



A hybrid framework for business intelligence systems adoption by small scale enterprises in Namibia

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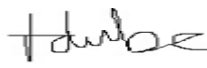
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DECLARATION

I, **Teressa Tjwakinna Chikohora**, student number **28256417**, declare that the study ***A hybrid framework for business intelligence systems adoption by small scale enterprises in Namibia, submitted*** to North West University, Mafikeng Campus for PhD study, is my work and has not been submitted before to any institution. All the information used has been acknowledged both in text and in references.

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DEDICATION

This thesis is dedicated to my husband and children, for their support and encouragement.

ABSTRACT

The prevailing economic environment, characterised by retrenchments, company closures and the drive to eradicate poverty has led to the increase in the number of small businesses. The small scale enterprises operate in the same environments with large companies and face challenges which often results in the businesses closing down within the first few years of inception. A lot of data that may be useful in improving performance and decision making, is generated during the small business's operations. The small scale enterprises however lack the tools and expertise to analyse data. Business intelligence systems are an example of the tools that small scale enterprises could use to handle, manage and effectively use the data they generate. Despite the availability of business intelligence systems and related tools, the data generated in the small businesses is fragmented, kept in different forms and rarely used to inform decisions because they have not embraced this technology. The business intelligence systems technology is complex, costly and requires expertise making the small scale enterprises reluctant to adopt it into their operations. This study investigates the extent to which small scale enterprises in Namibia have adopted business intelligence systems and design a framework and model that may guide the organisations in implementing the business intelligence systems and reduce implementation failures. The mixed method approach to research was followed for this study. A survey was conducted with a total of one hundred and thirty questionnaires distributed to small scale enterprises in Namibia, using the convenience sampling approach. The questionnaire was informed by the Diffusion of Innovation and Technology Organisation and Environment theories, the Information Evaluation Model and the critical success factors for business intelligence systems implementation, with dimensions and aspects rated on a Likert scale of 1 to 5. Seventy-four questionnaires were returned, coded and analysed using Microsoft Office Excel. The Object-Oriented Design approach was followed to design the framework and model. The Feature Driven Development method was used to build the model in small increments using Java programming language. The survey results showed that in Namibia, small scale enterprises are at level 3, which means that they have not adopted business intelligence systems, although they are aware of the existence of such tools and have some of the required resources. The results informed the development of a tool that could be used by the businesses to evaluate their readiness to adopt the business intelligence systems. A framework for evaluating the small businesses' resources against the framework parameters was defined to guide them in assessing their readiness to implement business intelligence systems. The framework was automated and simplified to produce a hybrid model that users can use without the intervention of experts. The resultant hybrid model was developed from the key technology adoption theories and factors specific to small scale enterprises. Desk checking and walkthroughs were conducted by peer experts to evaluate the model for correctness and efficiency. The use of the model is recommended to all small scale enterprises that wish to adopt business intelligence systems because it will show how ready they are, well before the implementation project commences thus reducing the cost of failed implementation projects.

LIST OF ABBREVIATIONS

SSEs	–	Small Scale Enterprises
BI	–	Business Intelligence
BIS	–	Business Intelligence System
DOI	–	Diffusion of Innovation
TOE	–	Technology, Organisation & Environment Framework
CSF	–	Critical Success Factors
GDP	–	Gross Domestic Product
SME	–	Small to Medium Enterprises
NCCI	-	Namibia Chamber of Commerce and Industry
IEM	-	Information Evaluation Model
RAD	-	Rapid Application Development
FDD	-	Feature Driven Development
TAM	-	Technology Acceptance Model
TPB	-	Technology of Planned Behavior
TRA	-	Theory of Reasoned Action
OOD	-	Object Oriented Design
UML	-	Unified Modeling Language

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DEFINITION OF KEY TERMS

Business Intelligence – Business Intelligence refers to the processes, technologies and tools required to transform raw data into useful information to improve decision making [1] .

Business Intelligence System – A business Intelligence system is a software application designed to integrate an enterprise's data and facilitate its analysis for input into decision making process [2].

Adoption – refers to the conversion or transfer from old system to a new system by an organisation [3].

Small scale enterprises – Small Scale Enterprise is a type of business that has few employees, low capital investment and low turnover. In this project it refers to a business that has between 11 and 30 employees with an annual turnover not exceeding 3 million Namibian dollars [4].

Framework – A standard set of rules, ideas or beliefs which may be used to build and deploy applications [5].

Model - A representation of a process designed to simulate real world events [6].

DOI (Diffusion of Innovation) – A theory defined by Rogers (1995) to explain how, why, and at what rate technology may be spread in an organisation.

TOE (Technology, Organisation and Environment) – A framework that defines the technological, organisational and environmental aspects that organisations may consider in adapting new technologies [7].

Implementation – is a process of putting an Information System to operation [5].

Hybrid – Refers to combining different approaches to design a solution [5].

CHAPTER 1 INTRODUCTION AND BACKGROUND

1.1 Introduction

This chapter introduces the study and explains the problem domain. A detailed background of the research problem, the problem statement, research questions and objectives are presented. The chapter also discussed the relevance of the study as well as the proposed solution. An explanation of the benefits that will be earned as a result of the successful completion of this study is included.

1.2 Background

Small scale enterprises (SSEs) also called small businesses are a type of business characterized by a small number of employees, low start-up costs and often a low turnover [8]. The prevailing economic condition has seen an increase in the number of small-scale enterprises, the world over. Retrenchments, company closures and efforts to eradicate poverty have influenced the increase in people trying to establish a way of living through their skills. In most countries, the number of SSEs has grown, though not dominant in the service area but they make a significant contribution to the private sector workforce of an economy. The SSEs help to create jobs as well as diversify industries, the businesses are highly competitive since the owners are motivated to succeed and expand their operations [9].

An SSE is defined as a privately owned and operated company that is limited in size and revenue depending on the industry [10]. SSEs may be defined based on the number of workers employed, annual turnover and or capital employed [8]. SSEs in the United States are businesses with between one and nineteen employees, characterised by skilled craftspeople (for example painters, plumbers, electricians) and professionals (accountants, architects, lawyers and healthcare providers) [11]. The owner of a small business is usually the expert in the service they offer, with a few other employees to help operate efficiently. According to [12] an SSE is a company with a turnover not exceeding 6.5 million British pounds, a balance sheet of more than 3.26 million pounds and not more than 50 employees.

An SSE is formal and or informal depending on whether the business is registered or not [4]. An SSE has between 11 and 30 employees and a turnover of less than 3 million Namibian dollars [4]. The business owners range from street vendors and shoe cobblers to a registered company with respectable capital employment. Generally, the total number of services

providing SSEs is more than that of the manufacturing SSEs. The change of colonial policies which prohibited blacks from starting their own business has influenced an increase in the number of SSEs [4]. The definition of SSEs varies by industry and country and for the purpose of this research, the definition of SSEs provided by the Namibian Ministry of Trade and Industry (2015) is used.

The number of SSEs in Namibia is estimated to be over 35000 following a survey conducted between 1997 and 1999, the numbers are suspected to have increased significantly over the years [13]. The sector has formal SSEs, that are registered with local authorities, a ministry, and a registrar of companies or is included in the SMEs database in the Ministry of Trade and Industry [13]. They are loyal and observe policies and legislation and tend to operate across all sectors of the economy including manufacturing, service provision, transport, tourism, financial services, agriculture and retail [14]. Informal SSEs on the other hand are unregistered and hardly observe laws and legislation, often evading paying tax. Most informal SSEs are located in rural areas and operate mostly as wholesalers, retailers and producers of food and beverages [13]. The SSEs make a significant contribution to resolving the unemployment problem in the country. Sakaria Nghikembua, in [14] reported that SSEs create 16000 jobs annually compared to the 4000 new jobs created by corporates. He commended the contribution of SSEs to employment creation and suggested that the businesses be given a favourable tax regime and funding terms in support of their growth. [13] . The increase in the labour force working in SSEs was highlighted to rise from 15% in 2002 to 198 % in 2003, excluding part-time employees. The income generated in SSEs contributes to the gross domestic product (GDP) of a country. In Namibia, SSEs contributed 8.43% in 2002 and then 11.01% in 2003 with the contribution estimated at over 12% in 2015, although there is no up-to-date statistic [4]. However, the SSEs in Namibia's retail sector fail and most of them collapse within the first five years of inception [15].

The Namibian government has been commended for initiating several programmes to help the SSEs to grow [4], for example, the vendor development programme aimed at addressing the market problems faced by SSEs and developing sector linkages, large business linkages as well as establishing trading relations within the economy. The access-to -information and Marketing Centre is another example of a programme which was launched by the Namibian Chamber of Commerce and Industry (NCCI) to provide market information and support to businesses at a cost. The centre provides access to market information and distribution arrangements which

were not available to SMEs [4]. The NCCI also has a database of Namibian registered companies among other services.

Most SSEs maintain a record of all the sales, purchases, income and expenditures incurred in their operations. The data may be used to improve and enhance decisions on risk management, research and development, targeting customers, understanding customer needs and analysing their social behaviour and ultimately increasing profit. Critical knowledge and patterns may be extracted from large amounts of data about a business and integrated for use in planning for resource and asset allocation. The fact that this data is disintegrated and spread across the enterprise makes it difficult for management to integrate, analyse and make well-informed decisions. The authors in [16] suggested that the challenges experienced in analysing the data may be improved by implementing business intelligence systems (BISs). They mentioned that the application of BISs or solutions helps to deliver information at the right location, time and in the right form as input into the decision-making process. SSEs require BIS to survive competition because BI supports fast, innovative, agile planning and decision-making [1].

BI is a tool that organisations may use to gather and analyse their data in order to support their decision-making process and improve performance [17]. The system comprises a group of tools, applications, processes and technologies for data gathering, integration, accessing and analysis to help management in decision making [18]. The authors in [19] mentioned that the BI system uses analytical tools to present organizational data in useful formats, enabling managers to make effective decisions. BI may also be seen as an organized and systematic process by which an enterprise acquires, analyses, and circulates relevant information from internal and external sources for its business activities and decision-making [20].

Hidayanto in [1] stated that BI consists of patterns, tools and or technologies that translate unprocessed business data into meaningful knowledge and information which are useful for decision-making and organisational profitability. They pointed out the availability of open source BIS which they described as high risk as they require a lot of resources, which SSEs cannot afford. Therefore, this research focused on the formulation of a framework and model that enhances the use of BIS and its associated tools for the effective management of SSEs in Namibia.

1.3 Problem description

Lots of data is generated and collected in SSEs but is often fragmented, kept in different forms, used and then either archived or deleted. It is a challenge to integrate the data from the various sources, applications and systems for businesses to make sense of this data [16]. In [21], the authors highlighted many challenges that SSEs face during BIS implementation as compared to large corporate enterprises explaining why many large companies have adopted BI tools compared to SSEs. BI technology is complex, requiring appropriate infrastructure and resources [22] which may be too costly for SSEs [23]. The highly complicated math functions in BIS require IT expertise which may not be available in SSEs, making it difficult for users with weak IT knowledge to adopt the technology. The BI systems available do not perfectly fit the business operations of SSEs making adoption a challenge [24]. The authors in [25] highlighted that most large companies are already using BI but there is less usage in SSEs and stated that only 16% of SSE are using these systems. A few studies have been conducted successfully in identifying the factors that impact BIS deployment, which has led to implementation failures [9]. Yeoh in [16] emphasised that very few SSEs are using BI technology even though more businesses could succeed and grow in the prevailing harsh economic environment through the implementation of BI. BI solutions are available but SSEs are reluctant to adopt them in their businesses [26]. Why are SSEs not adopting BIS? Is it due to cost-related issues? Complexity-related issues? Lack of documentation of activities required as input to the BIS? These and more are pertinent issues plaguing the minds of researchers that no visible solution has yet been provided according to the literature [5].

Would defining a framework that will guide SSEs in the deployment of BI systems reduce implementation failures and motivate other SSEs to adopt BI systems as well as impact positively on business profitability and sustainability? This study seeks to formulate a framework, based on the diffusion of innovation (DOI) and Technology Organisation and Environment (TOE) theories that SSEs in Namibia may follow as they deploy a BI system.

1.4 Justification for the study

This study is important because it addresses one of the critical areas in today's economies, the success of SSEs. Given the increase in the number of SSEs in the last few years, their contribution to the economy is highly expected, though it is determined by their performance or success. The SSEs require BI tools that will help them gather, store, analyse and interpret useful information for input into their decision-making process and ultimately yield profits.

Despite the availability of many BISs in the market, research shows that most SSEs face challenges in implementing the BISs and this has led to low adoption rates [21]. Adopting BI tools helps businesses to improve their operations. The developed framework and model provides guidelines that the SSEs may follow to successfully implement BISs. It is therefore expected to ease the implementation of BISs in SSEs and increase the number of SSEs that implement BISs.

Available BI tools are designed to use very huge amounts of data. SSEs do not generate such amounts so the tools are somehow underpopulated with data which affects the accuracy of patterns generated and ultimately decisions made. In other words, analysis is affected by the amounts of data given as input. The BI tools may have many parameters left blank as SSEs may not have that data which may however be available in bigger companies. The study is thus significant as the developed model will include parameters relevant to the data generated and decisions made in SSEs, thus it is customised for SSEs.

The study helps a researcher to understand the business processes in SSEs to contribute to the development of IT solutions that are compatible with the operations of these enterprises. Research shows that most research on BI focused on large, multinational and international enterprises because most of them have adopted the BISs, unlike the SSEs which are reluctant to adopt the technology [14].

1.5 Research aim and objectives

1.5.1 Research aim

This study aims to formulate a novel framework and develop a hybrid model for the implementation of BI systems in Namibian SSEs.

1.5.2 Research Questions

The study will answer the following questions:

RQ1: What is the present state of BIS adoption by SSEs in Namibia and globally?

RQ2: How have SSEs in Namibia adopted BIS?

RQ3: How can a BI implementation model be designed using DOI and TOE theories?

RQ4: How can a framework be developed for BI implementation using DOI and TOE?

RQ5: As proof of concept, how can we evaluate the performance of a framework for BI implementation in SSEs?

