practice and implement ICT projects. Generally, respondents expressed frustration at the status of Botswana ICT projects. They cited that most failed IT projects in Botswana were due to senior managers been either not aware or prefer to ignore the essential top management supporting processes. The metrics measures were applied to the empirical evidence of the study with the intention of assisting in estimation, quality control, productivity assessment and project control.

Tables 5.0 and 5.1 present the project success/failure metric model. This includes the success measure and its acceptability level. These were used to reveal the findings of the study.

Table 5.0: Success Categorization and Acceptability

Success category	Acceptability level	Success measure
Ideal Success	Ideal	100% metrics measures available
Acceptable tolerance	Best acceptable success	Less than 100% but greater than 89.2% metric elements
	Least acceptable success	Less than 89.2 % but greater than 79% of the metric elements
Unacceptable tolerance	Worse acceptable	Less than 79% but greater than 50% metric elements
	Unacceptable	Less than 50% metric elements

Table 5.0 shows the metrics model tool success categories, success acceptability levels and the success measure. The Ideal success means all the metrics elements are available. The Acceptable tolerance metrics category means partial metrics elements availability. In this category the value of the success measure can be tolerated. The other category of success which was used in the assessment of the success measure was the Unacceptable tolerance success category. At this stage success value or measure of success is unacceptable, therefore it is not desired.

Table 5.1: success or failure project metrics models

(A) Technological	(B) Human resource
A1 - IT functionality/ Capabilities	B1 – Use of Consultants
A2 - Ease of use/ quantity of use	B2 - Project Management
A3 - Happiness/willingness of end users	B3 - Project Manager experience
A4 - Technology and Technological issues	B4 - User training, education and support
A5 - Software development Methodology	B5 – Project Champion
A6 - Software prototyping and testing	B6 - Commitment
A7 - Vendor capabilities	B7 - Cooperation
A8 - Outsourcing strategy	B8 - Productivity
A9 - Implementation strategy	B9 - Empowerment
A10 - IT solved problem(s) that was intended to solve	B10 – Core competency
A11 - Software quality	B11 – Flexibility
A12 – Safety	
(C) Organisational	
C1 - Top management support	C13 – Leadership style
C2 - Project schedule	C14- Stakeholder management
C3 - Project Time	C15 - Security strategy
C4 - Project cost	C16 - Business process re-engineering
C5 - Project accuracy(specifications met)	C17– Organisational Benefits
C6 – Requirement Management	C18- Process improvements
C7 - Change management	C19 - Manual process intervention
C8 - Cultural management	C20 - Operating efficiencies
C9 - Quality management	C21 - Resource Management
C10 – Financial resources	C22 – Tracking of issues since implementation
C11 – Expectations Management	C23 - Business growth support
C12 - Business plan and vision	
Total metrics elements: 46	

From Table 5.1 the prefix (A) – was used to represent the metric elements under the Technology IS component, (B) - was used to denote the metrics elements under the Human resource IS component and finally (C) was used to represent the metrics elements under the Organisational components of information systems .

Qualitative data was collected from the respondents, and it then scrutinised for deeper meaning using the project metric tool (See Appendix section D and E – Interview results). The project success and failure factors were ranked based on their dominance using the metric tool (See section 5.1.1 and 5.1.2). Project success was categorised based on their information system components, success categories and acceptability as shown in Tables 5.7 and 5.15 using the metric tool. Finally a series of recommendation were proposed by the metric tool to achieve an ideal success. The project metrics model suggests that when a project comprise of all the valid success factors then the success measure is ideal successful project. Otherwise if partial or no valid factors were discovered then it was regarded as a theoretical failure (See section 3.5.1.2.3 Research methodology).

5.1.1 ICT/IT project success factors

All questions were addresses as it was necessary for the purpose of the study. The results were analysed and interpreted. During the data analysis key themes emerged which were used to interpret the findings. The findings were interpreted under the following themes: High impact level success factors, Project success and categorisation; Organisations schedule and budget constraints; Organisations size and number of team members involved; Organisations success and senior manager experience; Project success measurement and Acceptability level and Organisations success and Project Management tool usability obtained from the study research tool.

5.1.1.1 High impact level success factors

Table 5.3 presents the high impact level success factors extracted and ranked by the metric model. The High impact level are categorised by the IS components categories and the organisation names.

Table 5.3: High impact level success factors

IS Component	Success factors	Company A	Company B	Company C	Company D	Company E	Company F
Technology	**A1** - IT functionality/ Capabilities	✓	✓	✓	✓	✓	✓
	A4 - Technology and Technological issues	✓	✓	✓	✓	✓	✓
	A9 - Implementation strategy solve	✓	✓	✓	✓	✓	✓
	A10 - IT solved problem(s) that was intended to solve	✓	✓	✓	✓	✓	✓
Human resource	**B4** - User training, education and support	✓	✓	✓	✓	✓	✓
	B6 - Commitment	✓	✓	✓	✓	✓	✓
	B9 - Empowerment	✓	✓	✓	✓	✓	✓
Organisational	**C6** - Requirement Management	✓	✓	✓	✓	✓	✓

As shown in the table 5.3 most of the projects high impact level success factors embedded in the organisations belong to the Technological IS component category. The human resource constitutes fairly low high impact level success factors and the least factors belong to the Organisational IS component category. Therefore it can be concluded that most of the senior managers who delivered successful IT projects had their full attention in fulfilling most of the Technological dimension of the information system project. Other dimension like human resource and organisational components were given less attention by project management. This indicates that projects success in relation to IS components was not fairly balanced.

5.1.1.2 Project Success factors categorisations

Table 5.4 presents project dominant success factors rankings and their metric tool success categories. Success is also ranked based on the organisation. The organisation that constitutes

the most dominant success factors is given high precedence over the one with least dominant success factors.

Table 5.4: Project success and categorisation

Organisations rankings	Summary of project success factors ratings measured up against the Metric model	Metric tool success categorisation
Company A	40/46	
Company B	36/46	
Company F	34/46	
Company C	33/46	
Company E	31/46	
Company D	30/46	

Note:  Ideal Success (46 All elements fulfilled)  Acceptable tolerance (45 –36 elements fulfilled)  Unacceptable tolerance (less than 36 elements fulfilled)

Table 5.4 shows that few of the organisations which attain higher desired level of IT projects success, were organisations falling in the acceptable tolerance category of the metrics model. It is not easy to attain an ideal successful project; thus a project that satisfies all the success factors regarded by the metric model. However most of the successful projects fall within the most critical success category. These IT projects have fulfilled less than 36 metric measures or elements requirements.

5.1.1.3 Organisations schedule and budget constraints

Table 5.5 present the organisations project successes with respect to the schedule and budgets constraints which were initially set in the beginning of the projects and success was ranked using the metric tool as shown.

Table 5.5: Organisations schedule and budget constraints

Organisation success rankings	**Success factors summary ratings**	**Schedule of the project**	**Budget allocated**
Company A	🖐	2 years	P13m
Company B	🖐	3years	P30 m
Company F	👌	5 years	≈ P127 m
Company C	👌	7 years	≈ P340 m
Company E	👌	5- 7 years	P284 m
Company D	👌	7 years	P400 m

Note: 👍Ideal Success (46 All elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

From the above table 5.5 it is a clear indication that most IT projects which were in acceptable tolerance success category have typically been allocated small budgets and has been scheduled to run for a short span of time. These were less complex and relatively smaller size projects. It was revealed that as the magnitude and complexity of the project increases with the schedule and budget constraints, the achievement of the desired level of success was compromised.

5.1.1.4 Organisations size and number of team members involved

Table 5.6 shows the organisations size and the number of team members involved as the other dimensions assessed to evaluate the organisations project success. As indicated in Table 5.6, the organisation size with respect to the number of the team members involved contribute to the overall IT project success.

Table 5.6: Organisations size and number of team members involved

Organisation success ranking	Success factors variance summary ratings	Organisation size (employees)	No. of team members involved
Company A	🖐	≈ 170	6
Company B	🖐	150	15
Company F	👌	≈300	10
Company C	👌	870	20
Company E	👌	≈ 800	≈15
Company D	👌	≈ 750	10

Note: 👍Ideal Success (46 All elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

Table 5.6 indicates that organisation with projects that falls within the acceptable tolerance success category are the ones that constitute less number of employees and few number of project team members. This is on the contrary when you examine organisations that deliver less successful IT projects but falling under the unacceptable tolerance success category. As such it can be concluded that IT project success organisations has some relationship to organisation size and number of team members involved in the projects. Thus; the organisations with large number of employees and number of team members involved might have management challenges. Therefore the IT project is bound to be fairly successful but not up to its full potential.

5.1.1.5 Organisations success and senior manager's experience

Table 5.7 presents senior managers number of years in current position and frequency of their involvement IT projects. The two dimensions were used to assess the senior managers' experience in relation to their input towards the project success.

Table 5.7: Organisations success and senior manager experience

Organisation success ranking	Success factors variance summary ratings	No. of years in present position	No. of IT projects involved
Company A	🖐	8 years	5
Company B	👌	13 years	≈ 10
Company F	👌	15 years	≈ 9
Company C	👌	≈ 5 years	7
Company E	👌	≈ 2 years	2
Company D	👌	≈ 3 years	5

Note: 👍Ideal Success (46 All elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

As shown in table 5.7, the findings reveal that in organisations that delivered highly successful projects, (which falls under the acceptable tolerance success category), most of the

IT senior management who were in charge of those projects had indicated a higher number of years of experience in their project management position. The senior managers also indicated a greater frequency of involvements in similar projects. The findings emphasize the importance of having the highly experienced senior managers. It is assumed that in projects managed by well experienced managers are likely to be highly successful compared to those managed by less experienced managers. Moreover, the results dictate that most of the project managers that deliver less successful are senior managers with few years of experience in the senior management position and seem to have been involved in fairly small number of similar projects.

5.1.1.6 Project success measurement and Acceptability level

Table 5.8 presents the organisations success measures, based on the IS components categories, success category and acceptability derived from the success metric tool.

Table 5.8: Organisations success and acceptability

Organisation success rankings	Technology	Human resource	Organisational	Metric Total value of Organisation project success	Success Category	Success Acceptability level
Company A	17.39%	23.91%	45.65%	86.96%	☑	👌
Company B	21.74%	19.57%	36.96%	78.26%	☑	👌
Company F	19.57%	19.57%	34.78%	73.91%	☒	✌
Company C	17.39%	19.57%	34.78%	71.74%	☒	✌
Company E	17.39%	19.57%	30.43%	67.39%	☒	✌
Company D	15.22%	15.22%	34.78%	65.2%	☒	✌

Note: ☑Acceptable tolerance ☒Unacceptable tolerance 👍Ideal Success 🖐Best acceptable 👌least acceptable ✌worse acceptable 👎Unacceptable

As shown in table 5.8, the metric model indicates that very few projects are highly successful but the success is not up to the desired satisfaction. The IT projects which were in

unacceptable tolerance success category were the worse acceptable, thus the projects were still successful but not desired. Therefore, from the results it can be denoted that most of the IT projects in Botswana are successful but the success measure is undesirable.

5.1.1.7 Organisation success and Project Management (PM) success measuring tool usability

Table 5.9 presents the senior managers usability of the project management tool in measuring the values of project success within the organisations. The participants were required to state the value success measurement they accomplished in their projects. The value was then compared to the metric tool value of project success as shown.

Table 5.9: Organisations success and project management tool usability

Organisation success ranking	Senior Manager dictated value of project success	Metric model value of project success	Organisation Categorization of success measurement	Metrics model success Categorization of success	Organisation use of PM tools to measure success
Company A	85.7%	86.96%	✗	✓	✓
Company B	90%	78.26%	✗	✓	✗
Company F	75%	73.91%	✗	✓	✓
Company C	83%	71.74%	✗	✓	✓
Company E	90%	67.39%	✗	✓	✗
Company D	82%	65.22%	✗	✓	✗

Note: ✓Yes ✗ No

Table 5.9 reveals that the value of project success dictated by the senior managers compared against the metric tool value of success were not the same. However in some cases where senior managers have used a project management tool especially Prince 2 or HEAT to measure of project success, the difference between values was less. The difference between the two values was high when senior managers did not use any project management tool to

measure the value of success. In these cases senior managers relied on the project metrics of time and budget to dictate the value of project success.

It is against this lack of common agreement in the common value for success that suggests that project success measurement approach applied may be inconsistent or ineffective therefore needs attention. Moreover, the results revealed that senior managers in Botswana did not categorise success measure. As a results they could not clearly point out which area of IS components had a huge impact on the overall IT project success they were involved in.

5.1.2 ICT/IT project failure factors

Similarly as regard to the ICT/IT project failure factors, all questions were dealt with as it was of value to the overall study. The results were also analysed and interpreted using the project metrics tool. During the analysis of data, the key themes which emerged in the ICT/IT project success factors were repeated. They were used to interpret the findings.

5.1.2.1 High impact level failure factors

Table 5.11 presents the high impact level failure factors against there IS component metric categories. The high impact level failure factors are presented against the organisations names as shown.

Table 5.11: High impact level failure factors

IS Component	Failure factors	Company A	Company B	Company C	Company D	Company E	Company F
Technology	**A10 -** IT solved problem(s) that was intended to solve	✓	✓	✓	✓	✓	✓
Human resource	**B1 –** Use of consultants	✓	✓	✓	✓	✓	✓
	B2 - Project Management	✓	✓	✓	✓	✓	✓
	B6 - Commitment	✓	✓	✓	✓	✓	✓
Organisational	**C1 -** Top Management Support	✓	✓	✓	✓	✓	✓
	C5 – Project Budget	✓	✓	✓	✓	✓	✓
	C13 – Leadership style	✓	✓	✓	✓	✓	✓
	C14 – Stakeholder involvement	✓	✓	✓	✓	✓	✓

Table 5.11 reveals that most of the projects high impact level failure factors are associated with the Organisational component of IS followed by Human resource and the Technology IS component category. This shows that senior managers who deliver most failing IT projects keep less attention of the organisational component of the IS project compared to other IS components like Technology and Human resource. The findings reveal both the Technology components and the Human resource components contribute to less high impact level failure factors. This implies that most of the ICT/IT project failure in IT Organisations belong to the organisation dimension of IS and very little is from the Technological component of IS category.

5.1.2.2 Project Failure factors categorisations

Table 5.12 shows the organisations project failure factors and their success categories based on the metric tool. The project failure results were used to rank the organisations IT failures respectively as shown.

Table 5.12: Project failure categorisation

Organisations rankings	**Summary of project success factors ratings measured up against the Metric model**	**Metric tool success categorisation**
Company C	20/46	👌
Company D	18/46	👌
Company B	17/46	👌
Company A	16/46	👌
Company F	16/46	👌
Company E	8/46	👌

Note: 👍Ideal Success (All metric elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

Table 5.12 above shows that most of the IT projects embedded in organisation fall within the unacceptable tolerance success category derived by metrics model tool. These were IT projects that satisfy less than 36 metric measures.

5.1.2.3 Organisations schedule and budget constraints

Table 5.13 presents the organisations project failure examined with respect to the schedule and budgets constraints. These constraints were set for the project during the project initiation stage.

Table 5.13: Organisations schedule and budget constraints

Organisation success rankings	Summary of project success factors ratings measured up against the Metric model	Metric model success categorisation	Schedule of the project	Budget allocated
Company C	20/46	👌	2 years	P13m
Company D	18/46	👌	3years	P30 m
Company B	17/46	👌	5 years	≈ P127 m
Company A	16/46	👌	7 years	≈ P340 m
Company F	16/46	👌	5- 7 years	P284 m
Company E	8/46	👌	7 years	P400 m

Note: 👍Ideal Success (46 All elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

The results from table 5.13 showed that most IT projects which were in the unacceptable tolerance category. These projects had relatively high impact level failure factors and have been allocated huge budgets and have been scheduled to run for longer period of time. These were less complex and relatively smaller size projects. The table also shows that as the

magnitude and complexity of the project increases with the schedule and budget constraints, the overall IT project failure factors increases amongst failing projects.

5.1.2.4 Organisations size and number of team members involved

Table 5.14 presents organisations size and the number of team members involved dimensions used to evaluate the organisations project failure. The results shows that the organisation size with respect to the number of the team members involved can have an impact in the overall IT project failure as shown.

Table 5.14: Organisations size and number of team members involved

Organisation success rankings	Summary of project success factors ratings measured up against the Metric model	Success factors variance ratings summary	Organisation size (employees)	No. of team members involved
Company C	20/46	👌	≈ 170	6
Company D	18/46	👌	150	15
Company B	17/46	👌	≈300	10
Company A	16/46	👌	870	20
Company F	16/46	👌	≈ 800	≈15
Company E	8/46	👌	≈ 750	10

Note: 👍Ideal Success (46 All elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

Table 5.14 indicates that organisation with projects that fall within the unacceptable tolerance category but with few high level impact failure factors are the ones that constitute less number of employees and less number of project team members. On the contrary this is not the case when examining organisations that deliver more failing IT projects. As such it could be concluded that the higher the number of employees in the organisation and the higher the number of team members involved, the IT project is bound to fail even more. Therefore this is a clear indication that such IT project might be facing a lot of management challenges.

5.1.2.5 Organisations failure and senior manager's experience

Table 5.15 presents the senior manager number of years in current position and the frequency of IT project involvement.

Table 5.15: Organisations failure and senior manager experience

Organisation success rankings	Summary of project success factors ratings measured up against the Metric model	Success factors variance summary ratings	No. of years in present position	No. of IT projects involved
Company C	20/46	👌	8 years	5
Company D	18/46	👌	13 years	≈ 10
Company A	17/46	👌	15 years	≈ 9
Company B	16/46	👌	≈ 5 years	7
Company F	16/46	👌	≈ 2 years	2
Company E	8/46	👌	≈ 3 years	5

Note: 👍Success (46 All elements fulfilled) 🖐Acceptable tolerance (45 –36 elements fulfilled) 👌Unacceptable tolerance (less than 36 elements fulfilled)

The results as shown in Table 5.15 reveal that in organisations that delivered less failure projects, most of the IT senior management in charge of those projects had indicated a higher number of years in their project management position. Senior managers of less failing projects also indicated a greater number of involvements in similar projects as compared to those with high number of failing IT projects. The results emphasize the view that having highly experienced senior managers would increase the chances of having less failure IT projects. In the same vein senior managers who have less experienced in the senior management position and had been involved in small number of similar projects are likely to have a high IT projects failure rate.

5.1.2.6 Project failure measurement and Acceptability level

Table 5.16 shows the organisations' projects failures assessed using the metric tool to determine their failure acceptability levels and the total measure of project success.