1.5.3 Research Objectives

The objectives of this research are to:

RO1: critically review existing literature on current BIS in SSE models.

RO2: investigate the extent of BI adoption by SSEs in Namibia.

RO3: design a framework for BI implementation.

RO4: develop a hybrid model for implementing BI in SSEs.

RO5: evaluate the performance of the framework and model for correctness as a proof of concept.

1.6 Contribution of the study

The study makes the following contributions to the existing body of knowledge:

- i. The study builds on existing work done by other researchers on the adoption of BISs by SSEs.
- ii. The novel framework formulated in this study will inform the successful implementation of BISs in SSEs which may result in improved operations and higher profit margins.
- iii. The hybrid model combines two common theories and their incorporation results in a new model with novel features thus adding new knowledge to the body of knowledge.

1.7 Research limitations

The following are the limitations of this study:

- i. The respondents of this study were located in the urban settings of Namibia. SSEs operating in rural areas were excluded because of their geographical location from the researcher.
- ii. The focus was on the SSEs that availed themselves for the study (convenience sample) excluding other SSEs who may have different opinions on the subject.

1.8 Current status of BI in SSEs, challenges and benefits

Large organisations are adopting BI tools as evidenced by the top spending priorities on Business Intelligence (BI) systems and the rise in the number of available BI tools [27]. Examples of such tools include XLMiner, Google Analytics, Lotus Approach and Corel Paradox. BI tools may be employed to forecast and predict business patterns and avoid late and over-budgeted implementations [28]. The techniques bring about several benefits for businesses as summarised in Table 1.1 below.

Table 1.1: Benefits of using BI systems for SSEs

Aspect of Business	Benefits of using BIS
Data and/or information [29]	-Comprehensive presentation of information -Data presented logically -Improved access to information amongst organizational departments -prevents overlap and distortion of data since the BIS would be the only source of data processing and analysis
Time [30]	-Lots of time saved since BIS are automated to prepare, analyse and process data -Reports are produced in less time compared to the time humans would take.
Cost [31]	-Initial investment costs are high but offset by the benefits of using the BI system. -savings in other IT investments
Return On Investment (ROI) [31]	-Operations become more efficient, reducing costs and increasing profitability -helps decide which products are profitable
Competition [26]	-ensures that production matches with demand after analysing the purchasing patterns -helps business to understand its competition -informs market segmentation -gain competitive advantage and increase market share
Customers [18]	- improve customer satisfaction after understanding their preferences from analyses data -helps create custom products -provide what customers are demanding

Some SSEs have resorted to using spreadsheets and databases as their BI solutions [32]. It is thus challenging to integrate the data from the various sources, applications and systems because of their incompatibility with BI technology [16]. However, the increasing competition amongst enterprises requires businesses to use the data to adjust their business processes and device strategies that will create a competitive advantage and cope with uncertainties in the business environment. Alshawhi et al. in [11] mentioned that businesses ought to make sense of the data to exploit new opportunities and BI systems may be the solution.

Stodder in [21] highlighted many challenges that SSEs face during BIS implementation as compared to large corporate enterprises explaining why many large companies have adopted BI tools compared to SSEs. The BI technology is complex, requiring appropriate infrastructure and resources compared to the traditional spreadsheets technology that SSEs are using [22]. The highly complicated math functions in BIS require IT expertise which may not be available in SSEs making it difficult for users with weak IT knowledge to adopt the technology [24]. SAP also mentioned that the BI systems available do not perfectly fit the business operations of SSEs making adoption a challenge. The relevant infrastructure for BI deployment is often too costly for SSEs hindering them from embracing the beneficial BI technology [23].

McCabe in [25] highlighted that most large companies are already using BI but there is less usage in SSEs and stated that only 16% of SSE are using these systems. A few studies have been conducted successfully in identifying the factors that impact BIS deployment, which has led to implementation failures [9]. BI solutions are available but SSEs are reluctant to adopt them in their businesses [26]. While Yeoh et al. [16] stated that most SSEs were not doing well because of a lack of proper information about their markets. They also emphasized that very few SSEs are using the BI technology even though more businesses could succeed and grow in the prevailing harsh economic environment through the implementation of BI.

1.9 BI adoption

Various tools have been defined to assess an organisation's level of adopting technology and one such tool is the information evaluation model (IEM) defined by SAS. The IEM includes four dimensions which may be considered in assessing an organisation's BI adoption level [33]. The dimensions are:

1. Infrastructure- considers the required technologies for BI implementation like hardware, software, network, information creation, storage and distribution.

2. Knowledge process- considers whether the organisation uses the information it generates in decision making, knowledge sharing, information quality and accuracy.
3. Human capital- a consideration of personnel skills, training, and other capabilities.
4. Culture- moral, social and behavioural norms of organisational culture concerning the flow of organisational information.

Each of the four dimensions is then evaluated against the following five levels of maturity

1. Operate- a basic level of BI adoption where the concern is only information generated from daily operations without long-term plans.
2. Consolidate- organisations that consolidate information by integrating and storing information at the department level and use it for decision making.
3. Integrate- organisations have data in a central data warehouse and analyse it across separate departments.
4. Optimise- Organisations use new technologies allowing in-depth analysis and understanding of market place and customers to gain a competitive advantage.
5. Innovate- organisations at this level seek ways to reinvent and transform their value position for sustainable growth.

The five levels of maturity defined in the IEM model informed the researcher of the level at which a given SSE is in terms of BI adoption. This information influenced the design of the proposed implementation model, ensuring that SSEs at various adoption levels are considered.

1.10 Framework design and development

Lai [3] stated that many theories have been defined for the adoption of technologies by organisations including the Diffusion of Innovation [34], Technology Organisation and Environment framework [7], Technology Acceptance Model [35], Technology of Planned Behaviour [36] and Theory of Reasonable Action [37]. Each theory has its application domain and characteristics that define how it may be used in research as summarized in Table 1.2.

Table 1.2: Summary of Adoption theories and application domain

Theory	Application domain
Diffusion of Innovation (DOI)	Adoption of innovations among individuals and organisations
Technology, Organisation & Environmet Framework (TOE)	Adoption of technological innovations
Technology Acceptance Model (TAM)	User acceptance of Information Systems or technologies
Theory of Planned Behavior (TPB)	Psychology of user acceptance
Theory of Reasoned Action (TRA)	Understand the psychology of user acceptance

1.11 Diffusion of Innovation Theory (DOI)

The theory was founded by [34] and seeks to explain how, why and at what rate new ideas and technology spread. How innovation is communicated over time among the participants in a social system is defined as diffusion in this theory. The theory outlines how innovation is communicated through certain channels over time emphasizing that the adoption of innovation happens after going through several stages including understanding, persuasion, decision, implementation and confirmation [3]. Rogers also defined 5 adopter categories of innovators, known as the S-shaped adoption curve. The key components of the theory are innovation, communication channels, time and social system. Figure 1.1 depicts aspects of the DOI theory.

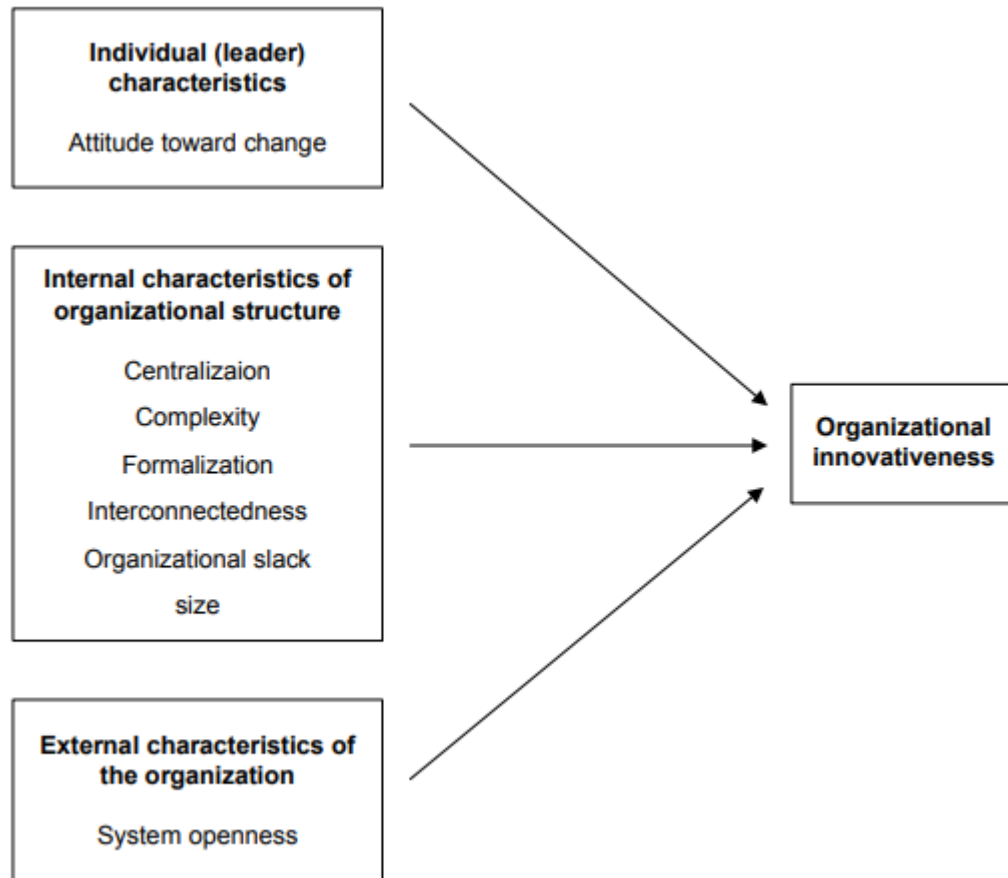


Figure 1.1: DOI theory [34]

DOI is appropriate for the study because it is considered the most significant theory used by researchers studying technology innovation adoption in organisations, including SSEs. The DOI theory is important for technology implementations because it is market-focused [30].

1.12 Technology, Organisation and Environment framework (TOE)

The TOE framework considers the technological context, the organizational context as well as the external task environment. The technological context consists of the innovations and readiness of technology. The environmental context includes the technology support infrastructure, industry characteristics and market structure, as well as government regulation. The organizational context includes formal and informal linking structures, collaboration, resource availability and the organization's management. Figure 1.2 shows the interactions among the 3 aspects of the TOE framework as defined by [7].

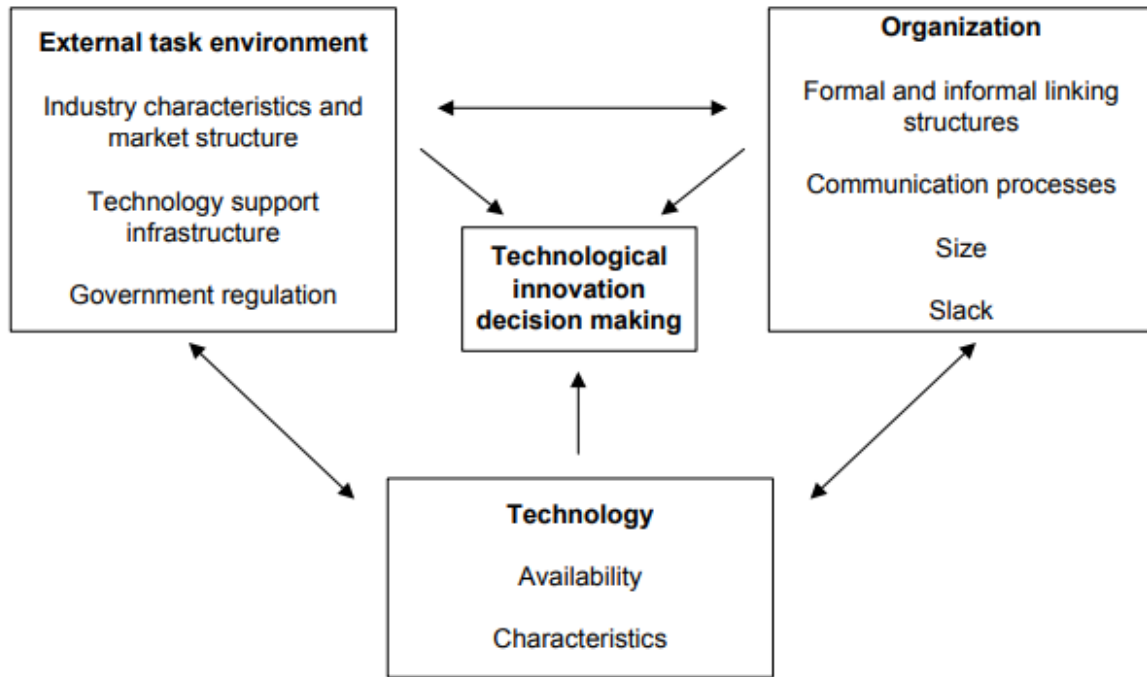


Figure 1.2: TOE framework [7]

TOE is selected because it can be used to identify groups of variables that may be important in the diffusion of innovations in addition to compensating for the aspects that DOI overlooks. The TOE framework has a solid theoretical basis, consistent empirical support and the potential for application to IS innovation domains, though specific factors identified within the three contexts may vary across different studies [38]. This framework is consistent with the DOI theory, in which [34] emphasized individual characteristics, and both the internal and external characteristics of the organization, as drivers for organizational innovativeness. These are identical to the technology and organization context of the TOE framework, but the TOE framework also includes a new and important component, namely the environmental context. The environmental context presents both constraints and opportunities for technological innovation. The theory encourages the researcher to take into account the broader context in which the adoption takes place.

A consideration of DOI and TOE in designing the hybrid model was made based on the fact that both theories may be applied at the organizational level since they emphasize the characteristics of the organization whilst others apply to individuals within the organization [34]. The TPB, TAM and UTAUT are at the individual level which only focused on the

individual perceived benefits instead of an organizational perceived benefit. The hybrid model approach was chosen to achieve a reliable insight into the adoption issues [38]. The theories complement each other, TOE includes aspects that the DOI model overlooks [39].

1.13 Methods of investigation

1.13.1 Mixed method research

A mixed method approach was adopted for this study where both the quantitative and qualitative approaches were followed so that the methodologies may complement each other.

Qualitative research is ideal in studies where there is a need to understand meanings, describe and understand experiences. In qualitative research, results are in words and they help the researcher to have a better understanding of the area under study. This approach addresses RQ1 and RQ2 as well as RO1 and RO2.

A quantitative approach is a structured approach with objectives, design and questions predetermined [40]. All the activities, procedures and test outcomes are created before they are used in the research. The methodology is commonly used when testing theories with large samples and with a set of known variables. As a result, the quantitative approach concentrates on key variables in a study and controlling other factors which may introduce bias in the study. Given the nature of the framework development and testing, the quantitative approach was selected because it is structured, giving order to the study activities. The methodology allows the researcher to identify key variables in their study and control all other factors. The quantitative approach addresses RQ4 and RQ5 as well as RO4 and RO5.

1.13.1.1 Questionnaires

A questionnaire was designed and distributed to the SSEs in Namibia to gather data about their level of BI adoption. The set of questions were aimed at establishing the level of BIS usage in the SSEs. The questionnaire was designed based on the DOI and TOE theories, the CSFs and Information Evaluation Model (IEM) defined by SAS. Questions relating to each of the dimensions will be drafted and rated on a 5-point Likert scale. The questionnaire was piloted to a few of the SSEs and modified before wide distribution to the target sample.

The collected data were analysed using Microsoft Office Excel to determine the BI usage levels in SSEs in Namibia. The level was determined by matching the results to the maturity levels defined in the IEM.

1.13.1.2 Interviews

Face-to-face or telephone interviews were conducted with respondents from the SSEs as a follow-up to the questionnaire responses. In cases where responses to the questionnaire are unclear, a follow-up interview was conducted with the respondents. Interviews were also conducted for respondents who could not complete the questionnaire due to time and other constraints. A set of interview questions was also based on the DOI and TOE theories, the CSFs and IEM, conforming to the questionnaire to a large extent.

1.14 Sampling

Convenience sampling was used to draw respondents from the SSEs population in Namibia. This is a non-probability sampling technique which relies on data collection from population members who are conveniently available to participate in the study. The method allows respondents to be identified wherever they may be found within the target population as long as they deem their participation in the study convenient. In [40], Fowler described the technique as simple and commonly used in studies where there is limited time to generate and collect data. He stated that it provides researchers with an opportunity to decide who will participate in their study. The technique is however vulnerable to selection bias and other influences that the researcher does not have control over.

1.15 Developing the framework

The agile methodology was used to develop the framework. This methodology allows the project to be built in small increments, refining the modules or function at each iteration. The Feature Driven Development method was the most appropriate to use. The methodology was chosen because it allows learning through communication, collaboration and small rapid iterations [33]. The framework was used to attain RQ3 and RQ4 as well as RO3 and RO4.

1.16 Framework and model design using DOI and TOE theories

A framework is a set of rules, ideas or beliefs which may be used to deal with a problem or decide what to do [5]. The study proposes the design and development of a framework and

model that will guide the implementation of a BI system in SSEs. Systematic modelling was followed to ensure that the framework design is methodologically done. Systematic modelling is ideal because it is simple, widely accepted, well known and used.

The various characteristics and levels of adoption were considered in determining the deployment activities (what the SSE should do) that would fulfil the theories as well as ensure the successful implementation of a BI system in SSEs. From the two preferred adoption models, main and important aspects would be extracted, improved and enhanced to fit the SSEs. In other words, the components of the proposed framework and subsequent model were determined by the factors and characteristics defined in the DOI and TOE theories.

1.17 Evaluating developed model

The goal of evaluation is to identify and correct as many shortcomings as possible in the model before putting it into full-time use. The testing process is laborious and requires a lot of time since it has to be run more than once and is often done manually [41]. Several testing procedures have been suggested by various authors such that the developers must select a procedure that best suits the type of model to be tested. However, the major aspects considered are centred on the accuracy, efficiency and reliability of models.

Desk checking and walkthroughs are methods used to test the model. In desk checking, a table of variables and outputs was drawn to work through the model, using test data and noting the changing values of the variables. So for each input data, the result produced by the model must be recorded and analysed to decide whether the model was designed properly or not. Desk checking must be iterated for each model to see if the same results are produced. The authors in [41] stated that during the desk checking, the developer must try to establish how often the model gets its predictions right as well as how consistent the model is with different data sets.

The second method, the walkthroughs, involves testing the logic of a model, to find out what it does. The walkthrough was done by a peer checker whose aim was to find out what the model does. The developer measured the correctness of the model by comparing what the peer checker determined to what they wanted the model to be able to do. This means that the developer verifies whether what they intended to achieve with the model design has been achieved by analysing the results of the walkthrough.

In this study, the discussed approaches were adopted at the different steps of the framework development and implementation, to try and maximise the chances of producing an effective

framework. For instance, walkthroughs were conducted to check the logic and desk checking to verify if the framework is producing the desired outcomes. These methods were used to achieve RQ5 and RO5.

1.18 Contribution to knowledge

As a result of this research, the following are the contributions made to knowledge:

1. The results of the investigation of the extent to which Namibian SSEs have adopted BIS are presented in a paper submitted for review.

Title: Investigation of the extent of Business Intelligence Systems adoption by SSEs in Namibia

Journal: African Journal of Science, Technology, Innovation and Developments

Date of submission: 05 April 2022.

2. A novel framework was formulated based on the DOI and TOE theories, IEM and the critical success factors for implementing BIS in SSEs. The framework is published as
Title: A Hybrid Framework for the Implementation of Business Intelligence Systems in small scale enterprises.

Journal: Journal of Information Systems and Informatics

Volume: 4 Issue 1

Date of publication: March 2022

3. The study also contributes a novel hybrid model that SSEs can use to evaluate their readiness to adopt BIS. A paper presenting the model had been submitted to a journal. The details are :

Title: Software for Business Intelligence Systems implementation readiness assessment for Small Scale Enterprises

Journal: MDPI Software

Date of submission: 07 August 2022

1.19 Thesis structure

The final report contains 6 chapters. A description of the contents of each chapter follows.

CHAPTER ONE INTRODUCTION: This chapter introduces the study, describing the operations of small businesses and the need to analyse the huge amounts of data they generate as input into their decision-making process. A problem statement and justification of the study were discussed to give a background of the study. Details of the objectives and research questions that the study seeks to address were explained.

CHAPTER TWO LITERATURE REVIEW: A critical review of literature is included in this section. Literature informing all the research questions was reviewed and findings were discussed in relation to this study. The critical success factors for implementing BI in SSEs, the challenges and benefits of using BI as well as information on how to design, develop and implement a framework and a model are discussed.

CHAPTER THREE METHODOLOGY: The methodology chapter includes the details of how the study was conducted. An outline of the various data gathering, population, sampling and data analysis and results from interpretation techniques employed in the study was included. The chapter also includes the methodologies adopted for framework and model development. A description of the techniques followed to develop and test the framework and model are discussed in this section of the report. The tools adopted are also discussed.

CHAPTER FOUR DATA ANALYSIS AND INTERPRETATION: The chapter explains how the data were gathered using the instruments as well as their analyses. The results of the analysis are presented in tables and graphs to report on the extent to which SSEs in Namibia has adopted BISs in their operations.

CHAPTER FIVE FRAMEWORK DESIGN AND DEVELOPMENT: The chapter entails the design and development of the novel framework. A presentation of the developed framework, a description of the framework components, how it is to be used and other guidelines for its usage are under this heading.

CHAPTER SIX MODEL DESIGN AND DEVELOPMENT: The design and development of the model following the Feature Driven Development (FDD) methodology are described in this chapter. The activities conducted at each of the phases of the methodology are explained.

CHAPTER SEVEN SUMMARY, CONCLUSION, AND RECOMMENDATIONS: A conclusion and recommendation for future work are stated in this section of the thesis.

1.20 Conclusion

The main aim of this chapter was to introduce the study which is about defining a framework and model that SSEs may use to implement BISs. The research objectives, research questions and justification of the study were stated. The next chapter is on the literature review.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The chapter is organised into four sections. The first section focuses on the present state of BIS adoption by SSEs. The second section discusses how a BI implementation model may be designed, the third section outlines how a BI implementation framework and model may be developed and the fourth section outlines the implementation of the framework. The relevant literature on all aspects was reviewed to give a theoretical base for this study.

2.2 State of BIS adoption by SSEs

The authors in [9] conducted a study to explore the current BI adoption situation of Thai SMEs. The results showed that the majority of Thai SMEs were classified at the lowest level, suggesting that they are still at an early stage of BI technology adoption. This leaves ample scope for Thai SMEs to be elevated to higher levels by focusing on understanding the enabling factors of BI as a strategy. In identifying the factors that elevate BI levels in Thai SMEs, the results showed that high relative advantage, high organisational resource availability, high competitive pressure, high vendor selection, high owner-managers' innovativeness and low levels of complexity were all important.

In a study conducted by [42] in Kenya, 15% of the SMEs have already adopted BI, 38% are not ready to adopt BI and 47% of the SMEs are willing to invest in personnel and technology despite their annual revenue. In their study, [18] explained that the usage of BI tools in SSEs was generally lower than that in large organisations. Studies show that SSEs appreciate the importance of streamlining their information resource to help them make important business decisions. They are also aware of the availability of many BI tools in the market. However, the technical expertise required to select the right combination of tools is not readily available in many SSEs. Furthermore, the general lack of a sufficient IT budget prevents SSEs from investing time and money in adopting BI solutions.

Many organisations are investing in Business Intelligence strategies and supporting technologies to manage their business performance. The BI adoption rate is reported to be at an average rate of 22% with a huge increase in the number of BI investments in Botswana [43]. The authors in [22] highlighted many challenges that SSEs face during BIS implementation as compared to large corporate enterprises explaining why many large companies have adopted BI tools compared to SSEs. Business Intelligence technology is complex, requiring appropriate

infrastructure and resources [43] which may be too costly for SSEs [44]. The highly complicated math functions in BIS require IT expertise which may not be available in SSEs, making it difficult for users with weak IT knowledge to adopt the technology. The BI systems available do not perfectly fit the business operations of SSEs making adoption a challenge [42]. Maumbe et al. [45] highlighted that most large companies are already using BI but there is less usage in SSEs and stated that only 16% of SSE are using these systems. The authors in [9] observed that a few studies have been conducted successfully in identifying the factors that impact BIS deployment, which has led to implementation failures. It was emphasised that very few SSEs are using BI technology even though more businesses could succeed and grow in the prevailing harsh economic environment through the implementation of BI [17]. BI solutions are available but SSEs are reluctant to adopt them in their businesses [15].

Mobile Business Intelligence (MBI) deployment is noticeable in developing countries but still inaccessible to SMEs in developing countries [46]. In their study, 49 factors that influence the deployment of BI were identified and reduced to 38 after further evaluation. The authors in [46] categorised the factors into 4 units namely active, critical, reactive and inert. Critical factors are important for the success of MBI implementation, active factors have minimal effect on the other factors whilst reactive and inert have little to no influence on the success of MBI implementation in SMEs.

2.2.1 Extent of adoption by SSEs

The use of the TOE framework and DOI theory in assessing technology adoption involves measuring an organisation's adherence to the dimensions defined by the theories. Literature on each of the dimensions was reviewed to establish the SSEs' status per dimension. Table 2.1 summarises the findings by dimension.

Table 2.1: TOE and DOI findings by Dimension

TOE framework	
Technology	New technologies available
	usability and feature mismatch
	lack of knowledge of latest technologies
	High cost of technologies
Organisation	Lack of funds and capital
	Lack of expertise to support BI infrastructure
	No collaboration with other businesses

External task environment	Operations smaller than what BI systems support
	Unclear communication channels
	Non- compliance with regulations
	Not all stakeholders are involved
	No collaboration amongst SSEs in the same line of business
	DOI theory
Individual (leader) characteristics	Lack of financial literacy
	Resistance to change
	No knowledge of available technology
	Fear of the unknown
Internal characteristics of organisational structure	No proper record keeping
	No interaction with other SSEs
	Organisations operate at small scale
	Lack of clear policies for example Information Technology policy
External Characteristics of the organization	Not all SSEs are registered
	The owner is the brain behind the business
	Satisfaction with traditional ways of running a business

The evaluation of organisations based on the TOE and DOI dimensions reveals that most SSEs in Namibia may be categorised as late majority and laggards. The late majority are described as businesses that are sceptical of change and will only adopt technology if it has been adopted by the majority of other businesses [34]. In the review, these are the few businesses that have adopted the technology. The majority of SSEs in Namibia may be regarded as laggards that are bound by tradition and have remained faithful to the traditional ways of doing business as they are discouraged by the results they observe from the few SSEs that have adopted the technology.

The DOI, TOE and Institutional Theory were used by [47] to investigate the adoption of BIS by banks in Ghana. Ghana banks are at their early stages of using BISs [47]. They also identified technology, organisation and environment factors as crucial in the successful implementation of BI.

Ahmad in [48] mentioned that more than 70% of BIS projects fail to give expected results. They further justified the need for BIS research in Africa given that statistics show that BIS research in Africa is at 11 % with a small percentage focussed on SSEs. The framework for evaluating BIS adoption was informed by the TOE theory. The determinants were grouped as Individual Context, Technology Context, Environment Context and Organisation Context. They however

did not include details of how the framework can be used by SSEs to evaluate their readiness to adopt BISs.

2.2.2 BIS adoption by SSEs in Namibia

The state of BIS adoption by SSEs in Namibia was measured by considering the key dimensions of technology adoption as defined by the TOE [7] and DOI [34] theories. The findings summarised in Table 2.1 are discussed in this section. Most SSEs lack knowledge of the latest available technologies and are bound by tradition [44]. They emphasised that the SSEs have not adopted technology because they are unsure of the technologies and are satisfied with existing systems. The slow adoption rate is related to resistance to change [44]. It is thought that SSEs fear that if they adopt technology they will misinterpret their data hence the decision to stick to traditional spreadsheets. SSEs want to continue with their traditional ways of running their businesses as they do not understand the need to change. SSEs in Namibia have not adopted BIS because they are not aware of relevant technologies that may improve their business operations [16]. Some SSEs are willing to adopt BIS but do not know how to implement it [45].