Table 5.16: Organisations failure and acceptability

Organisation success rankings	Technological	Human resource	Organisational	Metric Total value of Organisation project success	Success Category	Success Acceptability level
Company C	17.39%	13.04%	13.04%	43.48%	☒	✌
Company D	8.70%	6.52%	23.91%	39.13%	☒	✌
Company A	17.39%	2.17%	17.39%	36.96%	☒	✌
Company B	4.35%	4.35%	26.09%	34.78%	☒	✌
Company F	4.35%	13.04%	17.39%	34.78%	☒	✌
Company E	2.17%	4.35%	10.87%	17.39%	☒	👎

Note: ☑Acceptable tolerance ☒Unacceptable tolerance 👍Ideal 🖐Best acceptable 👌least acceptable ✌worse acceptable 👎Unacceptable

From the table 5.16 above it is revealed that few of the failed IT projects fall within the unacceptable tolerance failure category, under the worse acceptable failure. The results also illustrate that majority of these projects are in the unacceptable category of failure. According to the metric tool this IT project failure cannot be tolerated.

5.1.2.7 Organisation failure and Project Management (PM) failure measuring tool usability

Table 5.17 shows participants stated value of project failure against the metrics model tool value project failure. The study also sought to discover the usability of the project management tool by measuring the values of project failure within the organisations and the success categorization of the value of project failure.

Table 5.17: Organisations project failures and project management tool usability

Organisation success ranking	Senior Manager dictated value of project success	Metric model value of project success	Organisation Categorization of failure measurement	Metrics model Categorization of failure measurement	Organisation use of PM tools to measure success
Company C	44.5%	43.48%	✗	✓	✓
Company D	55%	39.13%	✗	✓	✗
Company A	37%	36.96 %	✗	✓	✓
Company B	40%	34.78%	✗	✓	✗
Company F	50%	34.78%	✗	✓	✗
Company E	30%	17.39%	✗	✓	✗

Note: ✓Yes ✗ No

The table 5.17 above reveals that the value of IT project failure as dictated by the senior managers compared to the metrics tool value of failure were not the same. But in cases where senior managers did not use any project management tool to measure the value of project failure, the difference between the two values was high. Furthermore, the results revealed that senior managers in Botswana did not categorise the IT project failure measure. As result senior managers of Botswana could not clearly pinpoint which area of IS had huge impact on the overall downfall of the IT projects they were involved in.

5.2 Discussions

The discussion of the results is aimed at extrapolating clearly the qualitative outcome from the interviews with an effort to address the study research questions. The results show that majority of the successful projects are in acceptable tolerance success category. This means IT project success measure at this category is not up to the ideal project success but can be tolerated. The results also indicate that the failed IT projects are mostly in unacceptable tolerance failure category. Therefore this indicates that project failure measure at this

category cannot be tolerated. The findings are discussed according to the research Questions (RQ) in the study. The attempt has also been made to draw as much as possible on the theoretical models and ideas presented in the literature review chapters.

5.2.1 Factors contributing to ICT/IT project success in Botswana

There are a number of factors contributing to the success of ICT/IT projects in Botswana. The respondents indicated the project success factors embedded in IT projects they have been involved in to be;

- The ability to address technological and technical issues
- The IT capability or functionality
- Effective implementation strategy
- The ability of the IT to solve the problem it is intended to solve
- User training, education and support
- Effective project team commitment
- Empowerment
- Requirements management

The participants strongly believed that the factors are important and valid factors for the success of Botswana IT projects. The respondents above sentiments were shared by a number of scholars when they outlined the influential success factors (Wateridge, 1995; Thomesett, 2002 Horine, 2005; Hastie, 2006; Standish Group International, 2010; Nkwe, 2012). However some of the studies outlined high impact factors that contradict critical success factors (Zink, Steimle and Schroder; 2008)

It has been revealed that most of the dominant success key factors established in the context of Botswana are not on the managerial side, most of them come from the technical

perspective. The results could be closely related to the success factors mentioned by Nkwe (2012) when relating ICT project success in Botswana to the accomplishment of technical aspect of the project information system.

5.2.2 Factors contributing to ICT/IT project failure in Botswana

In endeavour to establish the factors contributing to project failures in Botswana, the respondents indicated that the prime failure factors in project include;

- IT system inability to solve problem(s) that was intended to solve
- Use of consultants
- Poor project management
- No commitment
- Lack of top management support
- Violated budget constraints
- Poor leadership style
- Lack of stakeholder involvement.

Researches (Bentley & Whitten, 2007; Al-Ahmand, 2009; Nasir and Sahibuddin 2011) have discovered similar results. The other prime failure factor that all respondents were in agreement with was the lack of commitment from the project team. Respondents indicated that lack of commitment from the project team and senior management had been the main factor to failures in their projects recently.

The other revelation from the interviews was the use of consultants as the principal factor that contributes to project failures in most organisations. Although this contradicts views concerning failure factors outlined in literature, some studies in Botswana have poor consultancy among the failure factors (Tabane, 2011; Ontebetse, 2013).

The findings of this study clearly indicate that the respondents are fully aware of the project failure factors; but fulfilling other projects requirements was not that important in their opinion. Most of the participants agreed that the product should be developed according to users' and not to customer's requirements. Hence, the negligence on addressing other fundamental elements by the project management society in Botswana could be an indication of the fact that this society has forgotten altogether the principles of the profession. If this turns out to be the case, a revolutionary movement is required to change the entire mind-set of project management profession in Botswana.

5.2.3 Project Managers experience on the success or failure of ICT projects in Botswana

During interviews, participants from all the organisations agreed that project manager's experience is one of the principal factors that can inspire the project success or failure outcome. When emphasizing on successful projects, respondents indicated that a successful project manager should have acquired technological skills, domain expertise, and vast experience – including overall IT experience as well as project management experience. The findings of this study clearly suggest that project managers who are less experienced, thus who had been involved in the less number of projects and have relatively less number of years in their senior management position are likely to deliver less successful projects. This is affirmed by Ibrahim *et al.* (2013) in their studies that project failures are associated with lack of requisite knowledge and experience by project managers.

It was also commonly agreed by participants that most of the unsuccessful IT projects are the ones that were allocated big budgets and a run for a longer period of time. This was beyond most project manager's level of experience and became a main contributor to project failure.

Interviews also revealed that participants found it difficult to categorise the measure of success. Their stated value of project success was different from the metric model success value. In this case senior managers affirmed that they did not use any measuring tool but relied on the project metrics of time and budget to evaluate the success measure. The researcher was quick to note that this could not be used to criticize the project management expertise nor the experience of the project manager in delivering successful/failing projects.

Nevertheless, it was due to lack of consensus in the use of a common value of the success/ failure measure which clearly signified that the existing system for evaluating and measuring the value for the success/failure of IT projects is ineffective. Therefore it needs further development and improvement.

5.2.4 Top management support on the success or failure of ICT projects in Botswana.

Even though it was commonly agreed by respondents that top management support can positively inspire IT project success, this was not so evident in most of the successful projects in Botswana. However, most participants stated that even though top manager's support was not that much of an influence, but other project management success strategies like fostering team commitment, developing project management procedures and empowerment were support processes for the projects needs and requirements.

When examining the top management support influence towards the failed projects, participants indicated that lack of top management support was the key factor that contributed to the failure of most projects they had been involved in. These were the cases where the top management did not see the benefit of the IT system to the organisation business and gave it a low priority in terms of resource allocation. McKeeman and Zhang (2006) also found

similar results in their study when they argued that top managers can become an ultimate project failure.

The findings of the study clearly show that participants are aware of the effect of top management support towards project success/failure outcome. However, prefer to ignore it, and depend on various supporting processes they believe define the project success. Therefore, this results in most of the ICT/IT project failing.

5.3 Summary

The findings of the study showed that majority of Botswana IT projects could be successful in functionalities and best acceptable. Unfortunately when these projects are evaluated against theoretical success models and success evaluation criteria's in literature, they are not up to their full potential, hence unsuccessful. The findings also revealed that senior managers are aware of the factors contributing to the project success/failure in their organisation but are keen to deliver functional systems. Therefore, they tend to forget or choose to ignore other fundamental areas of project management profession which they regard not important. These are the major causes of failure in their projects. Furthermore, the findings had shown that if the success measurement metrics tool is used to evaluate project success then senior managers can make more IT projects strategic and informed decisions The empirical evidence had shown that the metric tools enable senior managers to categorise success and determine success acceptability levels. This provides them with strong justification to identify the exact source of IT project success or failure factors and a series of recommendation to address those factors.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter focuses on conclusions based on the data collected and interpreted in chapter 6 thereby answering the research questions outlined in chapter one. Recommendations were made on the basis of the findings of the study. A few recommendations on what ICT/IT senior managers of Botswana can do to ensure the consistent delivery of successful IT projects into the future were suggested.

6.1 Conclusions

The findings of the study suggest several important conclusions. It was revealed that defining project success, its measure and the establishment of a set of success/failure factors is of paramount importance for every project-oriented organization. The implication was that if an organisation does not know early in the project how they are going to measure its business success, they are bound to face challenges. The study also suggested that the consequences of projects failures in ICT/IT projects could be financially costly and could be extremely crucial to the overall survival of an organization. The general feeling of the respondents was that having an ample knowledge during the project's initial phase of how the project success might look like, and its assessment strategies; project team and stakeholders can be more focused on common objectives and establish robust targets for evaluating project progress.

The study revealed that most what Botswana denotes as highly successful and highly acceptable ICT/IT projects are actually disappointing when evaluated against classical models and the theoretical project success measures in literature. These are projects that

deliver their functionality to their full potential, but other aspects of project success were regarded not important by the project team. The respondents believed that in order to attain successful project in Botswana it must constitute the following success factors;

- The ability to address technological and technical issues,
- Effective IT capability or functionality,
- Best implementation strategy,
- The ability of the IT to solve the problem it is intended to solve
- Effective project team commitment
- User empowerment
- Good requirements management
- User involvement,
- Top management support
- Clear business objectives
- Emotional maturity
- Optimization,
- Agile process
- Project management expertise and skilled resources.

When scrutinizing the failed IT projects, the empirical study had shown that, most of these projects are in the unacceptable tolerance failure category (See Table 5.14). These are project which were regarded complex and characterised by huge budgets, scheduled to run for longer period time and large number of employees. The study findings also indicated that an IT project is regarded a failure in Botswana if it enshrines the following failure factors;

- Lack of top management support

- Weak project manager
- Inadequate stakeholder involvement
- Team members lack of requisite knowledge
- Poor project planning
- Poor management of requirements
- Poor project consultancy
- Failure to manage the changing scope, poor commitment
- Violated budget constraints and poor leadership style.

The other major factor that the study highlighted as the major cause of project failure was use of consultants. The respondents felt that some of the consultants lack of consultant competency. Brunsson (2000) affirms that consultants are known to attribute to project failures by lack of competency, ineffective project management and abandoning some project even before or during the implementation stage.

Another finding is that project management experience is a key determinant for project success or failure outcome. This suggests that project managers must be highly experienced to handle different project dimensions and complexity of challenges. It implies that the higher the experienced senior manager, the higher the chances of the project's success. Experienced hereby refers to those who had been involved in numerous number of related IT project and have many years in their senior management position.

The survey findings also indicated that organisation size and the number of teams involved have an impact on the overall success or failure of an IT project. This was evident in IT projects carried out in organisations with large number of employees and team number involved.

Such organisations experience more failures compared the ones with smaller numbers. Therefore the findings suggested that these organisations may be experiencing a lot of management challenges.

Furthermore, the study findings also revealed that although most project managers have been equipped with the knowledge of some project management methodologies such as HEAT and PRINCE 2, a lot needs to done in the area of project management. Project managers are not adequately trained to successfully apply and put the theory of project management into practise. The fact that Botswana project managers have been proved to be unwilling to categories the project success, or come to consensus to a single success measurement value, this was a clear indication that Botswana project management practice, experience and the evaluation process are the causes of Botswana ICT/IT projects failures.

Another key point to mention is that, vigorous the top management would wish to set clear organisational goals and objectives – the reality is that, this is not evident in most of the successful Botswana organisations. The survey findings have shown that in most failed IT projects in Botswana, senior managers are either not aware, or prefer to ignore, the essential top management supporting processes. The research findings indicate that top managers choose to focus on developing project management procedures, fostering team commitment and empowerment keen to deliver functional systems. The findings furthermore reveal that top management support is not fair across projects; as a result, some projects which are considered of less benefit to the organisation are given less priority in resource allocation. This was a major cause of project failure.

When scrutinising on factors contributing to IT projects success or failure in Botswana against the success/failure factors in literature on other countries, the study revealed that Botswana IT project success/failure factors are not exactly the same as in literature. However, they are still some similarities. The study findings have shown that most of the IT project success factors in Botswana are dominated by the technological dimension of IS compared with other components of information system. Hence delivering more functional systems.

Apart from establishing factors contributing towards the success/failure of IT projects and setting out a set of recommendations, this study has also shown that success still needs to be measured, categorised and ranked to be justified. This would not only boosts project justification, but also project acceptance by the user community and the resulting return on investment (ROI). The outcome of this study is that, it is only those organisations that measure and rank the dominant success and failure factors that will eventually emerge as industry leaders in this information age.

6.2 Recommendations

On the basis of the findings of the study and the conclusion drawn, the following recommendations were suggested for considerations;

- Top management should give support to all technological and non-technological project initiatives within IT organisations and should not sabotaged or abandon some projects for being deemed low priority or not important to the benefits to the organisation.

- Top management should define clear, realistic project goals and organisations objectives to the project team at the initial phase of the project.

- Top management should have an insight in applying different top management support processes to a particular industry and culture.

- Project Managers must be adequately trained to deliver more successful IT projects in Botswana

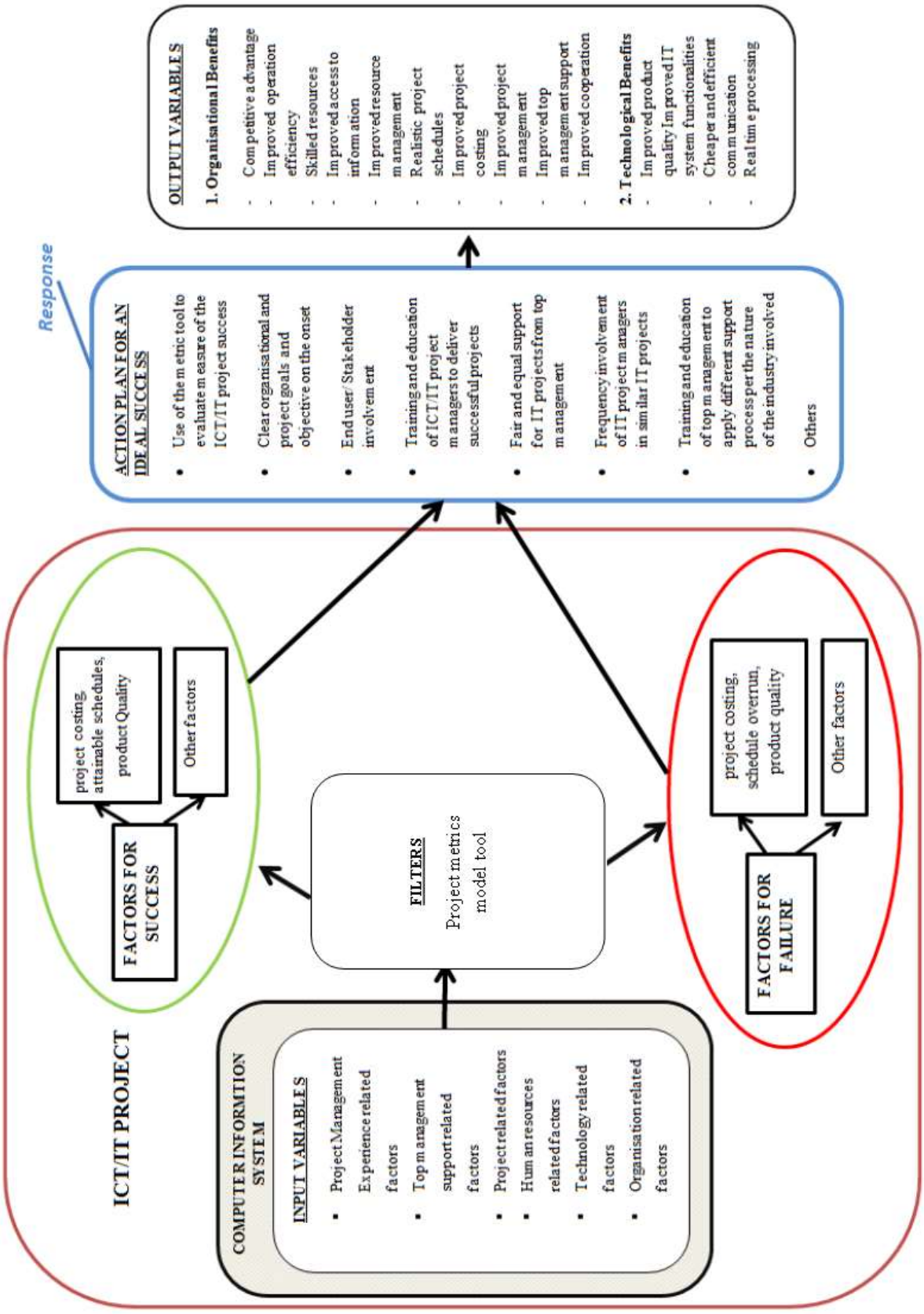
- The senior managers within organisation should consequently, with every effort involve end users in every stage of the project life cycle; thus from the initial stage of the project until the implementation stage.

- Senior managers should utilise the metrics model tool to assess, evaluate and measure project success or failure.

6.2.1 The recommended conceptual framework for ICT/IT project success in Botswana

The study also recommends the conceptual framework for achieving an ideal successful project in Botswana. The framework expresses that a Computer Information System can be regarded as a subset of an entire ICT project. The success or failure of an ICT project can be associated with the factors relating to IS components which their expected outcome is influenced by factors such as social, cultural, political, governmental, technical and operational environment. The framework main goal is to recommend the action plans that can be taken by ICT/IT senior managers in Botswana to achieve an Ideal success as recommended by the project metric tool. Figure 6.0 shows the recommended conceptual framework for ICT/IT project success in Botswana.

Figure 6.0: Recommended Conceptual Framework for ICT/IT project success in Botswana



6.3 Suggestion for future research

Project management practises and methodologies must be improved to accomplish successful IT projects in Botswana. This suggest that variety of research directions needs to be pursued in the area of factors contributing towards the success/failure of ICT/IT project in Botswana to make such an effort feasible. It is worth reiterating that this study was confined to the ICT/IT projects in the southern part of Botswana, in the city of Gaborone. Therefore it would be imprudent to assume that the findings are representative of the entire industry. The study further recommends areas to be researched on if the study is to be repeated.

- Future research should therefore strive to expand the scope of the same or similar studies to cover more if not all ICT/IT projects in Botswana, of which results would then be more representative of the industry.

- Future researchers may also seek to conduct similar studies in different industries to establish whether indeed project management challenges are standard across all industries or whether each industry presents its own unique challenges.

- Future researchers may also seek to expand the functionality of the project metrics model tool to be able to draw the graphical comparison of different project evaluation dimensions such as schedules, size and budget without having to use other statistical tools like Microsoft excel to draw comparisons .