BI systems have many features which are complex given the nature of SSEs operations [24]. The SSEs are unsure of how to apply the available technologies to their operations. This is usability versus feature mismatch because SSEs feel that the features of BI systems are not compatible with their current systems and will not support their operations [49].

Insufficient capital to finance the high cost of BI systems infrastructure was described by [16] as another reason for the slow adoption of BIS by SSEs. He mentioned that funding is available to a small percentage of SSEs making it difficult for the businesses to raise the high capital required for BIS. In Namibia, most SSEs cannot meet the high collateral security required by financial institutions. Another report mentioned that SSEs do not keep proper financial records leaving institutions doubting their ability to repay loans [13]. Ogbokor and Ngeendepi [49] mentioned that SSEs struggle to comply with legislation so they do not qualify for the support programmes initiated by the government and other stakeholders. The lack of capital and unclear financial status of SSEs has stifled their adoption and expansion of technology endeavours.

SSE owners lack knowledge of implementing new technology making expansion difficult [13]. The report described the SSEs' approach as reactive rather than proactive, which hinders them from adopting new technologies. The authors in [44] highlighted that SSEs lack the expertise required to support complex infrastructure such as BIS hence their decision not to adopt new

technologies. Their study also revealed that the SSEs that have adopted technology are struggling to efficiently utilize it. As a result, those SSEs that have not adopted the technology are discouraged.

2.3 Critical Success Factors for BIS adoption

Critical success factors (CSFs) are a set of tasks and procedures that should be addressed in order to ensure BI system accomplishment [29]. They are characteristics or variables that have an impact on the success of a firm competing in a particular industry. Successful execution of CSFs guarantees a project's success. If the CSFs for BIS adoption are observed in BI systems implementation, the chances for a successful and beneficial implementation are increased. In their study, [50] mentioned that in Iran, BI systems implementations are rising and are characterised by high failure rates making it important to identify the critical success factors which may reduce the failure rates.

The authors is [51] conducted a study to identify the CSFs for BIS in public organisations. They suggested 7 critical factors for BI implementation in the public sector as top management support, clear vision and strategic planning, team skills, user participation, organisational structure, user access and flexible and appropriate technology framework.

In their study, [52] identified 26 CSFs which were presented in four constructs, namely tasks, people, structure and technology. They also defined a framework which extends the Information Systems success framework by 4 factors being vision and strategy, organisational structure, competency development and organisational culture.

As more organizations move towards intelligent IT infrastructure, nowadays, business intelligence systems (BIS) become a more widely used IT solution. Even though it is a widely used IT solution, many BIS implementations are not successful because they are time-consuming and expensive [53]. Resistance to change is one of the obstacles facing the implementation of new technology in an organization. To overcome this obstacle, any changes to the business processes must be managed and continued support from top management is necessary. So, effective project management is important to achieve BIS success. Yeoh and Koronios in [50] explained that to facilitate the implementation process, speedy and successful implementation of the BIS, users and other stakeholders should be involved in the implementation team from the beginning of the project. From the technical perspective, data accuracy and IT infrastructure are also two key determinants of BIS success. Inaccurate data input will adversely affect the functionality of the whole system, so data must be cleansed to

ensure that there will be no disruption to BIS performance. BIS implementation is a complex transition from legacy information systems to an integrated and high technological IT infrastructure. Thus, adequate IT infrastructure, hardware, software and networks will affect the quality of the BIS and are crucial to its success [29]. Many projects fail in the end due to a lack of proper training for their users [53]. The figure 2.1 below summarises the critical success factors for the adoption of BIS.

Stages	Pre-implementation		Implementation		Post-implementation	
	Implementation strategy planning	vendor selection	Design of business blueprint	BIS configuration and testing	System optimization & evaluation	maintenance, repair, updating and upgrading
Success Measures	- Organizational readiness - Competent BIS package - Consultant and Service vendor		Completion of the BIS project - According predefined standards - On time - Within budget		- User satisfaction - Perceived contribution of the BIS to organizational performance	
Critical Success Factors of BIS	- Suitability of software and hardware - IT skills in organization - Qualified BIS Vendor and Service Consultant		- Data accuracy and integrity - Adequate IT infrastructure, and legacy systems - Hardware, software and network - reliability, flexibility and scalability		- Perceived usefulness - Learnability and user oriented and friendly technologies	
	- Clear vision and mission (goals and objectives) - Organizational culture - Committed management Support		- Change management - Stakeholder active involvement - Top management Support - Effective project Management		Users training and Education	

Figure 2.1: Summary of CSFs for BIS adoption [53]

Various authors identified critical success factors in their studies. Table 2.2 below summarises the factors by author.

Table 2.2: Critical Success Factors by various authors

Author/s	CSFs
Olszak and Ziemba (2012)	- User satisfaction - Management support - Budgetary skills and resources - Data quality - Flexible enterprise model

	• Data stewardship • Strategy for automated data extraction methods/ tools • Integration of data with existing systems • Hardware and software
Yeoh and Koronios (2010)	• Management support • Sponsorship • Vision • Business case • Balanced team composition • Business-centric championship • Business-driven and interactive development approach • Business-driven, scalable and flexible technical framework • Sustainable data quality and integrity
Wixom et al (2011)	• Management support • Adequate resources • User participation • Team skills • System quality • Data quality • Source systems • Development technologies • Organisational alignment • Clearly defined business objectives
Rungasamy et al (2002)	• Management commitment • Training • Measurement • Identification and measurement of critical quality characteristic • Teamwork • Organisational culture change • Process prioritization and definition • Use of computer and software packages • Documentation and update of knowledge processes

Shehab et al (2006)	• Leadership • Management support and resources • Skills and expertise • Organisational culture • finances
---------------------	--

Salisu in [54] investigated the factors influencing BIS adoption in the healthcare sector. They proposed a framework built through the TOE and CSFs. The four characteristics in the framework were Technology, Organisation, Environment and Manager's characteristics. The authors mentioned the need to extend their framework by combining it with other models so that SSEs can assess their readiness to adopt BIS.

A review of literature on the critical success factors identifies that an implementation that observes all the factors has a higher probability of success. Subsequent evaluations are required to modify, optimise and improve the systems after a successful implementation.

2.4 Designing BI model (using DOI and TOE)

Literature states that various approaches may be followed in the design and development of models. Designing models, using pseudo code and flowcharts are described by many developers as a simple-to-follow method because it is programming language independent. Pseudocode and flowcharts are structured ways to express logic in models and they avoid ambiguities, [55].

To define useful algorithms, frameworks and models, developers may follow the steps defined by [56] and [57]. They suggested that the steps be executed in sequence, reviewing and refining the artefact several times so that it gets more precise as it gets closer to the final product. The five steps defined by [56] and [57] may be summarised into five steps which are summarised in Figure 2.2 below:

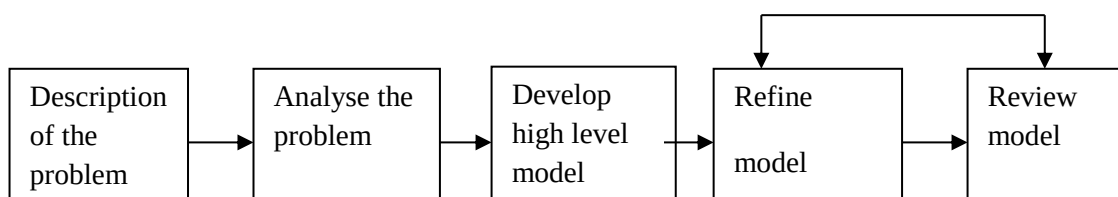


Figure 2.2: Steps in developing an Algorithm, model or framework [56] [57]

It is evident that there are many development tools and approaches available for adoption in the design and development of frameworks and models. Most of the tools require that the researcher have skill and experience in their usage hence the decision to follow a simple approach derived from selecting best practices from the various tools. A model may therefore be designed successfully by combining the steps suggested by various authors. A combination of approaches will help to balance out bias that may be introduced by the different approaches. In other words, the shortcomings of one approach may be complemented by the advantages of the other technique. The steps suggested by [56] may be adopted for developing the problem-solving as well as the implementation parts of the model. The main reason for adopting the two approaches is that the activities involved in the design are clear, simple and easy to understand which will make their adoption easier.

The basic notations for developing software products (flowcharts and pseudo-code) would be used and a programming language used to implement the model. The model development would be iterative to ensure its preciseness, with all the necessary steps to solving the problem included, including the possibility of executing the model and its successful termination. Iteration and testing would also help improve the model's efficiency in terms of time taken to solve the problem and resource usage.

2.5 Adoption theories

The literature identifies various theories that have been used in other studies to assess the adoption of new technologies by organisations. Common adoption theories include TAM, TOE, DoI, TPB and TRA. For purposes of this study, consideration of TAM, TOE and DOI was done as most of the studies relating to BI adoption referred to the theories.

2.5.1 Technology Acceptance Model

The technology acceptance model (TAM) has been adapted from the theory of reasoned action (TRA) regarding beliefs, attitudes, intention and behaviour for modelling user acceptance of information systems [58]. The TRA is a social psychology model that examines the key determinants of intended behaviours. According to the model, an individual's performance of a particular behaviour is determined by his or her behavioural intention to perform the behaviour and behavioural intention is determined by multiple factors including a person's attitude and subjective norms [58]. The basic premise of the TAM is that the more accepting users are of new systems, the more they are willing to make changes in their practices and use

their time and effort to start using the system. In 1989, [35] posited that the perceptions of ease of use and usefulness were key indicators of consumers' intention to adopt new technology. Perceived usefulness referred to the tendency to use or not to use technology to the extent it is believed that it will help or enhance an individual's ability to perform his or her job better. Perceived ease of use involved the level of effort it would take to use an application such that the degree a person believes a system is free of effort, he or she would be more likely to use and accept the system. Perceived ease of use also influenced perceived usefulness in that the easier the system is perceived to be to use, the more useful it would be [35]. Actual system use is determined by perceived usefulness and perceived ease of use, which is related to attitudes towards use, which in turn, relates to intention and finally to behaviour.

2.5.2 Diffusion Of Innovation Theory (DoI)

The diffusion of innovation (DoI) theory by [34] defined diffusion as a process through which innovation is spread, communicated and accepted by users in an organisation, over some time. The theory defines five adopter categories and when promoting an innovation, there are different strategies used to appeal to the different adopter categories. The adopter categories are outlined below

1. Innovators - These are people who want to be the first to try the innovation. They are venturesome and interested in new ideas. These people are very willing to take risks and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population.
2. Early Adopters - These are people who represent opinion leaders. They enjoy leadership roles and embrace change opportunities. They are already aware of the need to change and so are very comfortable adopting new ideas. Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need the information to convince them to change.
3. Early Majority - These people are rarely leaders, but they do adopt new ideas before the average person. That said, they typically need to see evidence that the innovation works before they are willing to adopt it. Strategies to appeal to this population include success stories and evidence of the innovation's effectiveness.
4. Late Majority - These people are sceptical of change, and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this population include

information on how many other people have tried the innovation and have adopted it successfully.

5. Laggards - These people are bound by tradition and very conservative. They are very sceptical of change and are the hardest group to bring on board. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups.

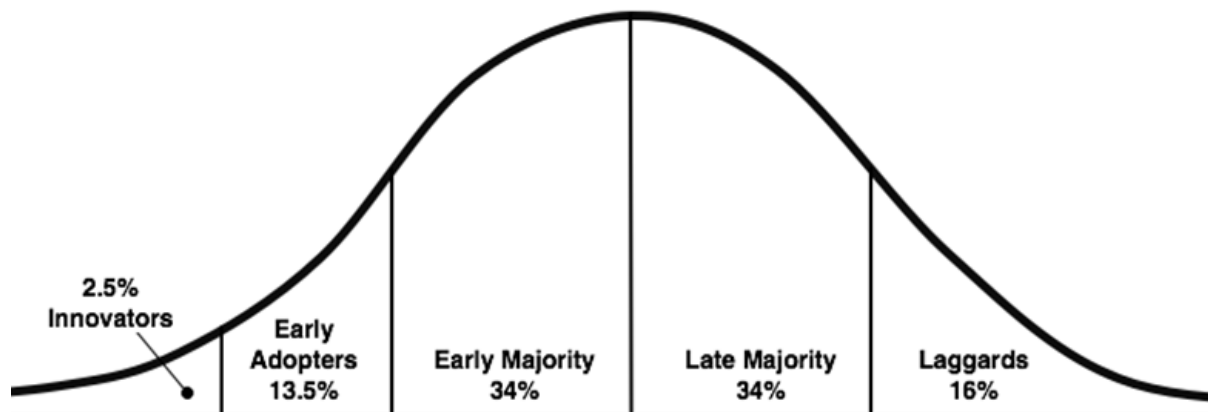


Figure 2.3: Categories of adopters [34]

2.5.3 TOE theory

The TOE theory is based on three (3) factors that affect the adoption of technology by businesses, technological context, organisational and environmental contexts. Figure 2.4 shows the interactions among the 3 aspects of the TOE framework as defined by [7].

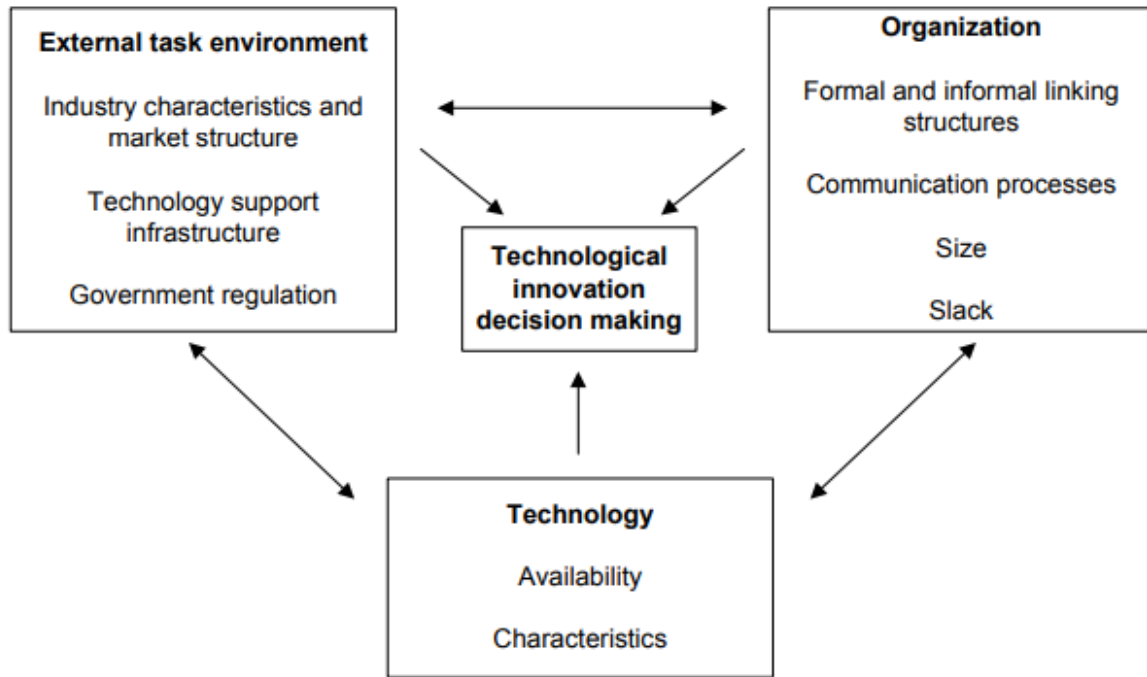


Figure 2.4: TOE Framework [7]

2.6 Developing BI implementation framework and model

The relevant, suggested methodologies for the development of the framework and model include rapid application development (RAD), prototyping spiral models and feature-driven development. These methodologies involve an incremental approach to development, suitable for the size of the project and involve analyzing risks at every stage of development.

The rapid application development model is a type of incremental model which emphasises developing large projects in small pieces [59]. Figure 2.5 shows the phases involved in RAD. The mini projects are developed in parallel with each stage planned and delivered individually and then assembled into one working prototype. Adopting the RAD model often ensures that the project is delivered quickly and in a less structured manner, ultimately reducing the development time. However, the approach will not be adopted for the development of the model mainly because successful implementation of the model requires several designers who will work on the mini projects in parallel. In this study, there was only one person available for the development. The development activities were carried out in a less structured manner such that following the methodology was a challenge. RAD does not have to involve risk analysis and given the high technical risks in this algorithm, RAD is to some extent inappropriate.

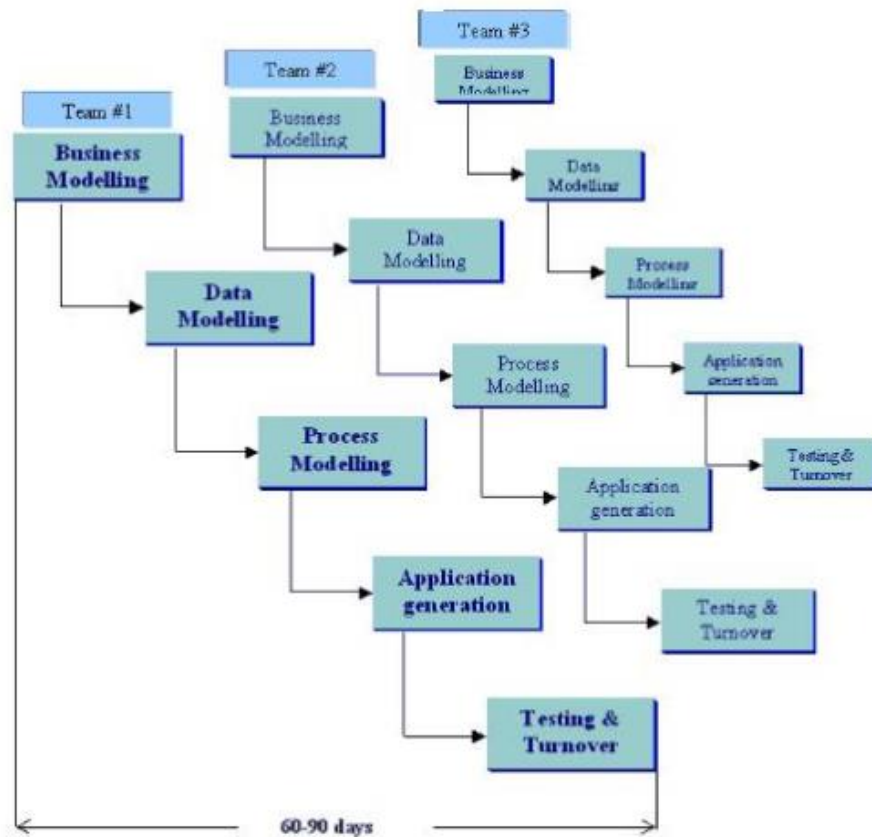


Figure 2.5: RAD model diagram [59]

Prototyping is a software development methodology that involves building a working version of the system, engaging users to provide feedback on the prototype and refining it until users are satisfied [60]. The process is incremental since additional features are added to the prototype and refined to build a later version of the software product. Prototyping allows for a flexible design with both the developers and target users taking part and visualizing the project's progress. Users provide feedback on the software prototype until they are satisfied with it. As a result, the development time becomes long given that the users may not be available to evaluate the prototype on time. The other reason why prototyping will not be adopted is that it allows scope creep and increases the chances of delaying or failing to deliver the software product. This methodology may also increase the development costs in cases where throw-away prototyping is followed. The prototyping methodology is summarised in figure 2.6 below

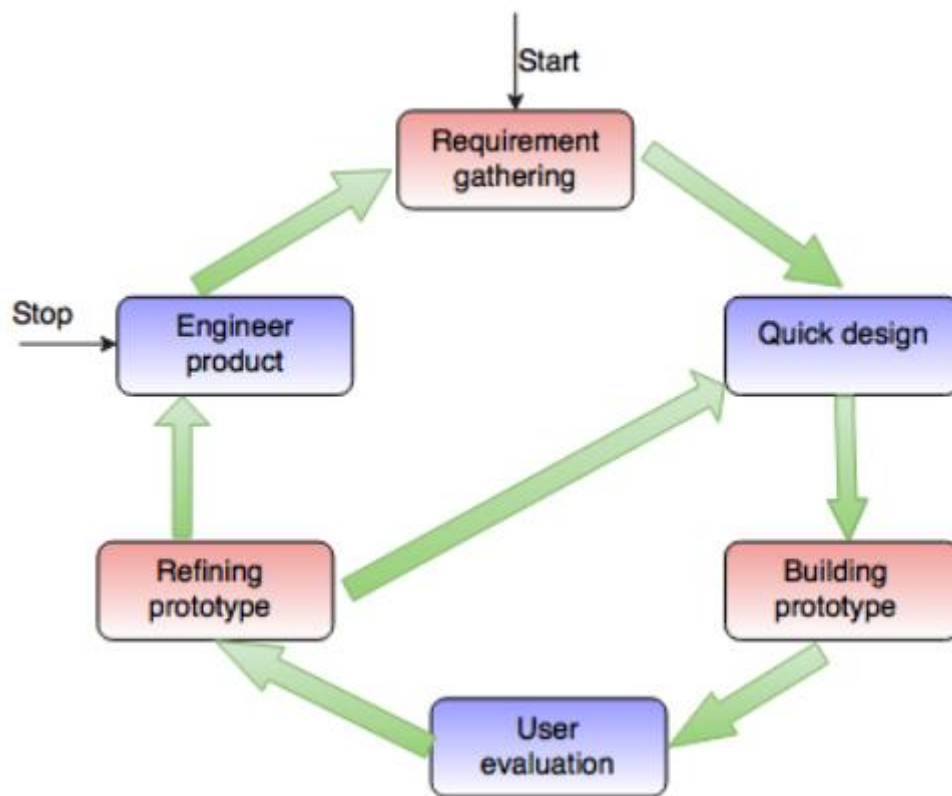
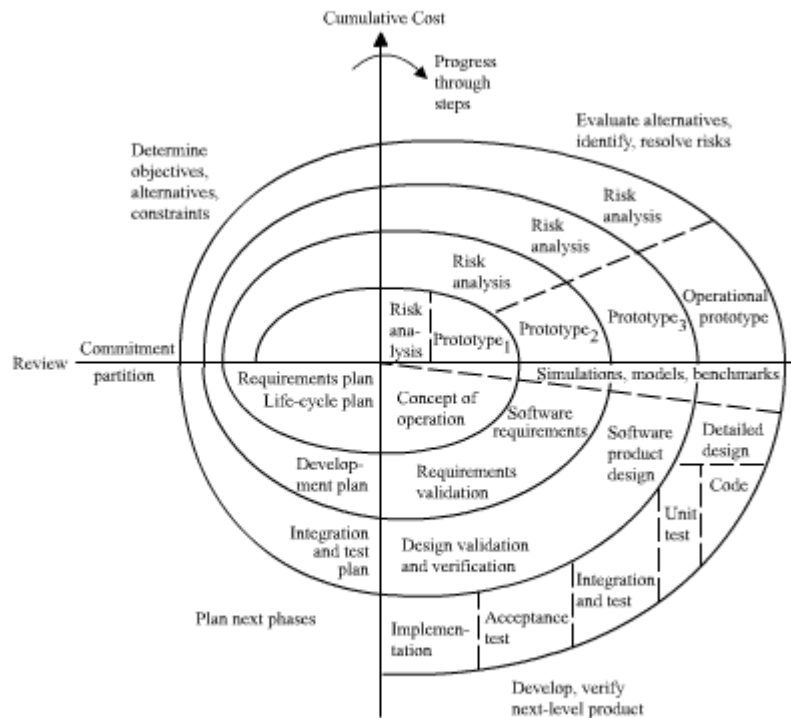


Figure 2.6: The prototyping model [6]

The other relevant methodology identified is the spiral model. The development of the software product goes through several cycles which involve the same development activities that contribute to the appropriateness of the final delivered product. The spiral model is incremental, starting with the development of a paper model of the product and becoming more complete at later iterations. Figure 2.7 below illustrates the Spiral Model.



The Spiral Model

Figure 2.7: A spiral model of Software development [61]

Feature-driven development (FDD) is an iterative software development methodology intended for use on a project using object-oriented technology [62]. The methodology description includes some prescriptions about what tasks should be done and what roles should be doing them. Palmer [62] emphasised that FDD is useful as it allows the iterative and incremental modelling of a project where a developer can spend a short amount of time at the beginning of the project to understand the domain. The understanding will assist in formulating a rough plan which serves as a guideline for the analysis and design.

FDD involves the following phases and is summarised in Figure 2.8:

1. **Develop an Overall Model:** A team is formed of development team members and people familiar with the business domain to build an overall model of the domain to establish the scope of the system and provide a common understanding of the domain.

2. **Build a Features List:** The team then develops a comprehensive list of features and groups these features into feature sets, and then major feature sets.
3. **Plan by Feature:** The team establishes a development plan that includes the order in which feature sets will be realized, which chief programmers are responsible for which feature sets, and which class owners are responsible for each class.
4. **Design by Feature and Build by Feature:** The team launches into a series of design by feature and build by feature iterations where they break into feature teams and design, build, and test features in two-week time boxes.
5. Repeat step 4 until no more features exist.

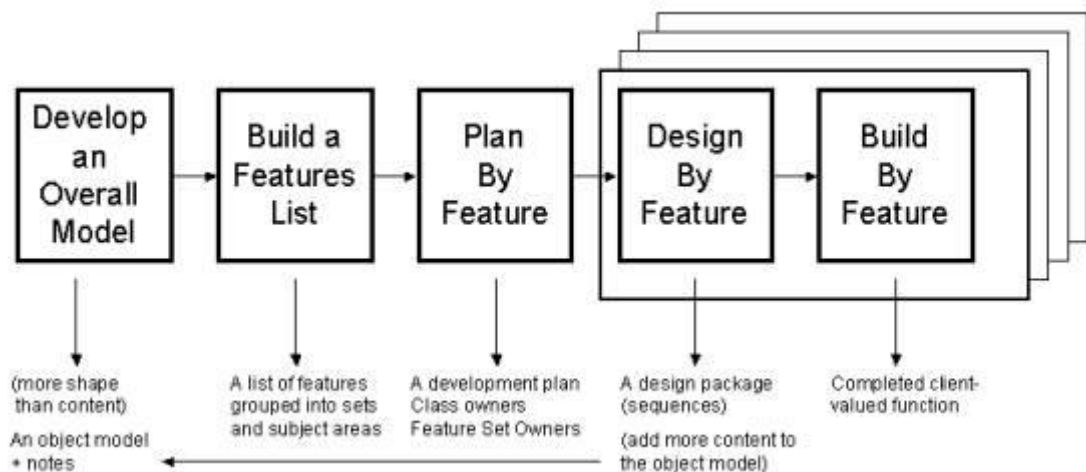


Figure 2.8: FDD approach to model development [62]

From the reviewed methodologies, the FDD approach is ideal given its iterative manner. Although it is often used with large development teams, the approach may be adopted where there is a single researcher, developing every feature of the artefact as a different class. Once the key problem domain concepts, relationships, and interactions are understood, FDD becomes easier to follow. Each feature becomes a model and a living artefact which can be enhanced through the iteration process. Throughout the project, the model becomes the primary vehicle around which requirements are clarified.