- Future research may also seek to expand the functionality of the project metrics model tool to encompass prediction models. Assumption is that as project success or failures are evaluated, data regarding project evaluation is saved for later consumption.

Through time this data will accumulate in to huge quantitative data, which can further be extrapolated with predictive models to predict the outcome of the next similar project.

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APPENDICES

Appendix A: Research tool - Interview Guide

CONFIDENTIAL

ASSESSMENT OF ICT PROJECT SUCCESS/FAILURE IN BOTSWANA USING PROJECT METRIC MODELS

I. Interview Protocol

Organisation (Main contractor/Subcontractor):_____

Interviewee Position_____

Interviewer: _____

Survey Section Used:

_____ A: Interview Schedule

_____ B: ICT project Success in Botswana

_____ C: ICT project Failure in Botswana

_____ D: Top management involvement

_____ E: Project Management Experience

_____ F: Organisational Objectives

Other Topics Discussed: _____

_____

Documents Obtained: _____

_____

_____

Post interview comments or Leads: _____

A. Interviewee schedule

How long have you been…

_____ in your present position?

_____ in this organisation?

Interesting background information on interviewee:

How many Big IT project were you involved in for the past ~~ten~~ years? _____

How can you describe the size of the IT projects you were involved in, in terms of…

_____ Numbers of Team members involved

_____Number of employees in the organisation

_____Budget

_____Duration

1. Briefly describe your role (IT chief officer, project manager, steering committee, team leader.) as it relates to your position in the organisation (if appropriate).

Probes: How are you involved in IT project management in your organisation?

How did you get involved?

2. What motivates you to use your project management approach in your organisation?

B. ICT/IT project success factors

1. Give % of success of IT project you were involved in for the past years? What was their contribution in terms of IS Technology, Organisational and Human resource component?

2. What do you think are the main factors that contribute to the success of the project you were involved in?

3. In your own opinion, what can you say about the following factors in terms of their impact towards project success in this organisation?

TECHNOLOGY	[F]	ORGANISATIONAL	[F]	HUMAN RESOURCE	[F]
IT functionality/ Capabilities		Top management support		Use of consultants	
Ease of use/ quantity of use		Project schedule		IT project management	
Happiness/willingness of end users		Project Time		User training, education and support	
Technology and technological issues		Project Budget		IT project champion	
Software development methodology		Project accuracy(specifications met)		Commitment	
Software prototyping and testing		Management of requirements		Cooperation	
Vendor capabilities		Change management		Communication	
Outsourcing strategy		Cultural management		Productivity	
Implementation strategy		Quality management		Team Composition and skills	
IT solved problem(s) that was intended to solve		Business process re-engineering		Flexibility	
Software quality		Financial resource		Empowerment	
Safety		Management of Expectations			
		Business plan and vision			
		Leadership style			
		Stakeholder involvement			
		Security strategy			
		Organisational benefits			
		Un-intentional process improvements			
		Manual process intervention			
		Real time reports			
		Tracked and recorded issues since implementation			
		Resource management			
		Support for business growth			

KEY: [F] = FACTOR

4. Who do you think is most responsible for IT project success you were involved in?

Probes: what is their degree of contribution towards projects success?

5. How did project management strategy imposed in this organisation attribute to IT project success?

Probes: Is it working – why or why not?

C. ICT/ IT project failure factors

1. Give % of Failure of IT project you were involved in for the past years? What was their contribution in terms of IS components; Technology, Organisational and Human resource?

2. Explain the actual factors that contributed to the projects to be not so successful?

3. In your own opinion, what can you say about the following factors in terms of their level of contribution towards project not to be successful in this organisation?

TECHNOLOGY	**[F]**	**ORGANISATIONAL**	**[F]**	**HUMAN RESOURCE**	**[F]**
IT functionality/ Capabilities		Top management support		Use of consultants	
Ease of use/ quantity of use		Project schedule		IT project management	
Happiness/willingness of end users		Project Time		User training, education and support	
Technology and technological issues		Project cost		IT project champion	
Software development		Project accuracy(specifications met)		Commitment	
Software prototyping and testing		Management of requirements		Cooperation	
IT vendor capabilities		Change management		Enhanced productivity	
IT outsourcing strategy		Cultural management		Empowerment	
IT implementation strategy		Quality management		Expanding/Improving core competency	
IT solved problem(s) that was intended to solve		Business process re-engineering		Increased flexibility	
Software quality improvements		Financial resource/resources		Empowerment	
Safety		Management			
		Management of Expectations			
		Business plan and vision			
		Leadership style			
		Stakeholder involvement			
		Security strategy			
		Benefits to the organisation			
		Un-intentional improvements			
		Reduction of manual intervention/process			
		Improved operating efficiencies			
		Issues recorded since implementation			
		Resource management improvements			
		Support for business growth			

KEY: [F] = FACTOR

D. Project Manager's Experience

1. Do you think project management experience can influence IT project success or Failure?

Probes: Why or why not?

2. What role did project management play in IT projects you were involved in for the past years?

3. What areas of project manager's experience need to be addressed to accomplish successful IT projects?

Probes: Why?

4. Are Project Managers adequately trained to nurture their experience and to successfully deliver IT projects in your organisation?

Probe: Why or why not?

5. In your own opinion, what are the most critical project managers experience factors that contributes to project success in your organisation?

6. What can you say about project management principles applied in project success?

Probes: Why or why not?

E. Senior Management Involvement

1. Explain how top management support played a critical role in attaining IT project success in most projects you were involve in?

2. In your opinion, what are the top most critical factors that top managers should address to stimulate support for IT project?

3. What are the top management currently doing to nurture IT success in your organisation?

F. Post interview Comments

Post Interview Comments and/or Observations:

Appendix B: Informed consent form

PROJECT TITLE: **ASSESSMENT OF ICT PROJECT SUCCESS/FAILURE IN BOTSWANA USING PROJECT METRIC MODELS**

Principal Investigator: *Ofaletse Mphale [Msc.]*

Phone number(s): *74349213*

What you should know about this research study:

- We give you this informed consent document so that you may read about the purpose, risks, and benefits of this research study.
- You have the right to refuse to take part, or agree to take part now and change your mind later.
- Please review this consent form carefully. Ask any questions before you make a decision.
- Your participation is voluntary.

PURPOSE

You are being asked to participate in a research study of **Contributing factors towards the success or failure of ICT project in Botswana: A senior manager's perception** .The purpose of the study is to explore senior management perception on their project management experience, insights, feelings and memories involved in to find answers as to what led to the particular outcome of each of their IT projects**.** You were selected as a possible participant in this study because you have a great deal to share and experience about ICT project success or not so successful outcome in Botswana. Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

PROCEDURES AND DURATION

If you decide to participate, you will be invited to an in-depth interview with the researcher that is planned to last approximately one hour of your time.

RISKS AND DISCOMFORTS

There are no anticipated risks or discomfort which could cause you to feel uncomfortable, embarrassed, sad, tired during process of this study.

BENEFITS AND/OR COMPENSATION

Although there may not be direct benefit to you for taking part in this study, the researcher may learn more about the actual triggering factors contributing towards the success or not successful of ICT projects in Botswana. By understanding this triggering factors project management approaches can be developed to address these success or failure causes to deliver more successful project in the future. There will nevertheless be no costs or compensation for participation.

CONFIDENTIALITY

The information that you give in the study will be handled confidentially. Your name will not be used in any report. The data from this investigation will be used for the purpose of accomplishing the objectives this study, hence academic purpose and enhancing the literature on ICT success or not successful outcome in Botswana's context. None of these will be used for commercial use.

With your permission, I would like to tape this interview so that I can make an accurate transcript. Once I have made the transcript, I will erase the recordings. Your name will not be in the transcript or my notes.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future relations with the University of Botswana, its personnel, and associated institutions**.** If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. Any refusal to observe and meet appointments agreed upon with the central investigator will be considered as implicit withdrawal and therefore will terminate the subject's participation in the investigation without his/her prior request. In this event the subject will be paid what if owed to him/her or forfeit a proportionate amount of relative payment mentioned earlier in this document. In the event of incapacity to fulfill the duties agreed upon the subject's participation to this investigation will be terminate without his/her consent and no compensation will be offered under these circumstances.

AUTHORIZATION

You are making a decision whether or not to participate in this study. Your signature indicates that you have read and understood the information provided above, have had all your questions answered, and have decided to participate.

_____ _____

Name of Research Participant (please print) Date

_____ _____

Signature of Staff Obtaining Consent Date

(Optional)

YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP.

If you have any questions concerning this study or consent form beyond those answered by the investigator, including questions about the research, your rights as a research participant; or if you feel that you have been treated unfairly and would like to talk to someone other than a member of the research team, please feel free to contact the Office of Research and Development, University of Botswana, Phone: Ms Dimpho Njadingwe on 355-2900, E-mail: research@mopipi.ub.bw, Telefax: [0267] 395-7573.

Appendix C: Research Permit

DRST 7/2/13

(33)

TELEPHONE: 3958500
Website: www.mist.gov.bw
FAX No: 3913303/3912922
REFERENCE:

REPUBLIC OF BOTSWANA

MINISTRY OF INFRASTRUCTURE,
SCIENCE & TECHNOLOGY
PRIVATE BAG 007
GABORONE
BOTSWANA

MIST 6/54/1 IV (29)

11th March 2015

Mr. Ofaletse Mphale
P O Box 2693
Selibe Phikwe
Botswana

Dear Sir

APPLICATION FOR RESEARCH PERMIT: MR OFALETSE MPHALE

Reference is made to your application on the above captioned matter.

Your application for Research Permit for the proposed research titled "***Contributing Factors towards Success or Failure of ICT Projects in Botswana: a Senior Management Perception***" has been granted. The permit is valid for one (1) year. You are kindly advised to peruse section 4.4 to 5.0 of the "Guidelines for Application for Research Permit in Botswana.

Any changes in the proposed research should be communicated, without fail, to the Permanent Secretary, Ministry of Infrastructure, Science and Technology citing the above reference.

By copy of this letter, the Director of Research, Science and Technology is advised to take note of this development and ensure deliverables to government are timely met.

Thank you.

Yours faithfully,

DEPARTMENT OF RESEARCH SCIENCE & TECHNOLOGY
2015 -03- 16

.....
Dikagiso B. Mokotedi
PERMANENT SECRETARY

cc. Director of Research, Science and Technology

Vision: To be a model service provider of quality building infrastructure, innovative research, science and technology and nuclear regulation.

BOTSWANA

Appendix D: Interview Results - ICT/IT Projects Success factors

Table 5.2 Organisations Projects Success Factors

METRICS MODEL TOOL	COMPANY A	COMPANY B	COMPANY C	COMPANY D	COMPANY E	COMPANY F
A1 - IT functionality/ Capabilities	✓	✓	✓	✓	✓	✓
A2 - Ease of use/ quantity of use	✓	✓	✓	X A lot of users have to be trained before they can use the system so it is not easy to justify their quantity of use of the system nor the system usability	X users required to be trained before they can use the system so it's usability was not that easy if you were not trained	X users required to be trained before they can use the system so it's usability was not that easy if you were not trained
A3 - Happiness/willingness of end users	✓	✓	X Even though there was no problem with the usability of the new system most of the users were not that happy with the system	✓	✓	X Even though the project was successful users were still happy with the old manual system
A4 - Technology and Technological issues	✓	✓	✓	✓	✓	✓
A5 - Software development Methodology	X The organisation outsource it's Software development hence they do not follow a particular software methodological approach	✓	X The organisation outsource it's Software development hence they do not follow a particular software methodological approach	✓	X The organisation outsource it's Software development hence they do not follow a particular software methodological approach	✓
A6 - Software prototyping and testing	X Since the organisation outsource it's software development, all the software prototyping and testing is done by the contractors and sub-contractors	✓	X Since the organisation outsource it's software development, all the software prototyping and testing is done by the contractors and sub-contractors	✓	✓	✓

Table 5.2 continues from previous page…

A7 - Vendor capabilities	✓	✗ A lot of times there was a need to change the vendors as the magnitude of the project increased and the vendors were not so capable	✓	✗ There was a point in time where there was a need to change the vendor as it was no longer so capable to support the needs of the project	✓	✗ A lot of times there was a need to change the vendors as the magnitude of the project increased and the vendors were not so capable
A8 - Outsourcing strategy	✗ No particular outsourcing strategy imposed because projects are won through the Government tendering system in the organisation	✗ No outsourcing strategy, all the software development was done in house	✓	✗ No particular outsourcing strategy imposed because projects are won through the Government tendering system	✗ The outsourcing strategy imposed did not have a huge impact	✗ No particular outsourcing strategy imposed because projects are won through the Government tendering system in the organisation
A9 - Implementation strategy	✓	✓	✗ Implementation strategy is done by the contractors so there is no particular or set implementation strategy in the organisation	✓	✓	✓
A10 - IT solved problem(s) that was intended to solve	✓	✓	✓	✓	✓	✓
A11 - Software quality	✓	✓	✓	✗ This is taken into consideration by the contractor side	✓	✓
A12 - Safety	✗ No safety measures were considered for the use or handling of the system.	✓	✓	✗ No safety measures were considered for the use or handling of the system	✗ No safety measures were considered for the use or handling of the system	✓
B1 – Use of Consultants	✓	✗ No consultants were engaged, software development was done by software developers	✗ No consultants were engaged. The entire system development process was the contractor's	✗ No consultants were engaged. The entire system development process was the contractor's responsibility	✓	✓

Table 5.2 continues from previous page…

B2 - Project Management	✓	hired in the organisation	✓	✓	✗ Not so much project management was carried out in the organisation. The project manager and the entire project management process is carried out at the contractor side	✓
	✓	responsibility	✓	✓		
B3 - Project Manager experience	✓		✓	✓	✗ Project managers are not that experienced in working practically under the project system development. The organisation contracts experienced project managers to handle Big Projects	✓
B4 - User training, education and support	✓		✓	✓	✓	✓
B5 – Project Champion	✓		✗ There was no project champion advocated for the project, the project was strictly set up to meet the required requirements	✗ There was no project champion advocated for the project, the project was strictly set up to meet the required requirements		✗ There was no project champion advocated for the project, the project was strictly set up to meet the required requirements
B6 - Commitment	✓		✓	✓	✓	✓
B7 - Cooperation	✓		✓	✓	✓	✗ Even though there project succeeded cooperation was still minimum especially top managers and middle management levels

Table 5.2 continues from previous page…

B8 - Productivity	✓	✓	✓	✓	✓	✓	✓	✓
B9 - Empowerment	✓	✓	✓	✓	✓	✓	✓	✓
B10 - Core competency	✓	✓	✓	✓	✓	✓	✓	✓
B11 - Flexibility	✓	✓	✓	✓	✓	✓	✓	✓
C1 - Top management support	✓	✓	✓	✓	✓	✓	✓	✓
C2 - Project schedule	✓	✓	✓	✓	✓	✓	✓	✓
C3 - Project Time	✓	✓	✓	✓	✓	✓	✓	✓

Table 5.2 continues from previous page…

C4 - Project budget	✓		✓		✓		✓	✗ budget constraint set in the beginning were violated periodically with the desire to meet the project expectations
C5 - Project accuracy(specifications met)	✓		✗ Project met most of the requirements but not all them but this was not taken in to high consideration because users still accepted the system	✓	✓		✓	✗ Project was successful but did not meet the entire specifications hence it was not as accurate as it was expected to be
C6 - Requirement Management	✓		✓	✓	✓		✓	✓
C7 - Change management	✓		✓	✓	✗ Change management process was not highly effective, top management still did not do much to motivate the entire project team to accept change		✓	✓
C8 - Cultural management	✓		✓	✓	✗ Top management still did not do much to advocate for multicultural environment of the project team	✗ No cultural management imposed to ensure a desirable multicultural project team working environment	✓	✓
C9 - Quality management	✓		✓	✓	✗ No project quality management were imposed on the project by the main organisation. Quality checks were associated and carried out by the contractor side.	✓	✓	✗ There were very few quality checks. Quality management was associated with the project contractor

Table 5.2 continues from previous page…

C10 – Financial resources	✗ There was a point of time where there was a need to change a contractor, hence employment of the new contractor required to re-adjustment of the budget which was initially fixed.	✓	✓	✓	✓	✓	✓	✓
C11 - Expectations Management	✓	✓	✗ No management of user expectation were carried out to ensure that the system is exactly up to user expectation once delivered	✓	✓	✓	✓	✓
C12 - Business plan and vision	✗ There was no particular business plan followed. The project was strictly aimed to address the user need	✗ The project wasn't aimed at archiving any business goals so there was no business plan set for the project	✓	✓	✗ There was no particular business plan followed. The project was strictly aimed to address the user need	✓	✓	✓
C13 - Leadership style	✓	✓	✓	✗ No particular leadership style followed in the project. The most function Project management process is carried out on the contractor's side	✓	✗ Stakeholders were not involved concurrently the entire project	✗ Stake holders once only involved in the beginning of the project	✗ Stakeholders not frequantly involved throughout the entire project
C14 - Stakeholder involvement	✓	✓	✓	✓	✗ No security strategy was set for IT system by the organisation. Security was	✓	✓	✗ No security strategy was imposed at organisational level for the project
C15 - Security strategy	✓	✓	✓	✗	✓	✓	✓	✓

Table 5.2 continues from previous page…

C16 – Business process re-engineering	✓	✗ No change in the fundamental business process of doing things in the organisation	the responsibility of the contractor	✓	✓	✓	✓	✓	✓
C17 - Organisational Benefits	✓	✗ There were no noticeable direct benefits to the organisation, except the society where the project was rolled out		✓	✓	✓	✗ No unintentional improvements	✓	✓
C18 –un-intentional process improvements	✓	✓		✓	✗ There were no un-intentional projects improvement which had a noticeable impact in the overall project success	✓	✓	✓	✓
C19 - Manual process intervention	✓	✗ Even though change management was eventually done successfully there were still a minority of the users who still withheld the manual process of doing things		✓	✓	✓	✓	✓	✗ The IT system did not improve the overall operation of the organisation in large amount
C20 - Operating efficiencies	✓	✓		✓	✓	✓	✓	✓	✓

Table 5.2 continues from previous page…

C21 - Resource Management	✓	✓	✓	✓	x Resources intended to accomplish the project objectives were managed just fairly. No new strategies to resource management were imposed	✓
C22 – Tracking and recording of issues since implementation	✓	✓	x No issues were recorded nor tracked since the implementation of the project	✓	✓	✓
C23 – support for business growth	✓	x The project wasn't intended to accomplish the support for any business need	✓	x The project wasn't intended to accomplish the support for any business need, so this area did not have impact at all	✓	x Did not support any business growth

KEY: ✓ Valid element x Invalid element

Appendix E: Interview Results - ICT/IT Projects Failure factors

Table 5.10 Organisations Project Failure factors

METRICS MODEL TOOL	COMPANY A	COMPANY B	COMPANY C	COMPANY D	COMPANY E	COMPANY F
A1 - IT functionality/ Capabilities	✗	✓ IT infrastructure which was designated to support the IT system project was inadequate hence incapable	✗	✓	✓	✓
A2 - Ease of use/ quantity of use	✓	✓ The IT system required users to be trained on use and this was not done so the system wasn't easy to use as such it was not embraced by desirable number of users as expected	✓ The IT system required users to be trained on use and this was not done so the system wasn't easy to use as such it was not embraced by desirable number of users as expected	✓ The IT system required users to be trained on use and this was not done so the system wasn't easy to use as such it was not embraced by desirable number of users as expected	✓	✓
A3 - Happiness/willingness of end users	✗	✓ Users were not happy with the use of the IT system	✗ Users were not happy with the use of the IT system	✓	✓	✗
A4 - Technology and Technological issues	✓	✗	✓ There was a lot of unaddressed technological incompatibility between the new IT system and the existing IT infrastructure environment requirements it was deployed so this led to the project failure	✓ There were a lot of technological issues pertaining the projects which were not addressed effectively	✓	✓
A5 - Software development Methodology	✗	✗	✗	✗	✓	✓
A6 - Software prototyping and testing	✓	✓ There was no software	✓ There was no software	✓	✗	✓

Table 5.10 continues from previous page…

A7 - Vendor capabilities	✗	prototyping and testing done during the IT project system development by the organisation. Hence some IT system errors were never known until after implementation.	✓ The IT vendor designated to the project failed to support the IT project as the scope and the magnitude of the project increased and hence the vendor was not so capable	prototyping and testing done during the IT project system development by the organisation. Hence the system errors were never known until after implementation.	✗	✓ A lot of times there was a need to change the vendors as the magnitude of the project increased and the designated project vendors were not so capable
A8 - Outsourcing strategy	✗	✗	✗ There was poor implementation strategy	✗	✓ Poor outsourcing strategy and management	✗
A9 - Implementation strategy	✗	✓	✓	✗	✓ Poor IT project implementation strategy	✓
A10 - IT solved problem(s) that was intended to solve	✓ Even though other factors really did not play such a huge impact. But at the end the IT system failed to solve the problem it was intended to solve, or at least serve its purpose as desired. Hence the project was a total failure	✓ IT system failed to solve the problem it was intended to solve, or at least serve its purpose as desired	✓ IT system failed to solve the problem it was intended to solve, or at least serve its purpose as desired	✓ IT system failed to solve the problem it was intended to solve, or at least serve its purpose as desired	✓	✓
A11 - Software quality	✗	✓	✗	✗	✓	✓
A12 - Safety	✗	✓	✗	✗	✓	✓

Table 5.10 continues from previous page…

					✓
	✓			✓	
		✓ Use of consultation sabotaged the project as other consultants abandoned the project before it was even completed	✓		✓
			✓ Use of consultation sabotaged the project as other consultants abandoned the project before it was even completed	✓	✗
				✗	✓
					✓
B1 – Use of Consultants	✓ Use of consultation sabotaged the project as other consultants abandoned the project before it was even completed				
B2 - Project Management	✓ The government outsource project management. The dedicated contractor project management was poor and inexperienced hence the project did not deliver up to the user expectations	✓			
B3 - Project team composition and skills	✓ The overall project team composition that was designated to carry out the project did not measure up to the necessary skills and experience to manage the project at different stages through-out its development life time. Hence the IT project was a failure.	✗	✓ The project team did not constitute of the right team members with the necessary skills to handle the project in different phases of the project life cycle.		
B4 - User training, education and support	✓ There was no training, education and support given to users pertaining the use of the IT system	✓	✓ There was no training, education and support given to users pertaining the use of the IT system	✓	

Table 5.10 continues from previous page…

B5 – Project Champion	✓ No project champion was designated for the project. Hence some of the project roadblocks were given less attention and highly contributed to the IT project failure	✗	✗	✓	✗	✗
B6 - Commitment	✓ There was very less commitment in the project team especially the top management	✓ There was very less commitment in the project team especially the top management	✓	✓	✓	✗
B7 - Cooperation	✗	✓ There was no cooperation in the entire project team.	✗	✓	✓	✓
B8 - Communication	✓ Communication in general between the middle level management and executive managers was poor. Hence the allocation for the some of the project necessary resources suffered.	✓ Communication between the stakeholders and the organisation senior management pertaining what the system had to deliver was not clear.	✓	✗	✓	✓
B9 - Empowerment	✓ The users of the system were not well empowered by the IT system	✓ The users of the system were not well empowered by the IT system	✓	✗	✓	✓
B10 - Productivity	✓ The productivity level of the users once the IT system was put in place was not up to satisfaction	✓ The productivity level of the users once the IT system was put in place was not up to satisfaction	✓	✗	✓	✗

Table 5.10 continues from previous page…

B11 - Flexibility	✓ No flexible working schedules. Everyone involved to in the system worked intensively around the clock to meet the project schedule and the allocated time. Hence some of the project team members were consequently overworked	✓ There were no flexible working schedules and times as there was a lot of pressure meet the IT project schedule and time deadlines	✗	✓	✗	
C1 - Top management support	✓ There was poor Top management support. Often at times middle managers did not see the project as being important to the enterprise or to their performance evaluations and therefore redirect resources and attention to activities that top management does support.	✓ No top management support. Top managers did not see the need of the IT project, hence it suffered a lot of neglect in resource allocation as top managers drove their attention to other projects they deemed more important.	✓ There was lack of top management support	✓ Even though the project was successful top management support was still low	✓	
C2 - Project schedule	✓ Project schedules initially set for the project were concurrently violated.	✓ Project schedules initially set for the IT project were not followed once the project was a kick-start.	✓	✓	✗	
C3 - Project Time	✓ Project time constraints set for the project was not followed	✓ The IT project failed to meet the project pre dined time	✓ Project schedules initially set for the IT project were not followed once the project was a kick-start.	✓	✓	✗
C4 - Project budget	✓ The project budget was exceeded several times	✓	✓ Time constraint set was violated to cater for the actual project delivery time	✓	✓	✓

Table 5.10 continues from previous page…

C5 - Project accuracy(specifications met)	✓ Project did not meet all the required specification hence it was with respect to the pre -defined requirements.	✓ Project did not meet all the required specification hence it was with respect to the pre -defined requirements	✗	✓	✗	✓	✓ Project did not meet all the required specification hence was with respect to the pre - defined requirements
C6 - Requirement Management	✗	✗	✓ Poor management of requirements. Because the waterfall methodology was used, it did not cater for the changing of concurrent changing stakeholder system requirements	✓	✗	✓	✗
C7 - Change management	✓ Poor change management. Senior management did not do that much to make the users to embrace the need to use the new system so users still did not see the need to change from the manual system.	✗	✗	✓	✗	✓	✓
C8 - Cultural management	✓ There was poor cultural management within the project team.	✗	✗	✓	✓ Top management still did not do much to advocate for multicultural environment of the project team	✓	✗
C9 - Quality management	✗	✗	✓ The IT project was of poor quality	✓	✓ No project quality management were imposed on the project by the main organisation.	✗	✓
C10 – Financial resources	✗	✗	✓ There was poor financial resources to embrace all the need of the IT project	✓	✗	✓	✓

Table 5.10 continues from previous page…

C11 - Expectations Management	✓	✓	✓ Poor management of expectation or what it intended to deliver. ✗	✗	✓	✓	✓	✓ Stakeholders not frequently involved throughout the entire project
C12 - Business plan and vision	✗	✗	✓ There was no particular business plan followed. The project was strictly aimed to address the user need	✓	✓	✓	✗	✓
C13 - Leadership style	✓ There was poor project leadership style, often it was only a one direction to go kind of leadership and most of the time the subordinates did not know how to craft the solution.	✓ There was poor project leadership style	✓ Poor leadership style	✓	✓	✓ Stake holders once only involved in the beginning of the project	✗	✓
C14 - Stakeholder involvement	✓	✓ Stakeholders were not concurrently involved to refine IT system requirements	✓ Stakeholders were not concurrently involved to refine IT system requirements	✓ Stakeholders were not involved concurrently the entire project	✓	✗	✗	✗
C15 - Security strategy	✗	✗	✓ No security strategy was set for IT system by the organisation.	✗	✗	✗	✓	✗
C16 – Business process re-engineering	✗	✗	✗	✗	✗	✓	✓	✓
C17 - Organisational Benefits	✓ There were no potential benefits to the organisation since the IT system was induced.	✓ There were no potential benefits to the organisation since the IT system was induced	✓ There were no potential benefits to the organisation since the IT system was induced	✗	✗	✗	✓	✓

Table 5.10 continues from previous page…

C18 –un-intentional process improvements	✓ No un-intentional improvements during the course of the project that was a benefit to the IT project	×	×	×	✓	✓
C19 - Manual process intervention	✓ The IT system often failed hence the manual process of carrying some process was always a rescue.	×	✓	×	✓	×
C20 – Real time reports	✓ There were real time reports generated by the IT system.	✓ No real time data was generated by the IT system	✓ No real time data was generated by the IT system	✓	×	✓
C21 - Resource Management	✓ Resources were poorly managed to embrace the needs of the entire project hence other areas the IT project suffered from inadequate resource allocation	×	✓ Poor project resource management	×	✓	×
C22 – Tracking and recording of issues since implementation	✓ There was no recording of issues pertaining the IT project since its implementation	✓ There was no recording of issues pertaining the IT project since its implementation	✓ No issues were recorded nor tracked since the implementation of the project	✓	×	✓
C23 –business growth	×	×	✓ IT system did not support business growth	×	✓	×

KEY: ✓ Valid element × Invalid element

Appendix F: Project Metrics Tool source code

LOGIN CLASS

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package is_evauation;
import java.awt.Cursor;
import java.awt.Toolkit;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
/**
 *
 * @author user1
 */
public class login extends javax.swing.JFrame {
      /**
     * Creates new form login
     *
     *
     */
    public login() {
        initComponents();
    }
    /**
     * This method is called from within the constructor to initialize the form.
     * WARNING: Do NOT modify this code. The content of this method is always
     * regenerated by the Form Editor.
     */
    @SuppressWarnings("unchecked")
    // <editor-fold defaultstate="collapsed" desc="Generated Code">
    private void initComponents() {
        try {
            jPanel1 =(javax.swing.JPanel)java.beans.Beans.instantiate(getClass().getClassLoader(),
"is_evauation.login_jPanel1");
        } catch (ClassNotFoundException e) {
            e.printStackTrace();
        } catch (java.io.IOException e) {
            e.printStackTrace();
        }
        jButton1 = new javax.swing.JButton();
        jPasswordField1 = new javax.swing.JPasswordField();
        jLabel1 = new javax.swing.JLabel();
        jLabel2 = new javax.swing.JLabel();
        jButton3 = new javax.swing.JButton();
        jLabel3 = new javax.swing.JLabel();
        jButton2 = new javax.swing.JButton();
        jTextField1 = new javax.swing.JTextField();
        jLabel5 = new javax.swing.JLabel();

        setDefaultCloseOperation(javax.swing.WindowConstants.DO_NOTHING_ON_CLOSE);
        setBackground(new java.awt.Color(153, 153, 255));
        jPanel1.setLayout(new org.netbeans.lib.awtextra.AbsoluteLayout());
        jButton1.setText("Login");
        jButton1.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton1MouseMoved(evt);
            }
        });
        jButton1.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton1ActionPerformed(evt);
```

```
        }
    });
    jPanel1.add(jButton1, new org.netbeans.lib.awtextra.AbsoluteConstraints(400, 90, 91, -1));
    jPasswordField1.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
    jPasswordField1.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jPasswordField1ActionPerformed(evt);
        }
    });
    jPanel1.add(jPasswordField1, new org.netbeans.lib.awtextra.AbsoluteConstraints(220, 120, 170, -1));

    jLabel1.setText("Username");
    jPanel1.add(jLabel1, new org.netbeans.lib.awtextra.AbsoluteConstraints(140, 90, 65, -1));
    jLabel2.setText("Password");
    jPanel1.add(jLabel2, new org.netbeans.lib.awtextra.AbsoluteConstraints(140, 120, 77, 20));
    jButton3.setText("Exit");
    jButton3.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
        public void mouseMoved(java.awt.event.MouseEvent evt) {
            jButton3MouseMoved(evt); }
    });
    jButton3.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButton3ActionPerformed(evt);}});
    jPanel1.add(jButton3, new org.netbeans.lib.awtextra.AbsoluteConstraints(220, 170, -1, -1));
    jLabel3.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/User.jpg"))); // NOI18N
    jPanel1.add(jLabel3, new org.netbeans.lib.awtextra.AbsoluteConstraints(40, 90, -1, -1));

    jButton2.setText("Forgot password?(hint)");
    jButton2.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
        public void mouseMoved(java.awt.event.MouseEvent evt) {
            jButton2MouseMoved(evt) }
    });
    jButton2.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButton2ActionPerformed(evt); } });
    jPanel1.add(jButton2, new org.netbeans.lib.awtextra.AbsoluteConstraints(280, 170, -1, -1));
    jTextField1.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
    jTextField1.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jTextField1ActionPerformed(evt); } });
    jPanel1.add(jTextField1, new org.netbeans.lib.awtextra.AbsoluteConstraints(220, 90, 168, -1));
    jLabel5.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/User_Login.png"))); // NOI18N
    jPanel1.add(jLabel5, new org.netbeans.lib.awtextra.AbsoluteConstraints(10, 11, -1, 62));

    javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
    getContentPane().setLayout(layout);
    layout.setHorizontalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, 557, Short.MAX_VALUE)
    );
    layout.setVerticalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, 223, Short.MAX_VALUE)
    );
    pack();
    setLocationRelativeTo(null);
}// </editor-fold>

private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {
    // TODO add your handling code here:
    Toolkit.getDefaultToolkit().beep();
    JOptionPane.showMessageDialog(null," You are now exiting from the IS Success Evaluation System");
    System.exit(0);
}
private void jButton2ActionPerformed(java.awt.event.ActionEvent evt) {
```

```
        // TODO add your handling code here:
        Toolkit.getDefaultToolkit().beep();
        JOptionPane.showMessageDialog(this," Your Username is : ENDUSER, Password is : USER123 in CAPS\n"+" or
contact the System Administrator");
    }
    private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        String name= jTextField1.getText();
        String password = jPasswordField1.getText();
        if(password.equals("")&& name.equals("")){
        Toolkit.getDefaultToolkit().beep();
        JOptionPane.showMessageDialog(null,"Username or password cannot be empty String!!! Please try again!!!");
        }else{
        if(password.equals("USER123")&& name.equals("ENDUSER"))
        {
         Home f1 = new Home();
        jPasswordField1.setText("");
         f1.setVisible(true);
        this.dispose(); }
        else{
        Toolkit.getDefaultToolkit().beep();
        JOptionPane.showMessageDialog(null,"Username or password invalid!!!");
        jPasswordField1.setText("");
        jTextField1.setText("");  }  }
    }
    private void jPasswordField1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:  }
    private void jTextField1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here. }
    private void jButton1MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton1.setCursor(curl);
            }
    private void jButton2MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton2.setCursor(curl);
    }
    private void jButton3MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton3.setCursor(curl); }
    /**
     * @param args the command line arguments
     */
    public static void main(String args[]) {
        /* Set the Nimbus look and feel */
        //<editor-fold defaultstate="collapsed" desc=" Look and feel setting code (optional) ">
        /* If Nimbus (introduced in Java SE 6) is not available, stay with the default look and feel.
         * For details see http://download.oracle.com/javase/tutorial/uiswing/lookandfeel/plaf.html
         */
        try {
            for (javax.swing.UIManager.LookAndFeelInfo info : javax.swing.UIManager.getInstalledLookAndFeels()) {
                if ("Nimbus".equals(info.getName())) {
                    javax.swing.UIManager.setLookAndFeel(info.getClassName());
                    break;}  }
        } catch (ClassNotFoundException ex) {
            java.util.logging.Logger.getLogger(login.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        } catch (InstantiationException ex) {
            java.util.logging.Logger.getLogger(login.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        } catch (IllegalAccessException ex) {
            java.util.logging.Logger.getLogger(login.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        } catch (javax.swing.UnsupportedLookAndFeelException ex) {
            java.util.logging.Logger.getLogger(login.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
```