2.7 Framework and model implementation

Object-oriented analysis and design is an approach that [63] recommended as it allows a developer to build a model of custom features. The artefact may be modelled as a group of

objects that can communicate by sending and retrieving messages. Object-oriented languages like Java, Python, UML and PHP may be used to generate the model's source code. Sukic and Saracevic [63] mentioned that UML and Java may be used for implementing frameworks and models in computer graphics. However, because of the limitations that may exist in the languages, an analysis of the languages will help in making an appropriate choice. Table 2.3 below shows a comparison of the different languages

Table 2.3: A comparison of the Object Oriented languages

Characteristic	Language		
	Java	Python	UML
Simple	Models real-life objects. Static typing makes the syntax challenging.	An object can be of any type Dynamic typed makes syntax much simpler	Uses a graphical notation. No need to master the notation because there are tools to help with the modelling e.g. Umlet
Secure	Objects are of generic type	Objects may be of any type	Notation must be used as defined in the language Helps document the system for future upgrades.
Portable	Portable but requires a Java virtual machine to work effectively	Very portable as it is available on many platforms.	Portable, may be used to model different types of systems Independent of any programming language.
Performance	High performance because there is automatic memory management	Requires a lot of processing power	Good at providing appropriate views of the system from multiple dimensions
Suitability in GUIs and interactive systems	Allows creation of interactive applications, ideal for desktop applications	Does not support interfaces, ideal for web applications	May be used to model different types of systems.
Libraries	Massive library	Has a smaller readymade library in the standard distribution.	The notation may be easily translated into an Object Oriented language.

Table 2.3 above shows that Java is a simple language that allows a developer to model the system following real-life concepts and allows code reusability. A study [63] suggested that a combination of Java and UML often produces good systems.

UML may be used to produce the model through the construction of diagrams like the use of case diagrams, class diagrams, sequence diagrams and activity diagrams. Schumacher [64] described a use case diagram as an overview of scenarios which depicts the various operations that a system performs to refine the scope. The main system requirements are captured through use cases which describe the tasks that users may want to perform using the system, the actors being the users who would perform the tasks as well as the associations which show the relationships that exist between actors and use cases.

The object-oriented approach allows modularisation where the complex system is broken down into smaller manageable components. In (2002), [64] mentioned that class diagrams help developers to understand the background domain by segmenting the problem into its smallest possible state, objects. A class diagram describes the objects in a system and their relationships such that several of these diagrams need to be constructed so that they can be put together to form a view of the whole system.

Activity diagrams can help to identify the set of activities that a user would conduct in order to achieve a task. The diagram describes the flow of control from one activity to another without any messages describing how they must be coordinated [65]. In framework and model implementation the activity diagram will help to model the proposed artefact, making it easier to map the diagram directly to OO languages.

The author [64] explained that sequence diagrams are used to capture the time ordering of message flow. The diagram describes how each and when every part of the system will be executed in relation to the other components. A sequence diagram is useful in mapping the resource requirements and identifies opportunities for optimization. The various tasks performed by the model will be scheduled or sequenced to ensure their successful flow as suggested by the literature.

2.7.1 Framework design methodology

A methodology outlines the activities followed to achieve the target objective, in this case, the framework design. Hevnar et al. [66] defined a step-by-step guideline that may be adopted when solving a design research problem. The steps were defined as

1. Identify a problem and motivate
2. Define objectives of solutions
3. Design and develop

4. Demonstration
5. Evaluation
6. Communication.

Each step is defined by several activities whose application shall be demonstrated as part of the framework design.

2.7.1.1 Identify the problem and motivate

The framework development is a response to RQ3 and RO4 of this study. The problem of this study is that SSEs generate lots of data that are not put into use because they are disintegrated from various sources [16]. The complexity of BIS technology and the challenges faced by SSEs in implementing BISs contribute to the motivation to conduct the study. The application of the steps defined by [66] is to design a BIS implementation framework using DOI and TOE theories. The resultant framework will enable SSEs to determine their readiness to adopt BISs by assessing the organisation's resources against the identified adoption dimensions.

2.7.1.2 Define the objectives of the solution

The objectives of developing the framework are to identify and evaluate the factors that influence an organisation's decision to adopt BIS. The framework must include the DOI and TOE aspects that are critical in accessing an SSE's readiness to adopt a BIS in their operations. Each of the aspects must be evaluated to assess the extent of its availability in line with the thresholds identified in Table 2.2 of the study. An SSE may be informed of its readiness based on the evaluation of aspects defined in the DOI and TOE theories of adoption. Table 2.4 summarises the objectives of the framework development task.

Table 2.4: Summary of framework development objectives

Objective	Description
1	Identify framework components from DOI and TOE theories
2	Define evaluation criteria for each aspect identified in objective 1
3	Decide on the readiness status of a given SSE.

2.7.1.3. Design and develop

The step involves identifying the components that will formulate a complete framework. Activities to achieve the objectives are thus described in the following paragraphs

2.7.1.3.1 Objective 1 Identify framework components

DOI and TOE theories of adoption define dimensions that organisations must consider if they are to introduce new technology in their operations. The DOI theory was defined by [34] to include relative advantage, observability, compatibility, triability and complexity dimensions. The TOE theory is a consideration of technology, organisation and environment issues that affect an SSE's decision to adopt technology [7]. Each of the dimensions has aspects that must be satisfied in order for an organisation to be considered ready to adopt a specified technology. The set of dimensions and their aspects were drawn from these two theories and are shown in Table 2.2.

Table 2.5: Framework components based on DOI and TOE theories

	Dimension	Aspects
DOI DIMENSIONS	Relative Advantage	• Improve operational efficiency • Reduce operational costs • Improve organisational performance • Increase Competitive advantage • Improve decision making • Availability of data storage platforms
	Compatibility	• Availability of hardware and software resources for BIS use • Data storage and accessibility • Use of data in the decision making process • Impact of new technologies on data management • Change process in the organisation
	Observability	• Prior BIS knowledge • BIS usage by competitors
	Triability	• Participate in BI-related issues
	Complexity	• BIS expertise in organisation • Data analysis expertise in organisation

TOE DIMENSIONS	Technology	• Currently used systems and hardware • Ease of use of current software, security • Software license issues • Availability of data analysis software • Defined data handling procedures and adherence • Review of data handling procedures
	Organisation	• Factors hindering BIS adoption • Knowledge in BIS • Capital requirements • Readiness to migrate • Availability of BIS that support the processes • Change and reception of change by organisational stakeholders
	Environment	• Availability of data analysis service in house • Competitors using BISs • Funding capital requirements • Availability of BIS support • Availability of BIS relevant to operations

2.7.1.3.2 Objective 2 Define evaluation criteria for identified components

The weightings were assigned based on literature. The outcome of the process was a table showing the weightings described in similar studies adopted. To decide on an organisation's status to adopt BIS, the weightings were multiplied by the score for each dimension.

2.7.1.3.3 Objective 3 decide on the readiness status

The readiness levels are defined based on the IEM as proposed by SAS. The model helps to classify organisations into one of the 5 levels of maturity [33]. In this study, an organisational score of a dimension was compared to the average score for all organisations on that dimension. The weighted score determines the maturity level of that dimension for the SSE under consideration. The weighted score is calculated for every dimension to determine its maturity level. So the IEM model was used to establish an organisation's readiness level, dimension by dimension. For instance, the weighted score for Technology aspects is used to determine how ready the organisation is with regards to the aspects defined for the Technology dimension.

2.7.1.4 Demonstration

In this step, guidelines of how the proposed framework may be used by SSEs are described.

1. Respond to aspects defined by the DOI and TOE theories. A more detailed list of questions for each dimension is included in Appendix B.
2. Apply the evaluation criteria to the responses and note
3. Decide on the SSE's readiness to adopt BIS
4. Provide status of SSE in regards to each dimension as a way of guiding the SSE on dimensions that require improvement so that they may be ready to implement BIS.

2.7.1.5 Evaluation

Framework evaluation is aimed at judging its value and measuring its worthiness [67]. The desk checking and walkthroughs were used to evaluate the proposed framework. A detailed description of how the framework was evaluated is included in Chapter 5 of this document.

2.8 Evaluating BI implementation framework

The goal of testing was to identify and correct as many shortcomings as possible in the framework and model before putting it into full-time use. The testing process is laborious and requires a lot of time since it has to be run more than once and is often done manually [41]. Ellman [68] mentioned the importance of running the model more than once ensuring that the test is conducted by someone else other than the developer to increase the chances of identifying mistakes. He also mentioned that the steps to evaluate the model must be consistent, in other words, the same procedure for testing must be followed for all the subsequent iterations of the testing for the results to be valid. To validate the test results, [41] suggested that the one testing must have an idea of the expected results to be able to evaluate whether the model works as it should.

Several testing procedures have been suggested by various authors such that the developers must select a procedure that best suits the type of result to be tested. However, the major aspects considered are centred on the accuracy, efficiency and reliability of models. Skiena [69] described a good model as one that is correct, efficient and easy to implement. A successful artefact is a logically correct model, performing the tasks for which it was designed and produced the desired outcomes [68]. If a model has very few faults or none at all, then it is considered as correct and efficient.

Desk checking and walkthroughs were suggested as methods that may be used to test algorithms, models and frameworks. In desk checking, a table of variables and outputs is drawn

to work through the artefact, using test data and noting the changing values of the variables. So for each input data, the result produced must be recorded and analysed to decide whether the artefact was designed properly or not. Desk checking must be iterated for each model to see if the same results are produced. During the desk checking, the developer must try to establish how often the model gets its predictions right as well as how consistent the model is with different data sets [41].

The second method, the walkthroughs, involves testing the logic of an artefact, to find out what it does. The walkthrough must be done by a peer checker whose aim is to find out what the model or framework does. The developer may measure the correctness of the artefact by comparing what the peer checker determined to what they wanted the artefact to be able to design. This means that the developer verifies whether what they intended to achieve with the artefact design has been achieved by analysing the results of the walkthrough.

The 10-fold validation technique may also be used for testing a model. This technique involves

- building a model with training data and validating it with validation data
- splitting the data into training and test sets
- randomly picking 70% of your data from the training set and 30% from the test set
- dividing the data set into 10 distinct subsets and picking 9 for training and 1 for testing
- repeating the testing process for several subsets to find the accuracy rate until all 10 subsets have been tested.
- calculating the average accuracy of the 10 tests which may be used to establish the level of correctness.

There was some emphasis that the subset of data must be randomly chosen and the process repeated multiple times to increase the chances of getting accurate test results.

In [69], the author suggested that a model's correctness may be determined by:

1. Make a clear statement of what you are trying to prove, in other words, what are you testing, specify if you will be testing, pseudo-code or real programming language making sure that your choice is unambiguous. The statement must include a description of the set of allowed input instances and the required properties of the output.

2. Defining assumptions to be taken and used as part of the proof/testing.
3. Stating a chain of reasoning which takes you from these assumptions to the statement you are trying to prove.

However, there is a need to ensure that the researcher chooses a form of the model that they are most comfortable with because a wrong choice is bound to give a wrong answer.

The speed of the model and its efficient memory allocation may be used to measure its efficiency. Ellman [68] suggested the use of a timing device to measure the speed of an artefact during its execution. He also mentioned that the speed may be determined by the number of elementary operations performed by the model. However, [70] mentioned that this time may be influenced by the coding, programming language and the actual test data. Ideally, an efficient artefact is expected to be fast and produce desired results in the minimum possible time. Mathematical analysis was described as a more reliable approach as it involves a number of time units to consider when measuring efficiency. The number of time units was defined as a constant multiple of a function of the size of the data set,

$$\textit{Time} = k * f(n)$$

Equation 1: Time units calculation

Two approaches that may be used to determine the correctness, efficiency and optimality were described by [70] as theoretical and empirical analysis. To measure the time efficiency of an artefact from a theoretical perspective, the researcher must determine the number of repetitions of the operation that contributes most towards the running of the artefact, referred to as the basic operation. The time efficiency $T_{(n)}$, may be calculated using the formula

$$T_{(n)} = C_{op} C_{(n)}$$

Equation 2: Time efficiency calculation

where $T_{(n)}$ is the running time,

C_{op} the execution time for the basic operation, and

$C_{(n)}$ is the number of times the basic operation is executed.

The empirical analysis of time efficiency requires that a specific sample of inputs be identified and the actual number of basic operations be counted in order to analyse the empirical data.

Some models are not only affected by the amount of data but also by the actual data itself [70]. In such cases, the worst case, best case and average case may be considered for inputs of size n .

Different authors have defined several testing approaches and strategies which may be used to test algorithms, models and frameworks. Most of the tools focus on correctness, accuracy and efficiency as performance indicators. It may be derived that a good artefact scores highly on all aspects, striking a balance amongst the criteria. In this study, several approaches were adopted at the different steps of the framework in model development and implementation, to try and maximise the chances of producing an effective artefact. For instance, walkthroughs were conducted to check the logic and desk checking to verify if the model was producing the desired outcomes. The speed of the model and its accuracy were also considered in the testing process.

Table 2.6 provides a summary of the specific research that were done by other researchers that are related to this research. What we have done here is to explain how our research differs from theirs. The first column on the table is the work of the researchers, the second column is the summary of what their research entails and the third column is the difference between their work and ours.

Table 2.6: Difference of the study from specifically related studies from literature identified from Systematic review method

Reference	What they discussed	How my study is different from theirs
[9] W. Boonsiritomachai, M. McGrath and S. Burgess, "A research framework for the adoption of Business Intelligence by Small and Medium-sized enterprises.," in Small Enterprise Association of Australia and New Zealand, 27th Annual SEAANZ Conference 2014, 2014.	Study addresses the unavailability of a framework for examining the state of BI adoption and identifying the factors influencing decision to implement BI in SMEs. Developed a framework for classifying SMEs into different BI adoption levels. Highlights the enabling factors that influence BI adoption in SMEs Uses 3 levels of IEM DOI, TOE and Information Systems adoption model.	Study identifies CSFs, theories that influence BIS adoption and defines a framework and model for evaluating SSE readiness to adopt BIS. Proposed framework and model uses all levels of IEM and enhances it to define clear evaluation criteria to arrive at the adoption levels. DOI, TOE and CSFs incorporated into the evaluation framework and model. Study addresses Namibia SSEs as suggested in their future work.