```
        }
        //</editor-fold>

        /* Create and display the form */
        java.awt.EventQueue.invokeLater(new Runnable() {
                    public void run() {
                new login().setVisible(true); }  });
    }
    // Variables declaration - do not modify
    private javax.swing.JButton jButton1;
    private javax.swing.JButton jButton2;
    private javax.swing.JButton jButton3;
    private javax.swing.JLabel jLabel1;
    private javax.swing.JLabel jLabel2;
    private javax.swing.JLabel jLabel3;
    private javax.swing.JLabel jLabel5;
    private javax.swing.JPanel jPanel1;
    private javax.swing.JPasswordField jPasswordField1;
    public javax.swing.JTextField jTextField1;
    // End of variables declaration
}
```

HOME CLASS

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package is_evauation;
import java.awt.Cursor;
import java.awt.Toolkit;
import static java.lang.Thread.sleep;
import java.text.SimpleDateFormat;
import java.util.Date;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
/**
 *
 * @author user1
 */
public final class Home extends javax.swing.JFrame {
    /**
     * Creates new form MAIN
     */
    public Home() {
        initComponents();
        setTextArea();
        display(); }
    Home(String name) {
        throw new UnsupportedOperationException("Not supported yet."); //To change body of generated methods, choose
Tools | Templates. }
    /**
     * This method is called from within the constructor to initialize the form.
     * WARNING: Do NOT modify this code. The content of this method is always
     * regenerated by the Form Editor.
     */
    @SuppressWarnings("unchecked")
    // <editor-fold defaultstate="collapsed" desc="Generated Code">
    private void initComponents() {

        jMenuBar2 = new javax.swing.JMenuBar();
        jMenu5 = new javax.swing.JMenu();
        jMenu6 = new javax.swing.JMenu();
        jToolBar1 = new javax.swing.JToolBar();
```

```
jToolBar2 = new javax.swing.JToolBar();
jLabel1 = new javax.swing.JLabel();
jPanel2 = new javax.swing.JPanel();
jButton1 = new javax.swing.JButton();
jButton2 = new javax.swing.JButton();
jButton3 = new javax.swing.JButton();
jButton4 = new javax.swing.JButton();
jLabel8 = new javax.swing.JLabel();
jLabel3 = new javax.swing.JLabel();
jButton5 = new javax.swing.JButton();
jButton6 = new javax.swing.JButton();
jButton7 = new javax.swing.JButton();
jScrollPane1 = new javax.swing.JScrollPane();
jTextArea1 = new javax.swing.JTextArea();
jLabel7 = new javax.swing.JLabel();
jLabel4 = new javax.swing.JLabel();
jLabel2 = new javax.swing.JLabel();
jMenu5.setText("File");
jMenuBar2.add(jMenu5);
jMenu6.setText("Edit");
jMenuBar2.add(jMenu6);
jToolBar1.setRollover(true);
jToolBar2.setRollover(true);

setDefaultCloseOperation(javax.swing.WindowConstants.DO_NOTHING_ON_CLOSE);
setBackground(new java.awt.Color(204, 204, 255));
getContentPane().setLayout(new org.netbeans.lib.awtextra.AbsoluteLayout());
getContentPane().add(jLabel1, new org.netbeans.lib.awtextra.AbsoluteConstraints(771, 0, -1, -1));
jPanel2.setBackground(new java.awt.Color(255, 255, 255));
jPanel2.setLayout(new org.netbeans.lib.awtextra.AbsoluteLayout());
jButton1.setBackground(new java.awt.Color(204, 204, 255));
jButton1.setText("New Evaluation");
jButton1.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
    public void mouseMoved(java.awt.event.MouseEvent evt) {
        jButton1MouseMoved(evt);
    }
});
jButton1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton1ActionPerformed(evt);
    }
});
jPanel2.add(jButton1, new org.netbeans.lib.awtextra.AbsoluteConstraints(30, 80, 120, 30));

jButton2.setBackground(new java.awt.Color(204, 204, 255));
jButton2.setText(" Projects List");
jPanel2.add(jButton2, new org.netbeans.lib.awtextra.AbsoluteConstraints(30, 190, 110, 30));

jButton3.setBackground(new java.awt.Color(204, 204, 255));
jButton3.setText("Reports");
jButton3.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
    public void mouseMoved(java.awt.event.MouseEvent evt) {
        jButton3MouseMoved(evt);
    }
});
jButton3.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton3ActionPerformed(evt);
    }
});
jPanel2.add(jButton3, new org.netbeans.lib.awtextra.AbsoluteConstraints(30, 290, 110, 30));

jButton4.setBackground(new java.awt.Color(204, 204, 255));
jButton4.setText("Log out");
jButton4.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
```

```
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton4MouseMoved(evt);
            }
        });
        jButton4.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton4ActionPerformed(evt);
            }
        });
        jPanel2.add(jButton4, new org.netbeans.lib.awtextra.AbsoluteConstraints(30, 410, 110, 30));

        jLabel8.setFont(new java.awt.Font("Arial", 0, 12)); // NOI18N
        jLabel8.setForeground(new java.awt.Color(255, 255, 255));
        jLabel8.setText("Time:");
        jPanel2.add(jLabel8, new org.netbeans.lib.awtextra.AbsoluteConstraints(550, 10, 70, 20));

        jLabel3.setFont(new java.awt.Font("Arial", 1, 12)); // NOI18N
        jLabel3.setForeground(new java.awt.Color(255, 255, 255));
        jLabel3.setText("Getting Started");
        jPanel2.add(jLabel3, new org.netbeans.lib.awtextra.AbsoluteConstraints(190, 110, 150, 30));

        jButton5.setText("Account");
        jPanel2.add(jButton5, new org.netbeans.lib.awtextra.AbsoluteConstraints(190, 50, 90, -1));

        jButton6.setText("Clients");
        jPanel2.add(jButton6, new org.netbeans.lib.awtextra.AbsoluteConstraints(290, 50, 80, -1));

        jButton7.setText("User Manual");
        jPanel2.add(jButton7, new org.netbeans.lib.awtextra.AbsoluteConstraints(380, 50, 110, -1));
        jTextArea1.setColumns(20);
        jTextArea1.setRows(5);
        jScrollPane1.setViewportView(jTextArea1);
        jPanel2.add(jScrollPane1, new org.netbeans.lib.awtextra.AbsoluteConstraints(210, 150, 460, 110));
        jLabel7.setFont(new java.awt.Font("Arial", 0, 12)); // NOI18N
        jLabel7.setForeground(new java.awt.Color(255, 255, 255));
        jLabel7.setText("jLabel7 -time");
        jPanel2.add(jLabel7, new org.netbeans.lib.awtextra.AbsoluteConstraints(590, 10, 90, 20));
        jLabel4.setFont(new java.awt.Font("Arial", 1, 12)); // NOI18N
        jLabel4.setForeground(new java.awt.Color(255, 255, 255));
        jLabel4.setText("About");
        jPanel2.add(jLabel4, new org.netbeans.lib.awtextra.AbsoluteConstraints(190, 270, 90, 20));
        jLabel2.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/HomeScreen.png"))); // NOI18N
        jLabel2.setText("jLabel2");
        jPanel2.add(jLabel2, new org.netbeans.lib.awtextra.AbsoluteConstraints(20, 0, 690, 460));
        getContentPane().add(jPanel2, new org.netbeans.lib.awtextra.AbsoluteConstraints(0, 0, 770, 454));
        pack();
        setLocationRelativeTo(null);
    }// </editor-fold>

    private void jButton4ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        Toolkit.getDefaultToolkit().beep();
        int selectedOption = JOptionPane.showConfirmDialog(null,
                             "Are you sure you want to Log out of the System?",
                             "Log out",
                             JOptionPane.YES_NO_OPTION);
if (selectedOption == JOptionPane.YES_OPTION) {
        System.exit(0);
}
    }
    private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        Toolkit.getDefaultToolkit().beep();
        JOptionPane.showMessageDialog(this,"Please Identify all the IS Factors that contributed to the Success of the IT
Project","New Evaluation",JOptionPane.INFORMATION_MESSAGE);
```

```
        SUCCESS_COMPONENTS frame = new SUCCESS_COMPONENTS();
        frame.setVisible(true);
        this.dispose();}
    private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
              Reports f1 = new Reports();
       f1.setVisible(true);
       this.dispose();
            }
    private void jButton1MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton1.setCursor(curl);  }
    private void jButton3MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton3.setCursor(curl);  }
    private void jButton4MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton4.setCursor(curl);    }
    /**
     * @param args the command line arguments
     */
    public static void main(String args[]) {
        /* Set the Nimbus look and feel */
        //<editor-fold defaultstate="collapsed" desc=" Look and feel setting code (optional) ">
        /* If Nimbus (introduced in Java SE 6) is not available, stay with the default look and feel.
         * For details see http://download.oracle.com/javase/tutorial/uiswing/lookandfeel/plaf.html
         */
        try {
            for (javax.swing.UIManager.LookAndFeelInfo info : javax.swing.UIManager.getInstalledLookAndFeels()) {
                if ("Nimbus".equals(info.getName())) {
                    javax.swing.UIManager.setLookAndFeel(info.getClassName());
                    break; }}
        } catch (ClassNotFoundException ex) {
            java.util.logging.Logger.getLogger(Home.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        } catch (InstantiationException ex) {
            java.util.logging.Logger.getLogger(Home.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        } catch (IllegalAccessException ex) {
            java.util.logging.Logger.getLogger(Home.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        } catch (javax.swing.UnsupportedLookAndFeelException ex) {
            java.util.logging.Logger.getLogger(Home.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        }
        //</editor-fold>
        /* Create and display the form */
        java.awt.EventQueue.invokeLater(new Runnable() {
            @Override
            public void run() {
                new Home().setVisible(true); }  });  }
     public void setTextArea(){
    String area;
    area = ("1. New Evaluation \n"+"User must first click on this module to make new project evaluation\n\n"
            +"2. Project List \n" +"User may click on this module if they are interested in the information about \n"+" the
projects which have been evaluated\n\n"
            +"3. Reports \n"+"User may view the reports associated with recent evaluations made\n\n"
            + "4. Account\n"
            + "User may use this module to set account preferences\n\n"
            + "Client\n"
            + "5. User may use this module to update and view their client details\n\n"
            + "6. Manual\n"
            + "This is where the user can access the user manual of the software \n");
    jTextArea1.setText(area);
    jTextArea1.setEditable(false);}
      public void display(){
```

```
        Thread clock = new Thread(){
        public void run(){
        for(;;){ try {  Date d = new Date();
              SimpleDateFormat sdf = new SimpleDateFormat("HH:mm:ss");
              jLabel7.setText(sdf.format(d));
                    sleep(1000);
           } catch (InterruptedException ex) {
              Logger.getLogger(Home.class.getName()).log(Level.SEVERE, null, ex)} } } };
        clock.start();
    }
    // Variables declaration - do not modify
    private javax.swing.JButton jButton1;
    private javax.swing.JButton jButton2;
    private javax.swing.JButton jButton3;
    private javax.swing.JButton jButton4;
    private javax.swing.JButton jButton5;
    private javax.swing.JButton jButton6;
    private javax.swing.JButton jButton7;
    private javax.swing.JLabel jLabel1;
    private javax.swing.JLabel jLabel2;
    private javax.swing.JLabel jLabel3;
    private javax.swing.JLabel jLabel4;
    private javax.swing.JLabel jLabel7;
    private javax.swing.JLabel jLabel8;
    private javax.swing.JMenu jMenu5;
    private javax.swing.JMenu jMenu6;
    private javax.swing.JMenuBar jMenuBar2;
    private javax.swing.JPanel jPanel2;
    private javax.swing.JScrollPane jScrollPane1;
    private javax.swing.JTextArea jTextArea1;
    private javax.swing.JToolBar jToolBar1;
    private javax.swing.JToolBar jToolBar2;
    // End of variables declaration
}
```

SUCCESS COMPONENTS CLASS

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package is_evauation;
import com.itextpdf.text.DocumentException;
import java.awt.Cursor;
import java.awt.Toolkit;
import java.io.FileNotFoundException;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
/**
 *
 * @author user1
 */
public final class SUCCESS_COMPONENTS extends javax.swing.JFrame {
    /**
     * Creates new form SUCCESS_COMPONENTS
     */
    public SUCCESS_COMPONENTS() {
        initComponents();
      ///  Technology(); }
    /**
     * This method is called from within the constructor to initialize the form.
     * WARNING: Do NOT modify this code. The content of this method is always
     * regenerated by the Form Editor.
```

```
 */
@SuppressWarnings("unchecked")
// <editor-fold defaultstate="collapsed" desc="Generated Code">
private void initComponents() {
    jButton1 = new javax.swing.JButton();
    jButton2 = new javax.swing.JButton();
    jButton3 = new javax.swing.JButton();
    jScrollPane1 = new javax.swing.JScrollPane();
    jPanel2 = new javax.swing.JPanel();
    jCheckBox2 = new javax.swing.JCheckBox();
    jCheckBox1 = new javax.swing.JCheckBox();
    jCheckBox3 = new javax.swing.JCheckBox();
    jCheckBox4 = new javax.swing.JCheckBox();
    jCheckBox5 = new javax.swing.JCheckBox();
    jCheckBox6 = new javax.swing.JCheckBox();
    jCheckBox7 = new javax.swing.JCheckBox();
    jCheckBox8 = new javax.swing.JCheckBox();
    jCheckBox9 = new javax.swing.JCheckBox();
    jCheckBox10 = new javax.swing.JCheckBox();
    jCheckBox11 = new javax.swing.JCheckBox();
    jCheckBox12 = new javax.swing.JCheckBox();
    jCheckBox14 = new javax.swing.JCheckBox();
    jCheckBox15 = new javax.swing.JCheckBox();
    jCheckBox16 = new javax.swing.JCheckBox();
    jCheckBox17 = new javax.swing.JCheckBox();
    jCheckBox18 = new javax.swing.JCheckBox();
    jCheckBox19 = new javax.swing.JCheckBox();
    jCheckBox20 = new javax.swing.JCheckBox();
    jCheckBox21 = new javax.swing.JCheckBox();
    jCheckBox22 = new javax.swing.JCheckBox();
    jCheckBox23 = new javax.swing.JCheckBox();
    jCheckBox24 = new javax.swing.JCheckBox();
    jCheckBox25 = new javax.swing.JCheckBox();
    jCheckBox26 = new javax.swing.JCheckBox();
    jCheckBox27 = new javax.swing.JCheckBox();
    jCheckBox28 = new javax.swing.JCheckBox();
    jCheckBox29 = new javax.swing.JCheckBox();
    jCheckBox30 = new javax.swing.JCheckBox();
    jCheckBox31 = new javax.swing.JCheckBox();
    jCheckBox32 = new javax.swing.JCheckBox();
    jCheckBox33 = new javax.swing.JCheckBox();
    jCheckBox34 = new javax.swing.JCheckBox();
    jCheckBox35 = new javax.swing.JCheckBox();
    jCheckBox36 = new javax.swing.JCheckBox();
    jCheckBox37 = new javax.swing.JCheckBox();
    jCheckBox38 = new javax.swing.JCheckBox();
    jCheckBox39 = new javax.swing.JCheckBox();
    jCheckBox40 = new javax.swing.JCheckBox();
    jCheckBox41 = new javax.swing.JCheckBox();
    jCheckBox42 = new javax.swing.JCheckBox();
    jCheckBox43 = new javax.swing.JCheckBox();
    jCheckBox44 = new javax.swing.JCheckBox();
    jCheckBox45 = new javax.swing.JCheckBox();
    jCheckBox46 = new javax.swing.JCheckBox();
    jCheckBox47 = new javax.swing.JCheckBox();
    jLabel1 = new javax.swing.JLabel();
    jButton4 = new javax.swing.JButton();

    setDefaultCloseOperation(javax.swing.WindowConstants.DO_NOTHING_ON_CLOSE);
    setBackground(new java.awt.Color(204, 204, 255));
    jButton1.setBackground(new java.awt.Color(255, 255, 255));
    jButton1.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/home.png"))); // NOI18N
    jButton1.setText("Home");
    jButton1.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
        public void mouseMoved(java.awt.event.MouseEvent evt) { jButton1MouseMoved(evt);
```

```
    }
});
jButton1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton1ActionPerformed(evt);
    }
});
jButton2.setBackground(new java.awt.Color(255, 255, 255));
jButton2.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/Help.png"))); // NOI18N
jButton2.setText("Help");
jButton3.setBackground(new java.awt.Color(255, 255, 255));
jButton3.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/compute.jpg"))); // NOI18N
jButton3.setText("Evaluate");
jButton3.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
    public void mouseMoved(java.awt.event.MouseEvent evt) {
        jButton3MouseMoved(evt);}    });
jButton3.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton3ActionPerformed(evt);
    }
});
jScrollPane1.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
jPanel2.setLayout(new org.netbeans.lib.awtextra.AbsoluteLayout());
jPanel2.add(jCheckBox2, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 260, -1, 30));
jPanel2.add(jCheckBox1, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 40, -1, 30));
jPanel2.add(jCheckBox3, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 70, -1, -1));
jCheckBox4.setBackground(new java.awt.Color(204, 204, 255));
jPanel2.add(jCheckBox4, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 240, -1, -1));
jPanel2.add(jCheckBox5, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 90, -1, 30));
jCheckBox6.addActionListener(new java.awt.event.ActionListener() {
public void actionPerformed(java.awt.event.ActionEvent evt) {
jCheckBox6ActionPerformed(evt);}});
jPanel2.add(jCheckBox6, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 210, -1, 30));
jPanel2.add(jCheckBox7, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 120, -1, -1));
jPanel2.add(jCheckBox8, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 190, -1, 20));
jPanel2.add(jCheckBox9, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 140, -1, 30));
jPanel2.add(jCheckBox10, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 170, -1, -1));
jPanel2.add(jCheckBox11, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 291, -1, 20));
jPanel2.add(jCheckBox12, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 310, -1, 30));
jPanel2.add(jCheckBox14, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 420, -1, 30));
jPanel2.add(jCheckBox15, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 450, -1, 20));

jCheckBox16.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jCheckBox16ActionPerformed(evt);
    }
});
jPanel2.add(jCheckBox16, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 470, -1, -1));
jPanel2.add(jCheckBox17, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 490, -1, 30));
jPanel2.add(jCheckBox18, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 520, -1, -1));
jPanel2.add(jCheckBox19, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 547, -1, -1));
jPanel2.add(jCheckBox20, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 570, -1, -1));
jPanel2.add(jCheckBox21, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 590, -1, 30));
jPanel2.add(jCheckBox22, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 613, -1, 30));
jPanel2.add(jCheckBox23, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 640, -1, -1));
jPanel2.add(jCheckBox24, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 663, -1, 20));
jCheckBox25.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jCheckBox25ActionPerformed(evt);
    }
});
jPanel2.add(jCheckBox25, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 690, -1, 20));
jPanel2.add(jCheckBox26, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 710, -1, 30));
jPanel2.add(jCheckBox27, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 740, -1, -1));
jPanel2.add(jCheckBox28, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 760, -1, 20));
```

```
        jPanel2.add(jCheckBox29, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 781, -1, 30));
        jPanel2.add(jCheckBox30, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 810, -1, -1));
        jPanel2.add(jCheckBox31, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 830, -1, 30));
        jPanel2.add(jCheckBox32, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 860, -1, -1));
        jPanel2.add(jCheckBox33, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 880, -1, 20));
        jPanel2.add(jCheckBox34, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 901, -1, 30));
        jPanel2.add(jCheckBox35, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 930, -1, -1));
        jPanel2.add(jCheckBox36, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 960, -1, -1));
        jPanel2.add(jCheckBox37, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1060, -1, -1));
        jPanel2.add(jCheckBox38, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1080, -1, 30));
        jPanel2.add(jCheckBox39, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1103, -1, 30));
        jPanel2.add(jCheckBox40, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1130, -1, -1));
        jPanel2.add(jCheckBox41, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1153, -1, 30));
        jPanel2.add(jCheckBox42, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1180, -1, -1));
        jPanel2.add(jCheckBox43, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1200, -1, 30));
        jPanel2.add(jCheckBox44, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1230, -1, -1));
        jPanel2.add(jCheckBox45, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1250, -1, -1));
        jPanel2.add(jCheckBox46, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1270, -1, 30));
        jPanel2.add(jCheckBox47, new org.netbeans.lib.awtextra.AbsoluteConstraints(370, 1301, -1, 30));

        jLabel1.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/Technology.png"))); // NOI18N
        jPanel2.add(jLabel1, new org.netbeans.lib.awtextra.AbsoluteConstraints(0, 0, -1, -1));
        jScrollPane1.setViewportView(jPanel2);
        jButton4.setBackground(new java.awt.Color(255, 255, 255));
        jButton4.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/infor.png"))); // NOI18N
        jButton4.setText("Metric Infor");

        javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
        getContentPane().setLayout(layout);
        layout.setHorizontalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(layout.createSequentialGroup()
                .addGap(52, 52, 52)
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addGroup(layout.createSequentialGroup()
                        .addComponent(jButton1)
                        .addGap(27, 27, 27)
                        .addComponent(jButton2)
                        .addGap(18, 18, 18)
                        .addComponent(jButton4)
                        .addGap(227, 227, Short.MAX_VALUE))
                    .addGroup(layout.createSequentialGroup()
                        .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                            .addComponent(jScrollPane1, javax.swing.GroupLayout.PREFERRED_SIZE, 568,
javax.swing.GroupLayout.PREFERRED_SIZE)
                            .addGroup(layout.createSequentialGroup()
                                .addGap(441, 441, 441)
                                .addComponent(jButton3)))
                        .addGap(0, 0, Short.MAX_VALUE))))  );
        layout.setVerticalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(layout.createSequentialGroup()
                .addGap(18, 18, 18)
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)
                    .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                        .addComponent(jButton2)
                        .addComponent(jButton1))
                    .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                        .addComponent(jButton4, javax.swing.GroupLayout.PREFERRED_SIZE, 58,
javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addComponent(jButton3)))
                .addGap(26, 26, 26)
                .addComponent(jScrollPane1, javax.swing.GroupLayout.PREFERRED_SIZE, 378,
javax.swing.GroupLayout.PREFERRED_SIZE)
                .addContainerGap(49, Short.MAX_VALUE))  );
```

```
        pack();
        setLocationRelativeTo(null);
    }// </editor-fold>

    private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        Home frame = new Home();
        frame.setVisible(true);
        this.dispose();
    }
      private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {  try {
            // TODO add your handling code here:
            compute_success();
        } catch (FileNotFoundException ex) {
            Logger.getLogger(SUCCESS_COMPONENTS.class.getName()).log(Level.SEVERE, null, ex);
        } catch (DocumentException ex) {
            Logger.getLogger(SUCCESS_COMPONENTS.class.getName()).log(Level.SEVERE, null, ex);  }
            }
    private void jButton3MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton3.setCursor(curl);  }

    private void jButton1MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton1.setCursor(curl);  }

    /**
     *
     * @return
     */
    @SuppressWarnings("empty-statement")
    public double Technology(){
     double a = 0,b = 0,c = 0,d = 0,e = 0,f = 0,g = 0,h = 0,i = 0,j = 0,k = 0,l =0;
     double sum =0;
       for(int counter = 0; counter<=12;counter++){  if(jCheckBox1.isSelected()== true){  a = 1;}
        if(jCheckBox2.isSelected()== true){ b = 1; }
        if(jCheckBox3.isSelected()== true){ c = 1; }
        if(jCheckBox4.isSelected()== true){  d = 1; }
        if(jCheckBox5.isSelected()== true){  e = 1; }
        if(jCheckBox6.isSelected()== true){ f = 1;  }
         if(jCheckBox7.isSelected()== true){  g = 1; }
        if(jCheckBox8.isSelected()== true){  h = 1; }
        if(jCheckBox9.isSelected()== true){ i = 1; }
        if(jCheckBox10.isSelected()== true){  j = 1;}
        if(jCheckBox11.isSelected()== true){k = 1; }
        if(jCheckBox12.isSelected()== true){ l = 1; }
        sum =(a+b+c+d+e+f+g+h+i+j+k+l);} return sum;}
         public double Organisational(){
     double a = 0,b = 0,c = 0,d = 0,e = 0,f = 0,g = 0,h = 0,i = 0,j = 0,k = 0,l = 0,m = 0,n = 0,o = 0,p = 0, q = 0,r = 0,s = 0,t = 0,u
= 0,v = 0,w = 0;
         double sum =0;

        for(int counter = 0; counter<=23;counter++)  if(jCheckBox14.isSelected()== true){  a = 1;  }
        if(jCheckBox15.isSelected()== true){ b = 1; }
        if(jCheckBox16.isSelected()== true){  c = 1; }
        if(jCheckBox17.isSelected()== true){ d = 1;}
        if(jCheckBox18.isSelected()== true){ e = 1;}
        if(jCheckBox19.isSelected()== true){ f = 1;  }
         if(jCheckBox20.isSelected()== true){g = 1; }
        if(jCheckBox21.isSelected()== true){h = 1; }
        if(jCheckBox22.isSelected()== true){i = 1; }
        if(jCheckBox23.isSelected()== true){ j = 1; }
        if(jCheckBox24.isSelected()== true){  k = 1;}
```

```
        if(jCheckBox25.isSelected()== true){l = 1; }
        if(jCheckBox26.isSelected()== true){  m = 1; }
        if(jCheckBox27.isSelected()== true){  n = 1;  }
        if(jCheckBox28.isSelected()== true){ o = 1;  }
        if(jCheckBox29.isSelected()== true){ p = 1; }
        if(jCheckBox30.isSelected()== true){ q = 1;}
        if(jCheckBox31.isSelected()== true){r = 1;}
         if(jCheckBox32.isSelected()== true){ s = 1;}
        if(jCheckBox33.isSelected()== true){ t = 1; }
        if(jCheckBox34.isSelected()== true){ u = 1;}
        if(jCheckBox35.isSelected()== true){v = 1;}
        if(jCheckBox36.isSelected()== true){ w = 1;}
    sum =((a+b+c+d+e+f+g+h+i+j+k+l+m+n+o+p+q+r+s+t+u+v+w)) } return sum; }
    public double Human_resource(){
    double a = 0,b = 0,c = 0,d = 0,e = 0,f = 0,g = 0,h = 0,i = 0,j = 0,k = 0;
    double sum =0;

        for(int counter = 0; counter<=11;counter++){ if(jCheckBox37.isSelected()== true){ a = 1; }
        if(jCheckBox38.isSelected()== true){  b = 1;  }
        if(jCheckBox39.isSelected()== true){ c = 1; }
        if(jCheckBox40.isSelected()== true){d = 1; }
        if(jCheckBox41.isSelected()== true){  e = 1;}
        if(jCheckBox42.isSelected()== true){  f = 1;}
        if(jCheckBox43.isSelected()== true){ g = 1; }
        if(jCheckBox44.isSelected()== true){ h = 1;}
        if(jCheckBox45.isSelected()== true){i = 1; }
        if(jCheckBox46.isSelected()== true){j = 1;}
        if(jCheckBox47.isSelected()== true){ k = 1; }
        sum =(a+b+c+d+e+f+g+h+i+j+k);  } return sum;}
    /**
     *
     */
    public void compute_success() throws FileNotFoundException, DocumentException{
     double Technology;
    double Human_resource;
    double Organisational;
    double result;
    double elements_in_Tech;
    double elements_in_HR;
    double elements_Org;

    Technology = Technology();
    Human_resource = Human_resource();
    Organisational = Organisational();
     elements_in_Tech = ((Technology/46)*100);
    elements_in_HR = ((Human_resource/46)*100);
    elements_Org = ((Organisational/46)*100);
    result = elements_Org + elements_in_HR + elements_in_Tech;

 if(Technology == 0|| Human_resource == 0 || Organisational == 0){
     Toolkit.getDefaultToolkit().beep();
     JOptionPane.showMessageDialog(this,"One or more IS success components is not Checked or left blank!!!Please try
again!!!","Evaluate" ,JOptionPane.WARNING_MESSAGE);
  }else{
     if(( result <100.00) && (result>= 75.00)){
      Toolkit.getDefaultToolkit().beep();
     JOptionPane.showMessageDialog(this,"The IT Project is at the less Critical Case !!","Evaluate"
,JOptionPane.WARNING_MESSAGE);
      elements_in_Tech = Math.round(elements_in_Tech*100)/100.0d;
     elements_in_HR = Math.round(elements_in_HR*100)/100.0d;
     elements_Org = Math.round( elements_Org*100)/100.0d;
     result = Math.round(result*100)/100.0d;

     RESULTS frame = new RESULTS(result, Technology, Human_resource,Organisational, elements_in_Tech,
elements_in_HR,elements_Org);
```

```
      frame.setVisible(true);
     this.dispose();
    }else if(( result <75.00) && (result> 00.00)){
        Toolkit.getDefaultToolkit().beep();
    JOptionPane.showMessageDialog(this,"The IT Project is at the Most Critical Case !!","Evaluate"
,JOptionPane.WARNING_MESSAGE);
      elements_in_Tech = Math.round(elements_in_Tech*100)/100.0d;
     elements_in_HR = Math.round(elements_in_HR*100)/100.0d;
     elements_Org = Math.round( elements_Org*100)/100.0d;
     result = Math.round(result*100)/100.0d;
     RESULTS frame = new RESULTS(result, Technology, Human_resource,Organisational, elements_in_Tech,
elements_in_HR,elements_Org);
     frame.setVisible(true);
     this.dispose();
      }else{
     Toolkit.getDefaultToolkit().beep();
     JOptionPane.showMessageDialog(this,"The IT Project is at the Ideal Case !!","Evaluate"
,JOptionPane.WARNING_MESSAGE);
     elements_in_Tech = Math.round(elements_in_Tech*100)/100.0d;
     elements_in_HR = Math.round(elements_in_HR*100)/100.0d;
     elements_Org = Math.round( elements_Org*100)/100.0d;
     result = Math.round(result*100)/100.0d;
     RESULTS frame = new RESULTS(result, Technology, Human_resource,Organisational, elements_in_Tech,
elements_in_HR,elements_Org);
     frame.setVisible(true);
     this.dispose(); } }}
      /**
     * @param args the command line arguments
     */
    public static void main(String args[]) {
        /* Set the Nimbus look and feel */
        //<editor-fold defaultstate="collapsed" desc=" Look and feel setting code (optional) ">
        /* If Nimbus (introduced in Java SE 6) is not available, stay with the default look and feel.
         * For details see http://download.oracle.com/javase/tutorial/uiswing/lookandfeel/plaf.html
         */
        try {
            for (javax.swing.UIManager.LookAndFeelInfo info : javax.swing.UIManager.getInstalledLookAndFeels()) {
                if ("Nimbus".equals(info.getName())) {
                    javax.swing.UIManager.setLookAndFeel(info.getClassName());
                    break; } }
        } catch (ClassNotFoundException ex) {

java.util.logging.Logger.getLogger(SUCCESS_COMPONENTS.class.getName()).log(java.util.logging.Level.SEVERE,
null, ex);
        } catch (InstantiationException ex)
{java.util.logging.Logger.getLogger(SUCCESS_COMPONENTS.class.getName()).log(java.util.logging.Level.SEVERE,
null, ex);
        } catch (IllegalAccessException ex) {

java.util.logging.Logger.getLogger(SUCCESS_COMPONENTS.class.getName()).log(java.util.logging.Level.SEVERE,
null, ex);
        } catch (javax.swing.UnsupportedLookAndFeelException ex) {

java.util.logging.Logger.getLogger(SUCCESS_COMPONENTS.class.getName()).log(java.util.logging.Level.SEVERE,
null, ex);
        }
        //</editor-fold>
        /* Create and display the form */
        java.awt.EventQueue.invokeLater(new Runnable() {
            @Override
            public void run() {
                new SUCCESS_COMPONENTS().setVisible(true);
            }}); }
    // Variables declaration - do not modify
    private javax.swing.JButton jButton1;
```