	Suggested that work be done for other regions in the world since his study was based on Thailand.	
[42] E. N. Laleyo, "A framework for assessing readiness of adopting Business Intelligence in Small and Medium Enterprises," 2017. [Online]. [Accessed 23 June 2019].	The study addresses the need by Small Medium Enterprises to make effective business decisions in highly competitive markets by adopting BISs. Measures BI adoption in Kenya. Only the Technology, Organisation and Environment factors defined by Tornatzky and Fleisher (1990) was used to measure the SMEs adoption status. Proposed framework includes TOE and IEM to rate the adoption rate but it is silent on how the IEM may be used.	Study motivated by the high implementation failure rates of BIS implementation projects and the reluctance by SSEs to adopt BISs. Measures the BIS adoption levels in Namibia. DOI, TOE theories, IEM and CSFs informed the model for evaluation. Proposed framework included the theories mentioned and includes evaluation criteria. A model was developed for easier use by SSEs who may struggle to follow the Framework. The proposed framework and model have a wider set of parameters to be considered and provides a clear evaluation criteria of how an SSE can know their readiness status.
[18] A. Lonnqvist and V. Pirttimäki, "The measurement of business intelligence," Information Systems	The benefits and challenges faced by businesses when they use BIS are discussed. Some terms are defined clearly for example the term BI	The researchers used definitions from this source. Considered the benefits and challenges to develop the problem description in section 2.2.

Management, vol. Winter, no. 1, 2006.		
[43] L. L. Kenosi, "A Case Study for Achieving an Integrated View of the Enterprise through Adoption of Enterprise-Wide Business Intelligence for Corporate Performance Management in Debswana," 2016. [Online]. Available: http://gsblibrary.uct.ac.za/researchreports/2016/Kenosi.pdf . [Accessed 13 July 2019].	The study is motivated by the fact that many large organisations are investing in BI strategies and technologies to manage their business performance yet adoption rates are reported to be low in small organisations. Explores the factors that influence adoption of BI. Four dimensions, being Knowledge Process, Human Capital, Infrastructure and Culture were used to evaluate Debswana. Result was Debswana status. No clear evaluation criteria was defined. Suggested future work on benefits of BI and how to develop successful business strategies.	Study motivated by the high implementation failure rates of BIS implementation projects and the reluctance by SSEs to adopt BISs. Defines a framework and model for assessing SSEs readiness to adopt BIS. DOI, TOE theories, IEM and CSFs informed the model for evaluation. Evaluation results were for SSEs in various industries in Namibia. Study extended their study by considering more factors for evaluation and defining a rating criteria.
[22] S. I. Chang, S. Y. Hung, D. C. Yen and P. J. Lee, "Critical factors of ERP adoption for small and medium-sized enterprises: An empirical study," Journal of Global Information Management (JGIM), vol. 18, no. 3, pp. 82-106, 2010.	The challenges faced by businesses during BIS implementation were identified. Complexity, high cost of infrastructure required for BIS, lack of expertise were some of the identified challenges. Identified CSFs relevant for SMEs.	Problems associated with BIS adoption are discussed in the problem statement Page 4 section 1.3 and in literature review Page 21 section 2.2.2

[1] A. N. Hidayanto, R. Kristianto and M. R. Shihab, "Business Intelligence Implementation Readiness: A Framework Development and Its Application to Small Medium Enterprises(SMEs)," in International Conference on Information Technology Systems and Innovation (ICITSI), 2016.	Defined a BI implementation readiness framework for SMEs. Uses CSFs and determined the weight of each dimension using AHP. Comprises of Organisational, Process and Technological factors. It is not clear how the implementation readiness is derived	The proposed framework is hybrid comprising of factors defined in the DOI and TOE theories, IEM and CSFs for BI implementation defined by various authors. Evaluation criteria defined by an enhanced IEM and classification criteria defined by the researchers
[25] C. M. Olsak and E. Ziemba, "Critical Success Factors for Implementing Business Intelligence Systems in Small and Medium Enterprises on the Example of Upper Silesia," Interdisciplinary Journal of Information, Knowledge, and Management, vol. 7, 2012.	Identified four primary sources of CSFs which could be used to assess readiness. The criteria for readiness assessment in not defined.	Factors in framework and model are a combination of DOI, TOE, IEM and CFS Readiness classification criteria was defined by the researchers and an explanation of how it is attained is detailed in Chapter 6 of the thesis
[16] W. Yeoh, A. Koronios and J. Gao, "Managing the implementation of	The authors proposed a model of success in BI. Organisation, Process and Technology dimensions are the basis of evaluation.	Framework and model were defined from the DOI and TOE theories, IEM and CSFs for BI implementation Classification Criteria defined in the model.

[51] A.I. Magaireah, H. Sulaiman & N.Ali, 2019. "Identifying the Most Critical Factors to Business Intelligence Implementation Success in the Public Sector Organizations," The Journal of Social Sciences Research, Academic Research Publishing Group, vol. 5(2), pages 450-462, 02-2019.	They defined CSFs for BIS in public organisations.	Framework and model is based on CSFs, DOI and TOE theories and IEM.
[52] R. Gaardboe and T. Svarre, "Business Intelligence Success Factors: A Literature Review," Journal of Information Technology Management, vol. XXIX, no. 1, 2018. 1-15.	Identified 26 CSFs related to BI success They extended the Information Systems success framework by 4 factors being vision and strategy, organisational structure, competency development and organisational culture.	Framework and model is based on CSFs, DOI and TOE theories and IEM.
[46] T. S. Adeyelu, B. M. Kalema and K. J. Bwalya, "Deployments factors for mobile business intelligence in developing countries small and medium enterprises," African Journal of Science, Technology, Innovation and Development, pp. 715-723, 2018. DOI: 10.1080/20421338.2018.1491137	Their study was on Mobile BI deployment. It explores the factors that influence deployment of MBI in developing countries's SMEs. Identified 38 factors and evaluated their relevance to SMEs.	The proposed framework and model defines an evaluation criteria based on factors from several theories. We did not end at defining the factors only
[48] S. Ahmad, S. Miskon, T. A. Alkanhal and I. Tlili,	Explored the determinants that influence BIS adoption and acceptance. Considers TOE in context	Defines a framework and model for assessing SSEs readiness to adopt BIS.

"Modeling of Business Intelligence Systems Using Potential Determinants and Theories with the Lens of Individual, Technological, Organizational, and Environmental Contexts-A Systematic Literature Review," MDPI Applied Sciences, 2020.	They defined a framework but no details of how SSEs can use it to measure their readiness.	DOI, TOE theories, IEM and CSFs informed the model for evaluation.
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2.9 Identification of research gap

In [48] mentioned that more than 70 % of BIS projects fail to give expected results but there are few studies that have been conducted to address this trend. They emphasized that there is no comprehensive review on the adoption perspectives, theories and models at individual or organizational level. Academic research on CSFs of implementing BIS is scarce [51]. Many researchers focus on implementation process but there is need to focus on pre-implementation [1]. Owusu in [47] defined factors influencing BIS adoption by Ghanaian banks and suggested that future work be conducted to develop a framework for BIS adoption in Ghana. Benefits of BI and how to develop successful BI strategies may be done for specific industry settings in the future [43]. The authors in [9] suggested that the work be done for other regions in the world since his work was based on Thai SMEs. Research has been conducted to define tools, framework, and models by a few researchers. They however did not specify the criteria to measure the dimensions defined in their models. Some of the models were based on one theory and have a narrow scope of parameters which does not allow a thorough readiness evaluation which Adamala and Cidrin (2011) emphasized is important to reduce implementation project failures. This study addresses these gaps by defining a comprehensive framework and model, informed by DOI and TOE theories, IEM and CSFs for BIS implementation as well as an evaluation criteria that SSEs can easily follow to evaluate their readiness status.

2.10 Conclusion

A review of the literature was done in this chapter to answer the research questions. Information on the status of BIS adoption was gathered from journal papers, research conference proceedings and books. Approaches identified for developing the framework and model include RAD, prototyping, spiral and FDD. Java was identified as the suitable programming language for the implementation of the framework and model. Desk checking and walkthroughs were suggested as possible testing procedures that may be adopted for testing the proposed artefact. Chapter 3 describes the methodology clearly stating how the study was conducted to address its objectives.

CHAPTER 3 METHODOLOGY

3.1 Introduction

The purpose of this chapter is to describe the research design that was followed in this study. The section includes the details of how information was gathered and analysed using various data collection methods. The chosen framework and model development methodologies are described in the third section of this chapter. The research design, approach, sampling, instruments, data analysis procedures, ethical considerations, the methodology adopted for model and framework development and testing technique for the framework are discussed in this chapter.

3.2 Research methodology

Research methodology is a theoretically informed approach that may be followed to produce data [71]. The mixed method approach which involves both the qualitative and quantitative approaches was adopted for this study. The method is appropriate for the study as either approach does not adequately address the study and understanding in that not all research questions are answered by one approach. Qualitative research addressed research questions RQ1 and RQ2, research objectives RO1 and RO2 and the quantitative approach addresses RQ4 and RQ5 as well as research objectives RO4 and RO5. Following up the qualitative study with the quantitative allows the researcher to gather more relevant and detailed information thereby enhancing understanding of the subject under study [72]. The two approaches were followed so that they may complement each other and ensure the practicality of the study.

3.2.1 Qualitative research

In 2009, [73] described qualitative research as an approach that a researcher may follow if they want to understand people's thoughts on a specific subject and context. The researcher relies on the participants' views to draw a conclusion. Qualitative research involves using interviews, questionnaires, documents and text reviews as the major data sources [73].

In this study, existing literature on BIS in SSEs was reviewed to establish whether BISs have been adopted by SSEs as well as to understand the extent of its adoption by SSEs in Namibia and the world over. Follow-up interviews were conducted for the respondents who could not complete their responses to the questionnaire and those whose responses remained vague. Existing BIS system user manuals were analysed to identify the critical success factors for the

successful implementation of BI systems. This information was required to inform the implementation framework and model design. Literature on BIS adoption theories was reviewed in order to understand the context of BI in an in-depth way.

3.2.2 Quantitative research

A quantitative approach is a structured approach with objectives, design and questions predetermined [40]. All the activities, procedures and test outcomes are created before they are used in the research. Quantitative research relies largely on the procedures that other researchers can reproduce. The methodology is commonly used when testing theories with large samples and with a set of known variables. As a result, the quantitative approach concentrates on key variables in a study and controlling other factors which may introduce bias in the study.

Given the nature of the model implementation and demonstration, the quantitative approach was also selected because it is structured, giving order to the study activities. The quantitative approach is not subjective because there is a blueprint of the research procedures adopted. These procedures may be used by other researchers in other almost similar studies.

3.3 Data collection techniques

Document review, interviews, questionnaires and data collected from similar studies were the main instruments adopted for this study.

3.3.1 Literature survey

Developing efficient and effective models require the use of credible model design methodologies and theories. A review of literature on approaches to effective model design was done to inform the choice of methodology which includes testing strategies.

Various business intelligence solutions have been developed and are in use in various organisations [28]. Examples of the tools to be reviewed include SPSS and SAS Enterprise Miner. A review of these systems' manuals helped in understanding the systems' functionality which in turn informed the proposed implementation model. The system reviews also reflected the critical features of the solutions. The critical features identified were considered for inclusion in the model parameters to ensure that they are well addressed in the implementation framework and model. The BI system features, the user roles and other implementation details

gave a clear understanding of the implementation process. The review of the current business intelligence tools in industries, either big or small, informed RO1, RO2 and RO3.

Literature on the critical success factors for BIS implementation was reviewed to inform the framework components. Research papers, conference proceedings and books were critically reviewed to identify factors that needed to be satisfied by the SSEs that intend to implement BISs. The sources of information were selected based on recency and relevance to their needs.

3.3.2 Questionnaires

A questionnaire was designed to gather data on the extent of BI adoption by SSEs in Namibia. The questionnaire was based on the TOE, DOI and IEM theories as well as the critical success factors identified for BIS implementation. It comprised of questions (aspects) related to each of the dimensions defined in the theories and rated on a 5-point Likert scale. The name, location and number of employees of the SSE were also collected to assist with the demographic details of responding SSEs.

Before distribution to the target respondents, the questionnaire was reviewed by the researcher's colleagues and their feedback was incorporated into the questionnaire used in the pilot study. Of note was the review of the questionnaire by a colleague who guided on the statistical aspects of the questionnaire ensuring that bias and negative questioning were addressed. A few of the target respondents participated in the pilot study, citing corrections and rephrasing some questions. The questionnaire was further corrected before redistribution to all the target respondents.

A total of one hundred and thirty questionnaires were distributed to small businesses across the regions of Namibia. Due to COVID 19 regulations, distributing the questionnaire was limited to the regions that were not under lockdown. The researcher had to leave some questionnaires with target respondents for days before collecting them as people's movement was restricted and the SSEs were not operating as usual, there were operating hour restrictions imposed in Namibia. These challenges posed a negative impact on the data collection process. Some questionnaires were returned incomplete whilst others showed that the respondents did not understand the questions. The details of the data preparation and cleaning are outlined in Chapter 4 of this document.

3.3.3 Interviews

Interviews were conducted with respondents as follow-ups to the questionnaires. The interview questions were similar to those on the questionnaire to ensure consistency. Sections that were not adequately responded to in the questionnaire were the point of focus in the interviews. The researcher elaborated the questions to respondents in cases where the respondent did not understand the question. Interviews were also conducted for target respondents who could not complete the questionnaire due to other constraints, for example, time. Their responses were recorded on the questionnaire.

3.4 Validity and reliability of the instruments

The data were validated through triangulating documents, questionnaires and interviews. The use of this technique ensured that the data collection methods complemented each other. The questionnaire used to collect data was designed including aspects defined in the DOI and TOE theories as well as IEM by [33]. These models have been used in several technology adoption studies and are relevant for this study which is also about the adoption of BI systems by SSEs. This is assurance that the instrument measures what it is intended to measure. A review of the questionnaire was done by colleagues before the pilot study which involved a few of the target respondents. The questionnaire was distributed to colleagues, who highlighted areas that required corrections. The modifications were made before the pilot study and further modifications were made following the recommendations by the same respondents. The corrected questionnaire was then redistributed to the target respondents (Appendix B).

3.5 Ethical considerations

The ethical considerations in this study include:

- i. Ethical clearance and authorisation to conduct the study were sought from the research office (Appendix A)
- ii. The personal details of respondents involved in the study were not disclosed for confidentiality purposes.
- iii. All respondents were asked to complete the consent form as an agreement to freely participate in this study (Appendix C)
- iv. The responses were also kept confidential and used solely for the purposes of this study.
- v. The work of other authors reviewed in this study was acknowledged as shown in the list of references.