```
    private javax.swing.JButton jButton2;
    private javax.swing.JButton jButton3;
    private javax.swing.JButton jButton4;
    private javax.swing.JCheckBox jCheckBox1;
    private javax.swing.JCheckBox jCheckBox10;
    private javax.swing.JCheckBox jCheckBox11;
    private javax.swing.JCheckBox jCheckBox12;
    private javax.swing.JCheckBox jCheckBox14;
    private javax.swing.JCheckBox jCheckBox15;
    private javax.swing.JCheckBox jCheckBox16;
    private javax.swing.JCheckBox jCheckBox17;
    private javax.swing.JCheckBox jCheckBox18;
    private javax.swing.JCheckBox jCheckBox19;
    private javax.swing.JCheckBox jCheckBox2;
    private javax.swing.JCheckBox jCheckBox20;
    private javax.swing.JCheckBox jCheckBox21;
    private javax.swing.JCheckBox jCheckBox22;
    private javax.swing.JCheckBox jCheckBox23;
    private javax.swing.JCheckBox jCheckBox24;
    private javax.swing.JCheckBox jCheckBox25;
    private javax.swing.JCheckBox jCheckBox26;
    private javax.swing.JCheckBox jCheckBox27;
    private javax.swing.JCheckBox jCheckBox28;
    private javax.swing.JCheckBox jCheckBox29;
    private javax.swing.JCheckBox jCheckBox3;
    private javax.swing.JCheckBox jCheckBox30;
    private javax.swing.JCheckBox jCheckBox31;
    private javax.swing.JCheckBox jCheckBox32;
    private javax.swing.JCheckBox jCheckBox33;
    private javax.swing.JCheckBox jCheckBox34;
    private javax.swing.JCheckBox jCheckBox35;
    private javax.swing.JCheckBox jCheckBox36;
    private javax.swing.JCheckBox jCheckBox37;
    private javax.swing.JCheckBox jCheckBox38;
    private javax.swing.JCheckBox jCheckBox39;
    private javax.swing.JCheckBox jCheckBox4;
    private javax.swing.JCheckBox jCheckBox40;
    private javax.swing.JCheckBox jCheckBox41;
    private javax.swing.JCheckBox jCheckBox42;
    private javax.swing.JCheckBox jCheckBox43;
    private javax.swing.JCheckBox jCheckBox44;
    private javax.swing.JCheckBox jCheckBox45;
    private javax.swing.JCheckBox jCheckBox46;
    private javax.swing.JCheckBox jCheckBox47;
    private javax.swing.JCheckBox jCheckBox5;
    private javax.swing.JCheckBox jCheckBox6;
    private javax.swing.JCheckBox jCheckBox7;
    private javax.swing.JCheckBox jCheckBox8;
    private javax.swing.JCheckBox jCheckBox9;
    private javax.swing.JLabel jLabel1;
    private javax.swing.JPanel jPanel2;
    private javax.swing.JScrollPane jScrollPane1;
    // End of variables declaration
}
```

RESULTS CLASS

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package is_evauation;
import com.itextpdf.text.Document;
import com.itextpdf.text.DocumentException;
import com.itextpdf.text.PageSize;
```

```
import com.itextpdf.text.Paragraph;
import com.itextpdf.text.pdf.PdfContentByte;
import com.itextpdf.text.pdf.PdfPTable;
import com.itextpdf.text.pdf.PdfWriter;
import static com.sun.org.apache.xalan.internal.lib.ExsltDatetime.date;
import java.awt.Cursor;
import java.awt.Graphics2D;
import java.awt.Shape;
import java.awt.Toolkit;
import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.PrintStream;
import java.sql.Connection;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.util.Calendar;
import java.util.Date;
import javax.swing.JOptionPane;
import net.proteanit.sql.DbUtils;
import java.sql.*;
import java.text.DateFormat;
import java.text.SimpleDateFormat;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.*;
/**
 *
 * @author user1
 */
public final class RESULTS extends javax.swing.JFrame {
    PreparedStatement pst = null;
    double a;
    double b;
    double c;
    double d;
    double e1;
    double f;
    double g;
    int a1;
    int b1;
    int c1;
public RESULTS() {initComponents();  }
     RESULTS(double result, double Technology, double Human_resource,double Organisational, double elements_in_Tech,

double elements_in_HR,double elements_Org) throws FileNotFoundException, DocumentException {
        initComponents();
        setDate();
       a = Technology;
       b = Human_resource;
       c = Organisational;
       d = elements_in_Tech;
       e1 = elements_in_HR;
       f = elements_Org;
       g =  result;
       a1 = (int)Math.round(a);
       b1 = (int)Math.round(b);
       c1 = (int)Math.round(c);
      jLabel5.setText(""+a1);
      jLabel6.setText(""+b1);
      jLabel7.setText(""+c1);
      jLabel8.setText(""+d+"");
      jLabel9.setText(""+e1+"");
      jLabel10.setText(""+f+"");
      jLabel11.setText(""+g+"");
```

```
    TF4.setText("Big Project");
    TF4.setEditable(false);
     if(( g <100.00) && (g>= 75.00)){
         jTextField2.setText("Less Crictical");
         jTextField2.setEditable(false);

         if((g <100.00) && ( g >= 82.00))
         {jTextField3.setText("Best Acceptable");
            jTextField3.setEditable(false);
            String Cat = jTextField3.getText();
            String Sever = jTextField2.getText();
            try{  Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
            try (Connection conn = DriverManager.getConnection("jdbc:odbc:recommendationsDB")) {
               Statement st = conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
               String sql ="Select * from RECOMMEND Score <100.00 AND Score >= 82.00
ORDER BY Score DESC
LIMIT 10";
               PreparedStatement pst1 = conn.prepareStatement(sql);
               ResultSet rst = pst1.executeQuery();
               ResultSet rs = st.executeQuery(sql);
               jTable3.setModel(DbUtils.resultSetToTableModel(rst));
                Document document = new Document(PageSize.A4);
                  PdfWriter writer = PdfWriter.getInstance(document, new
FileOutputStream("src\\Reports\\iBestReport.pdf"));

                  PdfPTable table = new PdfPTable(6);
                  document.open();
                  document.add(new Paragraph("                                        ~ITPES 2015~"));
                  document.add(new Paragraph("                                  IT PROJECT EVALUATION REPORT\n"));
                  document.add(new Paragraph("                                     Organisation - XYZ\n"));
                  document.add(new Paragraph("              ------------------------------------------------------------------------------
----------\n"));
                  document.add(new Paragraph("              Eval. Date:"+new Date().toString()+"\n"));
                  document.add(new Paragraph("              Category:"+Cat+"                Total Score(%):"+g+"\n"));
                  document.add(new Paragraph("              Serevernity:"+Sever+"\n"));
                  document.add(new Paragraph("              ------------------------------------------------------------------------------
----------\n\n"));
                  document.add(new Paragraph("                                        RECOMMENDATIONS TABLE\n\n"));
                  document.add(new Paragraph("                  [Please Vary the components of IS/IT in the following
combinations]\n"));
                  document.add(new Paragraph("                ID        Tech        Org        HR        Scores(%)
Severenity \n\n"));
                  while(rs.next()){
                  table.setHeaderRows(1);
                  table.addCell(""+rs.getString(1));
                  table.addCell(""+rs.getString(2));
                  table.addCell(""+rs.getString(3));
                  table.addCell(""+rs.getString(4));
                  table.addCell(""+rs.getString(5));
                  table.addCell(""+rs.getString(6));
                } document.add(table);
                document.add(new Paragraph("\n\n"));
                document.add(new Paragraph("                        ----------------------------End of report-----------------------------
-\n\n"));
                document.close();
             }
              }catch(ClassNotFoundException | SQLException e){
              JOptionPane.showMessageDialog(null, e);
              }
       }else{
           jTextField3.setText("Least Acceptable");
          jTextField3.setEditable(false);
          String Cat = jTextField3.getText();
          String Sever = jTextField2.getText();
```

```
        try{
            Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
            try (Connection conn = DriverManager.getConnection("jdbc:odbc:recommendationsDB")) {
                Statement st = conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
                String sql ="Select * from RECOMMEND where Score < 82.00 AND Score >= 75.00
ORDER BY Score DESC
LIMIT 10";
                PreparedStatement pst1 = conn.prepareStatement(sql);
                ResultSet rst = pst1.executeQuery();
                ResultSet rs = st.executeQuery(sql);
                jTable3.setModel(DbUtils.resultSetToTableModel(rst));
                Document document = new Document(PageSize.A4);
                PdfWriter writer = PdfWriter.getInstance(document, new FileOutputStream("src\\Reports\\iLeastReport.pdf"));
                 PdfPTable table = new PdfPTable(6);
                document.open();
                document.add(new Paragraph("                                        ~ITPES 2015~"));
                document.add(new Paragraph("                                    IT PROJECT EVALUATION REPORT\n"));
                document.add(new Paragraph("                                        Organisation - XYZ\n"));
                document.add(new Paragraph("              ----------------------------------------------------------------------------------
----------\n"));
                document.add(new Paragraph("              Eval. Date:"+new Date().toString()+"\n"));
                document.add(new Paragraph("              Category:"+Cat+"                    Total Score(%):"+g+"\n"));
                document.add(new Paragraph("              Serevernity:"+Sever+"\n"));
                document.add(new Paragraph("              ----------------------------------------------------------------------------------
----------\n\n"));
                document.add(new Paragraph("                                        RECOMMENDATIONS TABLE\n\n"));
                document.add(new Paragraph("                    [Please Vary the components of IS/IT in the following
combinations]\n"));
                 document.add(new Paragraph("                ID          Tech          Org          HR          Scores(%)
Severenity \n\n"));
                while(rs.next()){
                   table.addCell(""+rs.getString(1));
                   table.addCell(""+rs.getString(2));
                   table.addCell(""+rs.getString(3));
                   table.addCell(""+rs.getString(4));
                   table.addCell(""+rs.getString(5));
                   table.addCell(""+rs.getString(6)); }
                document.add(table);
                document.add(new Paragraph("\n\n"));
                document.add(new Paragraph("                        ----------------------------End of report----------------------------
-\n\n"));
                document.close();
             }
              }catch(ClassNotFoundException | SQLException e){

              JOptionPane.showMessageDialog(null, e);
              }
           }
       }
    else if((g  <75.00) && (g > 00.00)){ jTextField2.setText("Unacceptable Tolerance");
          jTextField2.setEditable(false);
            if((g <75.00) && (g >= 50.00)){
            jTextField3.setText("Worse Acceptable");
            jTextField3.setEditable(false);
            String Cat = jTextField3.getText();
            String Sever = jTextField2.getText();
            Try{Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
            try (Connection conn = DriverManager.getConnection("jdbc:odbc:recommendationsDB")) {
                Statement st = conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
                String sql ="Select * from RECOMMEND where Score <75.00 AND Score >= 50.00
ORDER BY Score DESC
LIMIT 10";
                PreparedStatement pst1 = conn.prepareStatement(sql);
```

```
            ResultSet rst = pst1.executeQuery();
            ResultSet rs = st.executeQuery(sql);
            jTable3.setModel(DbUtils.resultSetToTableModel(rst));
            Document document = new Document(PageSize.A4);
            PdfWriter writer = PdfWriter.getInstance(document, new FileOutputStream("src\\Reports\\iWorseReport.pdf"));

               PdfPTable table = new PdfPTable(6);
               document.open();
               document.add(new Paragraph("                                        ~ITPES 2015~"));
               document.add(new Paragraph("                                    IT PROJECT EVALUATION REPORT\n"));
               document.add(new Paragraph("                                        Organisation - XYZ\n"));
               document.add(new Paragraph("          ------------------------------------------------------------------------------
----------\n"));
               document.add(new Paragraph("          Eval. Date:"+new Date().toString()+"\n"));
               document.add(new Paragraph("          Category:"+Cat+"                Total Score(%):"+g+"\n"));
               document.add(new Paragraph("          Serevernity:"+Sever+"\n"));
               document.add(new Paragraph("          ------------------------------------------------------------------------------
----------\n\n"));
               document.add(new Paragraph("                                        RECOMMENDATIONS TABLE\n\n"));
               document.add(new Paragraph("                [Please Vary the components of IS/IT in the following
combinations]\n"));

               document.add(new Paragraph("                ID        Tech        Org        HR        Scores(%)
Severenity \n\n"));
               while(rs.next()){
               table.setHeaderRows(1);
               table.addCell(""+rs.getString(1));
               table.addCell(""+rs.getString(2));
               table.addCell(""+rs.getString(3));
               table.addCell(""+rs.getString(4));
               table.addCell(""+rs.getString(5));
               table.addCell(""+rs.getString(6));
            }
             document.add(table);
            document.add(new Paragraph("\n\n"));
            document.add(new Paragraph("                ----------End of report----------
-\n\n"));
            document.close(); }
           }catch(ClassNotFoundException | SQLException e){

           JOptionPane.showMessageDialog(null, e);
              }
       else if((g <50.00) && (g >= 20.00)){
           jTextField3.setText("Unaceptable");
          jTextField3.setEditable(false);
          String Cat = jTextField3.getText();
          String Sever = jTextField2.getText();

         Try{  Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
          try (Connection conn = DriverManager.getConnection("jdbc:odbc:recommendationsDB")) {
             Statement st = conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
             String sql ="Select * from RECOMMEND where Score <50.00 AND Score >=20.00 ORDER BY Score DESC
LIMIT 10";
             PreparedStatement pst1 = conn.prepareStatement(sql);
             ResultSet rst = pst1.executeQuery();
             ResultSet rs = st.executeQuery(sql);
             jTable3.setModel(DbUtils.resultSetToTableModel(rst));
              Document document = new Document(PageSize.A4);
             PdfWriter writer = PdfWriter.getInstance(document, new
FileOutputStream("src\\Reports\\iiWorstReport.pdf"));
               PdfPTable table = new PdfPTable(6);
               document.open();
               document.add(new Paragraph("                                        ~ITPES 2015~"));
               document.add(new Paragraph("                                    IT PROJECT EVALUATION REPORT\n"));
```

```
                document.add(new Paragraph("                                        Organisation - XYZ\n"));
                document.add(new Paragraph("                ------------------------------------------------------------------------------
---------------\n"));
                document.add(new Paragraph("                Eval. Date:"+new Date().toString()+"\n"));
                document.add(new Paragraph("                Category:"+Cat+"                    Total Score(%):"+g+"\n"));
                document.add(new Paragraph("                Serevernity:"+Sever+"\n"));
                document.add(new Paragraph("                ------------------------------------------------------------------------------
---------------\n\n"));
                document.add(new Paragraph("                                        RECOMMENDATIONS TABLE\n\n"));
                document.add(new Paragraph("                    [Please Vary the components of IS/IT in the following
combinations]\n\n"));

                document.add(new Paragraph("                ID          Tech          Org          HR          Scores(%)
Severenity \n\n"));
                while(rs.next()){
                table.setHeaderRows(1);
                table.addCell(""+rs.getString(1));
                table.addCell(""+rs.getString(2));
                table.addCell(""+rs.getString(3));
                table.addCell(""+rs.getString(4));
                table.addCell(""+rs.getString(5));
                table.addCell(""+rs.getString(6));
            }
                        document.add(table);
            document.add(new Paragraph("\n\n"));
            document.add(new Paragraph("                    ----------------------------End of report-----------------------------
-\n\n"));
            document.close();  }
           }catch(ClassNotFoundException | SQLException e){
           JOptionPane.showMessageDialog(null, e);   } }
       else{
            jTextField3.setText("Worst Acceptable");
            jTextField3.setEditable(false);
            String Cat = jTextField3.getText();
            String Sever = jTextField2.getText();
            try{
               Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
            try (Connection conn = DriverManager.getConnection("jdbc:odbc:recommendationsDB")) {
               Statement st = conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
               String sql ="Select * from RECOMMEND
ORDER BY Score DESC";
               PreparedStatement pst1 = conn.prepareStatement(sql);
               ResultSet rst = pst1.executeQuery();
               ResultSet rs = st.executeQuery(sql);
               jTable3.setModel(DbUtils.resultSetToTableModel(rst));
               Document document = new Document(PageSize.A4);
               PdfWriter writer = PdfWriter.getInstance(document, new FileOutputStream("src\\Reports\\iReport.pdf"));
               PdfPTable table = new PdfPTable(6);
               document.open();
               document.add(new Paragraph("                                        ~ITPES 2015~"));
               document.add(new Paragraph("                                    IT PROJECT EVALUATION REPORT\n"));
               document.add(new Paragraph("                                        Organisation - XYZ\n"));
               document.add(new Paragraph("                ------------------------------------------------------------------------------
---------------\n"));
               document.add(new Paragraph("                Eval. Date:"+new Date().toString()+"\n"));
               document.add(new Paragraph("                Category:"+Cat+"                    Total Score(%):"+g+"\n"));
               document.add(new Paragraph("                Serevernity:"+Sever+"\n"));
               document.add(new Paragraph("                ------------------------------------------------------------------------------
---------------\n\n"));
               document.add(new Paragraph("                                        RECOMMENDATIONS TABLE\n\n"));
               document.add(new Paragraph("                    [Please Vary the components of IS/IT in the following
combinations]\n\n"));
```

```
                document.add(new Paragraph("                    ID          Tech          Org          HR          Scores(%)
Severenity \n\n"));
                while(rs.next()){
                   table.setHeaderRows(1);
                   table.addCell(""+rs.getString(1));
                   table.addCell(""+rs.getString(2));
                   table.addCell(""+rs.getString(3));
                   table.addCell(""+rs.getString(4));
                   table.addCell(""+rs.getString(5));
                   table.addCell(""+rs.getString(6)) }
                document.add(table);
                document.add(new Paragraph("\n\n"));
                document.add(new Paragraph("                              --------------------------End of report--------------------------
----\n\n"));
                document.close();  }
               }catch(ClassNotFoundException | SQLException e){
               JOptionPane.showMessageDialog(null, e);}}}
     else{
         jTextField2.setText("Ideal");
         jTextField2.setEditable(false);
         jTextField3.setText("Ideal");
         jTextField3.setEditable(false);
         String Cat = jTextField3.getText();
         String Sever = jTextField2.getText();
          try{
            Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
            try (Connection conn = DriverManager.getConnection("jdbc:odbc:recommendationsDB")) {
               Statement st = conn.createStatement(ResultSet.TYPE_SCROLL_INSENSITIVE,
ResultSet.CONCUR_READ_ONLY);
               String sql ="Select * from RECOMMEND where Score = 100.00";
               PreparedStatement pst1 = conn.prepareStatement(sql);
               ResultSet rst = pst1.executeQuery();
               ResultSet rs = st.executeQuery(sql);
                jTable3.setModel(DbUtils.resultSetToTableModel(rst));
               Document document = new Document(PageSize.A4);
               PdfWriter writer = PdfWriter.getInstance(document, new FileOutputStream("src\\Reports\\iReport.pdf"));
                PdfPTable table = new PdfPTable(6);
               document.open();
               document.add(new Paragraph("                                                    ~ITPES 2015~"));
               document.add(new Paragraph("                                                IT PROJECT EVALUATION REPORT\n"));
               document.add(new Paragraph("                                                    Organisation - XYZ\n"));
               document.add(new Paragraph("          ------------------------------------------------------------------------------
----------\n"));
               document.add(new Paragraph("          Eval. Date:"+new Date().toString()+"\n"));
               document.add(new Paragraph("          Category:"+Cat+"                    Total Score(%):"+g+"\n"));
               document.add(new Paragraph("          Serevernity:"+Sever+"\n"));
               document.add(new Paragraph("          ------------------------------------------------------------------------------
----------\n\n"));
               document.add(new Paragraph("                                                RECOMMENDATIONS TABLE\n\n"));
               document.add(new Paragraph("                    [Please Vary the components of IS/IT in the following
combinations]\n\n"));
                document.add(new Paragraph("                    ID          Tech          Org          HR          Scores(%)
Severenity \n\n"));
               while(rs.next()){table.addCell(""+rs.getString(1));
                  table.addCell(""+rs.getString(2));
                  table.addCell(""+rs.getString(3));
                  table.addCell(""+rs.getString(4));
                  table.addCell(""+rs.getString(5));
                  table.addCell(""+rs.getString(6));
               } document.add(table);
               document.add(new Paragraph("\n\n"));
               document.add(new Paragraph("                              --------------------------End of report--------------------------
-\n\n"));
               document.close();} }catch(ClassNotFoundException | SQLException e){
```

```
            JOptionPane.showMessageDialog(null, e);  } } }
/**
 * This method is called from within the constructor to initialize the form.
 * WARNING: Do NOT modify this code. The content of this method is always
 * regenerated by the Form Editor.
 */
@SuppressWarnings("unchecked")
// <editor-fold defaultstate="collapsed" desc="Generated Code">
private void initComponents() {

    jScrollPane2 = new javax.swing.JScrollPane();
    jTable1 = new javax.swing.JTable();
    jPanel1 = new javax.swing.JPanel();
    jLabel11 = new javax.swing.JLabel();
    jLabel10 = new javax.swing.JLabel();
    jLabel9 = new javax.swing.JLabel();
    jLabel8 = new javax.swing.JLabel();
    jLabel7 = new javax.swing.JLabel();
    jLabel6 = new javax.swing.JLabel();
    jLabel5 = new javax.swing.JLabel();
    jLabel1 = new javax.swing.JLabel();
    jTextField1 = new javax.swing.JTextField();
    jLabel2 = new javax.swing.JLabel();
    jTextField2 = new javax.swing.JTextField();
    jLabel3 = new javax.swing.JLabel();
    jLabel4 = new javax.swing.JLabel();
    jTextField3 = new javax.swing.JTextField();
    jLabel12 = new javax.swing.JLabel();
    TF4 = new javax.swing.JTextField();
    jToggleButton1 = new javax.swing.JToggleButton();
    jButton1 = new javax.swing.JButton();
    jButton2 = new javax.swing.JButton();
    jButton3 = new javax.swing.JButton();
    jButton5 = new javax.swing.JButton();
    jPanel2 = new javax.swing.JPanel();
    jScrollPane4 = new javax.swing.JScrollPane();
    jTable3 = new javax.swing.JTable();
    jButton6 = new javax.swing.JButton();
    jLabel13 = new javax.swing.JLabel();
    jButton4 = new javax.swing.JButton();
    jButton7 = new javax.swing.JButton();

    jTable1.setModel(new javax.swing.table.DefaultTableModel(
        new Object [][] {
            {null, null, null, null},
            {null, null, null, null},
            {null, null, null, null},
            {null, null, null, null}
        },
        new String [] {
            "Title 1", "Title 2", "Title 3", "Title 4 }
    ));
    jScrollPane2.setViewportView(jTable1);
    setDefaultCloseOperation(javax.swing.WindowConstants.DO_NOTHING_ON_CLOSE);
    setBackground(new java.awt.Color(0, 0, 153));
    addWindowListener(new java.awt.event.WindowAdapter() {
        public void windowOpened(java.awt.event.WindowEvent evt) {
            formWindowOpened(evt);}  });

    jPanel1.setBackground(new java.awt.Color(153, 204, 255));
    jPanel1.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
    jPanel1.setLayout(new org.netbeans.lib.awtextra.AbsoluteLayout());
    jLabel11.setText("jLabel11");
    jPanel1.add(jLabel11, new org.netbeans.lib.awtextra.AbsoluteConstraints(360, 150, -1, 40));
```

```
jLabel10.setText("jLabel10");
jPanel1.add(jLabel10, new org.netbeans.lib.awtextra.AbsoluteConstraints(360, 144, -1, 20));
jLabel9.setText("jLabel9");
jPanel1.add(jLabel9, new org.netbeans.lib.awtextra.AbsoluteConstraints(360, 130, -1, -1));
jLabel8.setText("jLabel8");
jPanel1.add(jLabel8, new org.netbeans.lib.awtextra.AbsoluteConstraints(360, 110, -1, -1));
jLabel7.setText("jLabel7");
jPanel1.add(jLabel7, new org.netbeans.lib.awtextra.AbsoluteConstraints(230, 146, -1, -1));
jLabel6.setText("jLabel6");
jPanel1.add(jLabel6, new org.netbeans.lib.awtextra.AbsoluteConstraints(230, 130, -1, -1));
jLabel5.setText("jLabel5");
jPanel1.add(jLabel5, new org.netbeans.lib.awtextra.AbsoluteConstraints(230, 110, -1, -1));
jLabel1.setText("Eval. Date ");
jLabel1.setBorder(javax.swing.BorderFactory.createBevelBorder(javax.swing.border.BevelBorder.RAISED));
jPanel1.add(jLabel1, new org.netbeans.lib.awtextra.AbsoluteConstraints(210, 50, 90, 30));
jTextField1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jTextField1ActionPerformed(evt);  }
});
jPanel1.add(jTextField1, new org.netbeans.lib.awtextra.AbsoluteConstraints(300, 50, 140, 30));
jLabel2.setText("Category");
jLabel2.setBorder(javax.swing.BorderFactory.createBevelBorder(javax.swing.border.BevelBorder.RAISED));
jPanel1.add(jLabel2, new org.netbeans.lib.awtextra.AbsoluteConstraints(10, 10, 70, 30));
jTextField2.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jTextField2ActionPerformed(evt);}
});
jPanel1.add(jTextField2, new org.netbeans.lib.awtextra.AbsoluteConstraints(80, 10, 118, 30));
jLabel3.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/ResultTable.png"))); // NOI18N
jPanel1.add(jLabel3, new org.netbeans.lib.awtextra.AbsoluteConstraints(20, 90, 490, 96));
jLabel4.setText("Severenity   ");
jLabel4.setBorder(javax.swing.BorderFactory.createBevelBorder(javax.swing.border.BevelBorder.RAISED));
jPanel1.add(jLabel4, new org.netbeans.lib.awtextra.AbsoluteConstraints(10, 50, 70, 30));
jPanel1.add(jTextField3, new org.netbeans.lib.awtextra.AbsoluteConstraints(80, 50, 118, 30));
jLabel12.setText("Type of Project");
jLabel12.setBorder(javax.swing.BorderFactory.createBevelBorder(javax.swing.border.BevelBorder.RAISED));
jPanel1.add(jLabel12, new org.netbeans.lib.awtextra.AbsoluteConstraints(210, 10, 90, 30));
jPanel1.add(TF4, new org.netbeans.lib.awtextra.AbsoluteConstraints(300, 10, 140, 30));
jToggleButton1.setText("edit");
jToggleButton1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jToggleButton1ActionPerformed(evt);
    }
});
jPanel1.add(jToggleButton1, new org.netbeans.lib.awtextra.AbsoluteConstraints(440, 10, 60, -1));
jButton1.setBackground(new java.awt.Color(255, 255, 255));
jButton1.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/home.png"))); // NOI18N
jButton1.setText("Home");
jButton1.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
    public void mouseMoved(java.awt.event.MouseEvent evt) {
        jButton1MouseMoved(evt);}
});
jButton1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton1ActionPerformed(evt);
    }
});
jButton2.setBackground(new java.awt.Color(255, 255, 255));
jButton2.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/Print.png"))); // NOI18N
jButton2.setText("Print");
jButton3.setBackground(new java.awt.Color(255, 255, 255));
jButton3.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/save.png"))); // NOI18N
jButton3.setText("Save iReport");
jButton3.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
    public void mouseMoved(java.awt.event.MouseEvent evt) { jButton3MouseMoved(evt); }  });
```

```
        jButton3.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton3ActionPerformed(evt);  }  });
        jButton5.setBackground(new java.awt.Color(255, 255, 255));
        jButton5.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/QUIT.png"))); // NOI18N
        jButton5.setText("Quit");
        jButton5.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton5MouseMoved(evt);  }    });
        jButton5.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton5ActionPerformed(evt);
            }});
        jTable3.setBorder(javax.swing.BorderFactory.createLineBorder(new java.awt.Color(0, 0, 0)));
        jTable3.setModel(new javax.swing.table.DefaultTableModel(
            new Object [][] {
                {null, null, null, null},
                {null, null, null, null},
                {null, null, null, null},
                {null, null, null, null}
            },
            new String [] {
                "Title 1", "Title 2", "Title 3", "Title 4"
            }
        ));
        jScrollPane4.setViewportView(jTable3);

        javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
        jPanel2.setLayout(jPanel2Layout);
        jPanel2Layout.setHorizontalGroup(
            jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel2Layout.createSequentialGroup()
                .addComponent(jScrollPane4, javax.swing.GroupLayout.PREFERRED_SIZE, 507,
javax.swing.GroupLayout.PREFERRED_SIZE)
                .addGap(0, 3, Short.MAX_VALUE)) );
        jPanel2Layout.setVerticalGroup(
            jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addComponent(jScrollPane4, javax.swing.GroupLayout.PREFERRED_SIZE, 166,
javax.swing.GroupLayout.PREFERRED_SIZE)
        );
        jButton6.setBackground(new java.awt.Color(255, 255, 255));
        jButton6.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/Key.png"))); // NOI18N
        jButton6.setText("Key");
        jButton6.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton6MouseMoved(evt);
            }
        });
        jButton6.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton6ActionPerformed(evt);
            }
        });
        jLabel13.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel13.setText("    [ RECOMMENDATIONS TABLE ] ");
        jLabel13.setBorder(javax.swing.BorderFactory.createBevelBorder(javax.swing.border.BevelBorder.RAISED));
        jButton4.setBackground(new java.awt.Color(255, 255, 255));
        jButton4.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/infor.png"))); // NOI18N
        jButton4.setText("Infor.");
        jButton4.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton4MouseMoved(evt);
            }
        });
        jButton4.addActionListener(new java.awt.event.ActionListener() {
```

```
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButton4ActionPerformed(evt);} });
        jButton7.setBackground(new java.awt.Color(255, 255, 255));
        jButton7.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/Chart.jpg"))); // NOI18N
        jButton7.setText(" Charts");
        javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
        getContentPane().setLayout(layout);
        layout.setHorizontalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(layout.createSequentialGroup()
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)
                    .addGroup(layout.createSequentialGroup()
                        .addContainerGap()
                        .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE))
                    .addGroup(javax.swing.GroupLayout.Alignment.LEADING, layout.createSequentialGroup()
                        .addGap(43, 43, 43)
                        .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                            .addGroup(layout.createSequentialGroup()
                                .addComponent(jButton5)
                                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                                .addComponent(jButton1)
                                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                                .addComponent(jButton2)
                                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                                .addComponent(jButton3))
                            .addGroup(layout.createSequentialGroup()
                                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                                    .addComponent(jPanel1, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
                                    .addGroup(layout.createSequentialGroup()
                                        .addComponent(jButton4)
                                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                                        .addComponent(jButton6)
                                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                                        .addComponent(jButton7)))
                                .addGap(0, 0, Short.MAX_VALUE)))))
                .addContainerGap(44, Short.MAX_VALUE))
            .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, layout.createSequentialGroup()
                .addGap(0, 0, Short.MAX_VALUE)
                .addComponent(jLabel13, javax.swing.GroupLayout.PREFERRED_SIZE, 220,
javax.swing.GroupLayout.PREFERRED_SIZE)
                .addGap(170, 170, 170))
        );
        layout.setVerticalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(layout.createSequentialGroup()
                .addContainerGap()
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                        .addComponent(jButton1)
                        .addComponent(jButton5)
                        .addComponent(jButton2))
                    .addComponent(jButton3, javax.swing.GroupLayout.Alignment.TRAILING))
                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                .addComponent(jPanel1, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addComponent(jButton6, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(jButton4, javax.swing.GroupLayout.Alignment.TRAILING,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
```

```
                .addComponent(jButton7, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
            .addComponent(jLabel13)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
            .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addContainerGap())
        );
       pack();
        setLocationRelativeTo(null);
    }// </editor-fold>
    private void jTextField1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here }
    private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        Home frame = new Home();
        frame.setVisible(true);
        this.dispose(); }

    private void jButton5ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
         Toolkit.getDefaultToolkit().beep();
        int selectedOption = JOptionPane.showConfirmDialog(null,
                                "Are you sure you want Quit?",
                            "Quit",
            JOptionPane.YES_NO_OPTION); if (selectedOption == JOptionPane.YES_OPTION) { System.exit(0);} }
    private void jTextField2ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:}
    private void jToggleButton1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        if(jToggleButton1.isSelected()){
        jToggleButton1.setText("save");
        TF4.setEditable(true);}
        else{
        jToggleButton1.setText("edit");
        TF4.setEditable(false);
        }
    }
    private void jButton6ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:Toolkit.getDefaultToolkit().beep();
                Evaluation_Key frame =  new Evaluation_Key();
            frame.setVisible(true);
            frame.setFocusableWindowState(true);
    }
    private void formWindowOpened(java.awt.event.WindowEvent evt) {
        // TODO add your handling code here:    }

    private void jButton4ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        SuccessInformation frame = new SuccessInformation();
        frame.setVisible(true);
        frame.setFocusableWindowState(true);
    }
    private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {
        Toolkit.getDefaultToolkit().beep();
        JOptionPane.showMessageDialog(this,"Please rename the iReport file name from its system default filename!!!","",
JOptionPane.INFORMATION_MESSAGE);
        RenameFile file = new RenameFile();
        file.setVisible(true);
        this.dispose(); }

    private void jButton3MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
```

```
    jButton3.setCursor(curl); }

private void jButton5MouseMoved(java.awt.event.MouseEvent evt) {
    // TODO add your handling code here:
    Cursor curl = new Cursor(Cursor.HAND_CURSOR);
    jButton5.setCursor(curl);  }

private void jButton4MouseMoved(java.awt.event.MouseEvent evt) {
    // TODO add your handling code here:
    Cursor curl = new Cursor(Cursor.HAND_CURSOR);
    jButton4.setCursor(curl); }

private void jButton6MouseMoved(java.awt.event.MouseEvent evt) {
    // TODO add your handling code here:
    Cursor curl = new Cursor(Cursor.HAND_CURSOR);
    jButton6.setCursor(curl); }

private void jButton1MouseMoved(java.awt.event.MouseEvent evt) {
    // TODO add your handling code here:
    Cursor curl = new Cursor(Cursor.HAND_CURSOR);
    jButton1.setCursor(curl);}

/**
 */
public void setDate(){

int day, month, year;
   Calendar d = Calendar.getInstance();
   day = d.get(Calendar.DAY_OF_MONTH);
   month = d.get(Calendar.MONTH);
   year = d.get(Calendar.YEAR);
   jTextField1.setText(""+day+"/"+month+"/"+year);
   jTextField1.setEditable(false);
    }
public static void main(String args[]) {
    /* Set the Nimbus look and feel */
    //<editor-fold defaultstate="collapsed" desc=" Look and feel setting code (optional) ">
    /* If Nimbus (introduced in Java SE 6) is not available, stay with the default look and feel.
     * For details see http://download.oracle.com/javase/tutorial/uiswing/lookandfeel/plaf.html
     */
    try {
        for (javax.swing.UIManager.LookAndFeelInfo info : javax.swing.UIManager.getInstalledLookAndFeels()) {
            if ("Nimbus".equals(info.getName())) {
                javax.swing.UIManager.setLookAndFeel(info.getClassName());
                break;
            }
        }
    } catch (ClassNotFoundException ex) {
        java.util.logging.Logger.getLogger(RESULTS.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(RESULTS.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(RESULTS.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(RESULTS.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    }
    //</editor-fold>

    /* Create and display the form */
    java.awt.EventQueue.invokeLater(new Runnable() {
        public void run() {
            new RESULTS().setVisible(true);
        }
    });
}
```

```
    // Variables declaration - do not modify
    public javax.swing.JTextField TF4;
    private javax.swing.JButton jButton1;
    private javax.swing.JButton jButton2;
    private javax.swing.JButton jButton3;
    private javax.swing.JButton jButton4;
    private javax.swing.JButton jButton5;
    private javax.swing.JButton jButton6;
    private javax.swing.JButton jButton7;
    private javax.swing.JLabel jLabel1;
    private javax.swing.JLabel jLabel10;
    private javax.swing.JLabel jLabel11;
    private javax.swing.JLabel jLabel12;
    private javax.swing.JLabel jLabel13;
    private javax.swing.JLabel jLabel2;
    private javax.swing.JLabel jLabel3;
    private javax.swing.JLabel jLabel4;
    private javax.swing.JLabel jLabel5;
    private javax.swing.JLabel jLabel6;
    private javax.swing.JLabel jLabel7;
    private javax.swing.JLabel jLabel8;
    private javax.swing.JLabel jLabel9;
    private javax.swing.JPanel jPanel1;
    private javax.swing.JPanel jPanel2;
    private javax.swing.JScrollPane jScrollPane2;
    private javax.swing.JScrollPane jScrollPane4;
    private javax.swing.JTable jTable1;
    private javax.swing.JTable jTable3;
    private javax.swing.JTextField jTextField1;
    private javax.swing.JTextField jTextField2;
    private javax.swing.JTextField jTextField3;
    private javax.swing.JToggleButton jToggleButton1;
    // End of variables declaration
}
```

REPORTS CLASS

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */
package is_evauation;
import java.awt.Cursor;
import java.awt.Desktop;
import java.awt.HeadlessException;
import java.io.File;
import java.io.IOException;
import javax.swing.JOptionPane;
/**
 *
 * @author user1
 */
public class Reports extends javax.swing.JFrame {

    /**
     * Creates new form Reports
     */
    public Reports() {  initComponents();   }
    /**
     * This method is called from within the constructor to initialize the form.
     * WARNING: Do NOT modify this code. The content of this method is always
     * regenerated by the Form Editor.
     */
    @SuppressWarnings("unchecked")
```

```
    // <editor-fold defaultstate="collapsed" desc="Generated Code">
    private void initComponents() {
        jScrollPane1 = new javax.swing.JScrollPane();
        jTree1 = new javax.swing.JTree();
        jButton1 = new javax.swing.JButton();
        jButton2 = new javax.swing.JButton();
        jButton3 = new javax.swing.JButton();
        jButton4 = new javax.swing.JButton();
        setDefaultCloseOperation(javax.swing.WindowConstants.DO_NOTHING_ON_CLOSE);
        setAlwaysOnTop(true);
        setBackground(new java.awt.Color(204, 204, 255));

        jTree1.setModel(new FileSystemModel(new File("src\\Reports")));
        jTree1.addMouseListener(new java.awt.event.MouseAdapter() {
            public void mouseClicked(java.awt.event.MouseEvent evt) {
                jTree1MouseClicked(evt);
            }
        });
        jScrollPane1.setViewportView(jTree1);
        jButton1.setBackground(new java.awt.Color(255, 255, 255));
        jButton1.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
        jButton1.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/new.png"))); // NOI18N
        jButton1.setText("Open File");
        jButton1.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton1MouseMoved(evt);  }
        });
        jButton1.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton1ActionPerformed(evt);
            }
        });
        jButton2.setBackground(new java.awt.Color(255, 255, 255));
        jButton2.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
        jButton2.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/home.png"))); // NOI18N
        jButton2.setText("Home");
        jButton2.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton2MouseMoved(evt);
            }
        });
        jButton2.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton2ActionPerformed(evt);
            }
        });
        jButton3.setBackground(new java.awt.Color(255, 255, 255));
        jButton3.setIcon(new javax.swing.ImageIcon(getClass().getResource("/is_evauation/recommendation.png"))); //
NOI18N
        jButton3.setText("Rename File");
        jButton3.addMouseMotionListener(new java.awt.event.MouseMotionAdapter() {
            public void mouseMoved(java.awt.event.MouseEvent evt) {
                jButton3MouseMoved(evt);
            }
        });
        jButton3.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                jButton3ActionPerformed(evt);
            }
        });
        jButton4.setText("Delete File");
        javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
        getContentPane().setLayout(layout);
        layout.setHorizontalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
```

```
            .addGroup(layout.createSequentialGroup()
                .addContainerGap()
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)
                    .addComponent(jButton1, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(jButton4, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(jButton3, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(jButton2, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
                .addGap(18, 18, 18)
                .addComponent(jScrollPane1, javax.swing.GroupLayout.PREFERRED_SIZE, 251,
javax.swing.GroupLayout.PREFERRED_SIZE)
                .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
        );
        layout.setVerticalGroup(
            layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, layout.createSequentialGroup()
                .addContainerGap(15, Short.MAX_VALUE)
                .addGroup(layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addGroup(layout.createSequentialGroup()
                        .addGap(30, 30, 30)
                        .addComponent(jButton3)
                        .addGap(18, 18, 18)
                        .addComponent(jButton1)
                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                        .addComponent(jButton4)
                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                        .addComponent(jButton2))
                    .addComponent(jScrollPane1, javax.swing.GroupLayout.PREFERRED_SIZE, 300,
javax.swing.GroupLayout.PREFERRED_SIZE))
                .addGap(32, 32, 32))
        );
        pack();
        setLocationRelativeTo(null);
    }// </editor-fold>
    private void jButton2ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        Home frame = new Home();
        frame.setVisible(true);
        this.dispose(); }

    private void jTree1MouseClicked(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        jtreevar = jTree1.getSelectionPath().toString().replaceAll("[\\[\\]]", "").replace(", ", "\\");}

    private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        try{
                File Selection = new File(jtreevar);

                if(Selection.exists()){
                    if(Desktop.isDesktopSupported()){
                        Desktop.getDesktop().open(Selection);
                    }else{
                         JOptionPane.showMessageDialog(this,"Sorry Desktop not Supported", "Error!!",
JOptionPane.INFORMATION_MESSAGE);
                    }
                }else{
                 JOptionPane.showMessageDialog(this,"Sorry Desktop not Supported", "Error!!",
JOptionPane.INFORMATION_MESSAGE);
                } }catch(IOException | HeadlessException ex){  } }
```

```
  private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
        RenameFile rename = new RenameFile();
        rename.setVisible(true);
        this.dispose();  }
    private void jButton3MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton3.setCursor(curl);}
    private void jButton1MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton1.setCursor(curl); }
    private void jButton2MouseMoved(java.awt.event.MouseEvent evt) {
        // TODO add your handling code here:
        Cursor curl = new Cursor(Cursor.HAND_CURSOR);
        jButton2.setCursor(curl);
    }

    /**
     * @param args the command line arguments
     */
    public static void main(String args[]) {
        /* Set the Nimbus look and feel */
        //<editor-fold defaultstate="collapsed" desc=" Look and feel setting code (optional) ">
        /* If Nimbus (introduced in Java SE 6) is not available, stay with the default look and feel.
         * For details see http://download.oracle.com/javase/tutorial/uiswing/lookandfeel/plaf.html
         */
        try {
            for (javax.swing.UIManager.LookAndFeelInfo info : javax.swing.UIManager.getInstalledLookAndFeels()) {
                if ("Nimbus".equals(info.getName())) {
                    javax.swing.UIManager.setLookAndFeel(info.getClassName());
                    break;
                }
            }
        } catch (ClassNotFoundException | InstantiationException | IllegalAccessException |
javax.swing.UnsupportedLookAndFeelException ex) {
            java.util.logging.Logger.getLogger(Reports.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
        }
        //</editor-fold>

        //</editor-fold>

        /* Create and display the form */
        java.awt.EventQueue.invokeLater(new Runnable() {
            @Override
            public void run() {
                new Reports().setVisible(true);
            }
        });
    }

    // Variables declaration - do not modify
    private javax.swing.JButton jButton1;
    private javax.swing.JButton jButton2;
    private javax.swing.JButton jButton3;
    private javax.swing.JButton jButton4;
    private javax.swing.JScrollPane jScrollPane1;
    private javax.swing.JTree jTree1;
    // End of variables declaration
String jtreevar;
}
```

FILE SYSTEM MODEL CLASS

```
package is_evauation;

/*
 * To change this template, choose Tools | Templates
 * and open the template in the editor.
 */
import java.io.File;
import java.util.Iterator;
import java.util.Vector;
import javax.swing.event.TreeModelEvent;
import javax.swing.event.TreeModelListener;
import javax.swing.tree.TreeModel;
import javax.swing.tree.TreePath;

/**
 *
 * @author ProgrammingKnowledge
 */
public class FileSystemModel implements TreeModel {

    private final File root;
    private final Vector listeners = new Vector();

    public FileSystemModel(File rootDirectory) {
        root = rootDirectory;
    }
    @Override
    public Object getRoot() {
        return root;
    }
    @Override
    public Object getChild(Object parent, int index) {
        File directory = (File) parent;
        String[] children = directory.list();
 /*       for (int j = 0; j< children.length; j++ ){
            System.out.println(children[j]);
        }       */
      return new FileSystemModel.TreeFile(directory, children[index]);
    }

    @Override
    public int getChildCount(Object parent) {
        File file = (File) parent;
        if (file.isDirectory()) {
            String[] fileList = file.list();

            if (fileList != null) {
                return file.list().length;
            }
        }
        return 0;
    }
    @Override
    public boolean isLeaf(Object node) {
        File file = (File) node;
        return file.isFile();
    }
    @Override
    public int getIndexOfChild(Object parent, Object child) {
        File directory = (File) parent;
        File file = (File) child;
        String[] children = directory.list();
        for (int i = 0; i < children.length; i++) {
            if (file.getName().equals(children[i])) {     return i;  } }  return -1;   }
```

```
  @Override
   public void valueForPathChanged(TreePath path, Object value) {
      File oldFile = (File) path.getLastPathComponent();
      String fileParentPath = oldFile.getParent();
      String newFileName = (String) value;
      File targetFile = new File(fileParentPath, newFileName);
      oldFile.renameTo(targetFile);
      File parent = new File(fileParentPath);
      int[] changedChildrenIndices = {getIndexOfChild(parent, targetFile)};
      Object[] changedChildren = {targetFile};
      fireTreeNodesChanged(path.getParentPath(), changedChildrenIndices, changedChildren);

   }

   private void fireTreeNodesChanged(TreePath parentPath, int[] indices, Object[] children) {
      TreeModelEvent event = new TreeModelEvent(this, parentPath, indices, children);
      Iterator iterator = listeners.iterator();
      TreeModelListener listener = null;
      while (iterator.hasNext()) {
         listener = (TreeModelListener) iterator.next();
         listener.treeNodesChanged(event);
      }
   }
   @Override
   public void addTreeModelListener(TreeModelListener listener) {
      listeners.add(listener);
   }
   @Override
   public void removeTreeModelListener(TreeModelListener listener) {
      listeners.remove(listener);
   }

   private class TreeFile extends File {

      public TreeFile(File parent, String child) {
         super(parent, child);
      }
      @Override
      public String toString() {
         return getName();
      }
   }
}
```