3.6 Data analysis techniques

The collected data were analysed using Microsoft Office Excel to establish the extent of BI adoption by SSEs in Namibia. The responses to the questionnaires and interview questions were coded into Excel and tests were run, depicting the results in graphs. The various graphs were used in the interpretation of the results. Microsoft Office Excel was used because of its features which allow various tests to be conducted on large amounts of data, without having to re-capture it and its ease of use.

The collected data from the questionnaires were prepared and cleaned before analysis to ensure that only meaningful data was used for the study. Details of the data preparation and cleaning are included in section 4.2 of this thesis.

The researcher faced challenges in identifying respondents as they could not get details of registered SSEs from the relevant institutions and authorities. The institutions, for example, banks cited confidentiality issues that they could not share their clients' details without their consent whilst the Ministry did not have an updated list of SSEs. These challenges were overcome by doing a door-to-door visit to the SSEs, seeking their consent to participate in the study. Some respondents requested that they complete the questionnaire and return it on completion. Leaving the questionnaires for completion led to a delay in data collection as some respondents misplaced the questionnaires only to request another one at the time of collection. A considerable amount of time was spent with this group of respondents to ensure that the responses are submitted. The COVID 19 pandemic also brought challenges as most SSEs were adversely affected by the lockdowns and regulations imposed on businesses by the government. This affected the sample and delayed the data collection process which had to be put on hold for the duration of the lockdowns.

3.7 Population and sampling

In Namibia, some SSEs are registered whilst others are not registered. This leads to a high number of informal businesses that are not accounted for by the Ministry of Industrialisation, Trade and SME development. The Ministry, banks and other institutions do not have the exact number of small businesses in the country [4], making it difficult to know the exact population of small-scale enterprises in Namibia.

The sample size was calculated using the formula

$$\begin{aligned}
\text{Sample Size} &= \frac{(Z - \text{Score})^2 * \text{Standard Deviation} * (1 - \text{Standard Deviation})}{(\text{confidence interval})^2} \\
&= \frac{(1.150)^2 * 0.5 * (1 - 0.5)}{(0.05)^2} \\
&= 132.25
\end{aligned}$$

Equation 3: Sample size calculation

Where a confidence level of 75% has a Z-score of 1.150, a standard deviation of 0.5 and a confidence interval of $\pm 5\%$ to get a recommended sample size of 132. This sample size was used to determine the number of questionnaires that were distributed to target respondents. Convenience sampling is a technique which relies on data collection from population members who are conveniently available to participate in the study. A convenience sampling method was used to draw respondents from the SSEs. The SSEs are concentrated in the cities hence the decision to use the SSEs who were interested to participate.

3.8 Framework and model design

The framework and model designs were made following object-oriented design concepts. Java programming language and UML design tools were used for the design and development of the programming aspect of this document. The framework design is described in section 3.8.1 and the model design in section 3.8.2.

3.8.1 Framework design

The framework components were identified from the DOI theory, the TOE theory, critical success factors identified by other authors as well as BIS manuals. The framework was designed following the steps defined by [56] and [57]. The details of activities carried out at each of the steps are in Chapter 5, where the proposed framework is formulated and explained.

3.8.2 Model design

Several UML diagrams including class diagrams, activity diagrams and sequence diagrams were drawn to design the model from various dimensions. UML assisted in visualizing how the framework and model would work. Java programming language was used to develop the

source code for the model. The strengths identified for Java and UML have influenced their adoption in this study because UML uses a graphical notation to design software projects by expressing them as objects and their interactions. The framework and model must be precise, calling for a clearer view of how they work, hence the decision to adopt the various diagrams to design the model.

3.9 Framework and model implementation

An Agile methodology, the Feature-Driven Development (FDD) methodology was adopted to implement the model. The methodology phases and activities were followed, with several iterations to ensure the completeness and accuracy of the model. Key activities of the FDD methodology include

1. Develop an overall model
2. Build a features list
3. Plan by feature
4. Design by feature and
5. Build by feature.

The phases were iterated three (3) times in the design and development of the implementation model. The model phases may be executed until the developer is satisfied that the built model satisfies the identified requirements. Java was used to code the model. It was chosen because it is a familiar program that has been studied by the main participant in the study and there are a lot of reusable objects that could be customised to develop the model features.

The AGILE methodology was chosen because it focuses on user experience and input. The developer needed to modify the model based on the feedback given by reviewers. This was made possible and easier by the iterative nature of the FDD method adopted. Model features were modified and refined at each iteration. Chapter 6 of this write-up outlines how the methodology activities were carried out at each iteration to implement a model for BIS implementation for SSEs of Namibia.

3.10 Evaluating the developed framework and model

To ensure that the framework and model are correct, tests were conducted at different levels of the development and were iterated. During the design stage, the logical designs of the framework and model were tested following the modular approach. After the design of a module, an independent team of software developers performed a walkthrough to verify that all the necessary functionality had been included and had a logical flow. Refinements were made wherever necessary and the framework was tested again. The walkthroughs were iterative to increase the levels of correctness.

The development phase was characterised by more tests than there were in the design phase. The feasibility of each feature or function was assessed as more features were developed. Some tests involved verifying how the different features could be integrated to form one complete model. In other words, integration testing was performed iteratively until all modules were perfectly integrated.

Java programming language was used to implement the model. The initial test was the compilation of the source code. As part of checking the artefact, the researcher ensured that the code was error-free and performed some debugging until a successful compilation was achieved. The logical tests were followed to verify whether the code performed the desired tasks or not. This task was more laborious. Lastly, the interface was checked to ensure that all components required for a user to use this model were incorporated into the design.

It is important to mention that the different tests were conducted by other people who were not the developer. Experts and naïve users were involved in the testing of the model. This was an effort to reduce bias in the resulting outcome. Simulations on the proposed model were performed as a proof of concept. Research question 5, RQ5, and0 research objective 5 (RO5) were addressed by adopting this methodology.

Desk checking and walkthroughs were suggested by [41] as methods that may be used to test algorithms. In desk checking, the model had different values input for each parameter, executed with the test values and the outcome noted. Different input was entered, and the test was conducted several times to verify the validity of the results produced by the model. The process involved capturing responses to the input parameters and calculating the likely responses which were then compared to the output provided by the model. In essence, desk checking was conducted to test the validity, consistency and accuracy of the model.

A peer checker was identified to conduct a walkthrough on the model to establish how they work. The walkthroughs were conducted throughout the model's development as a way of testing the logic. Several logical concerns were highlighted at each iteration of the walkthrough suggesting that the method is to some extent useful. Details and outcomes of the walkthrough are described in Chapter 6 of this thesis.

During the framework and model implementation and testing, challenges in coding were encountered. Some of the features were difficult to implement, FDD allows each feature to be developed independently and then is integrated at a later phase. So several iterations to develop and refine feature by feature helped resolve these challenges.

3.11 Theoretical framework

A theoretical framework is a discussion of theories and concepts used in a study. The supporting theories of this study are the DOI and TOE theories as well as the IEM.

Innovation was defined by [74] as a planned process of introducing change in an organisation's operations. The change may be new procedures, products or services, policies or anything that alters existing business activities. The study focuses on the concept of innovation because it involves designing a model that will inform a change in the SSEs' procedures and business activities.

The DOI theory is about introducing changes in the organisation and is relevant for this study which is about introducing BISs in Namibian SSEs. The theory considers technology adoption which is the main thrust of this study. The DOI theory is suitable for this study because it focuses on the introduction of change as well as the adoption of technology. In addition, DOI has been used in many other studies on technology innovation. The DOI theory is ideal because it can be applied to investigate how various departments in an organisation have adopted technology [9]. This is in line with this study hence the decision to use it as a base theory. In 2014, [9] mentioned that DOI is ideal for model building, thus relevant for this study to develop a model that SSEs can use as a guideline for BIS implementation.

The framework and model bring in the technological, organisational and environmental dimensions of a business in understanding its technology adoption ability/ character. These three are useful when used together with DOI as they address aspects that the DOI overlooks.

3.12 Summary

Chapter 3 was a description of how the study was conducted. A survey was conducted to gather relevant information from the literature. Key respondents were SSEs registered in Namibia. The data collection process was adversely affected by the COVID 19 restrictions that Namibia announced, leading to the closure and failure of many SSEs. The information gathered was used to design and develop the framework and model, and guide its implementation as well as the testing approaches. The FDD was the preferred model for the development of the software artefact to alternative methodologies which include RAD, prototyping and spiral methodologies. The FDD was chosen mainly because it allows iteration such that the project could be built in small increments. The next chapter contains a detailed analysis and interpretation of the collected data.

CHAPTER 4 DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents on the results gathered from the study. An explanation of how the data was gathered, prepared for analysis and patterns discovered are discussed in various sections. The results are presented in the form of graphs, tables and figures. The chapter addresses RQ 2 and RO2 of the study. To conclude the chapter, a summary of the study results is given.

4.2 Data collection and response rate

The data collection process started with a pilot study where the draft questionnaire was distributed to sample respondents and field experts in Information Technology for their input. The feedback was incorporated leading to the questionnaire used for collecting data for this study. The final questionnaire is in Appendix B. Identifying respondents was a challenging task because authorities responsible for SMEs in Namibia communicated that they do not have a register of SMEs. Efforts to get information from banks through their SMEs banking departments were fruitless based on their confidentiality commitments. Government departments on the other hand cited outdated records which they said would be misleading for the study. These reasons influenced the sampling technique, with other respondents identified through door-to-door visits at their business premises which was a tedious and extremely labour-intensive exercise.

Questionnaires were delivered to target respondents who were conveniently sampled. Some completed the questionnaires upon presenting them to the respondents whilst others were collected after a few days. There are however a significant number of questionnaires that were not collected due to the emergency restrictions effected in Namibia following the outbreak of the COVID-19 pandemic. Questionnaires were distributed to other regions outside of Khomas (where the researcher is based) making it difficult to collect them since the region was locked-down on several occasions hindering access to the said regions. However, upon analysing the questionnaires collected, the responses depicted a repetitive pattern. No new details could be drawn from the new responses hence the decision to conclude the data collection and proceed with the analysis.

A total of one hundred and thirty questionnaires were distributed to SSEs in Namibia following the convenience sampling technique to ensure that only relevant SSEs were involved in the

study. The focus was on the SSEs in the Khomas region, which is defined as the hub of SSEs activity in Namibia [4]. Table 4.1 shows the questionnaire distribution and percentage response rate for this study.

Table 4.1: Questionnaire distribution and response rate

Sent out	Returned	Incomplete	Spoilt	Used for analysis	Response Rate
130	74	18	7	49	37.69

4.3 Data preparation

The collected data had to be re-organised in a way that it could be analysed [9]. The collected data was captured in a Microsoft Excel worksheet. The process involved data coding, data cleaning and data screening. Several completed questionnaires were incomplete with some responses showing that the respondents just schemed through the questionnaire and the answers were not valid. Questionnaires showing this pattern were not considered in the analysis as they were interpreted as evidence that the concerned SSEs do not know about BIS and have not implemented it.

4.4 Data coding

The collected data was populated into a Microsoft Office Excel workbook. The responses SD to SA were represented on a scale of 1 to 5. The questionnaire consisted of questions defined from the IEM, DOI and TOE theories as well as the CSFs for successful BIS implementation. Questions and their responses were grouped according to what they addressed, which we defined as dimensions. The categories defined in the IEM, DOI and TOE theories had several questions to establish their status in the SSE. The collected data were organised into different categories (dimensions), each category had several aspects that define it. Responses were listed for every aspect and were plotted in columns against the various responding SSEs. Such that a row would show an SSE's responses to all aspects as shown in Figure 4.1 below.

questionnaire	region	number of employees	Awareness													
			1	2	3	4i	4ii	4iii	4iv	5i	5ii	5iii	5iv	5v	5vi	6i
1	Hardap	17	5	5	5	5	4	5	delay time con	1	4	4	4	4	4	4
2	Hardap	8	1	3	5	4	4	4		4	3	3	4	3	5	5
3	Hardap	13	5	3	4	4	2	4	failure of system	2	4	2	4	3	2	4
4	Hardap	14	2	4	4	4	4	4		3	2	4	2	4	4	5
5	Khoma:	5	4	3	5	5	4	1		5	5	3	1	3	5	4
6	Khoma:	11	4	4	4	4	4	3		4	4	4	4	4	4	4
7	Khoma:	22	1	3	4	2	2	4	time delay	4	4	3	4	4	4	5
8	Khoma:	4	4	2	5	5	1	3		4		3	2	5	5	5
9	Hardap	14	4	4	4	2	4	2		1	4	4	1	3	4	5
10	Hardap	4	3	4	4	4	2	3		3	3	4	4	3	4	4
11	Khoma:	13	1	3	4	4	4	4		4	4	3	2	2	2	5
12	Khoma:	23	1	5	5	4	2	3		4	4	4	4	4	4	5
13	Khoma:	200	5	4	5	4	2	4		3	1	3	5	5	5	5
14	Omahe	6	4	3	4	5	5	5		4	4	4	4	4	5	5
15	Khoma:	6	4	3	5	5	5	5		5	4	5	1	5	5	5

Figure 4.1: Collected data preparation.

Questions without responses were considered in the study as some of the questions were follow-up questions and would not have a response if the base question was not answered. For instance, a question on whether an SSE uses software to generate reports followed by one that requires the names of reporting software used. If the SSE does not use any report-generating software, it means the follow-up question on software names would not have a response.

To simplify the analysis process, the data were plotted into different worksheets, with each dimension's aspects and responses. Questions were categorised such that those relating to Technology were grouped together and assigned numbers. For instance, questions evaluating the SSE's awareness of BIS were plotted in their worksheet. In each instance, the responses SD to SA were recorded as 1 to 5. The rows represented the questions in a category with the frequencies of responses plotted in the horizontal columns. Figure 4.2 shows the coding for the technological dimension aspects as well as responses from the SSEs.

	technological	1	2	3	4	5
IC9		4	3	6	24	12
10		0	0	1	21	25
KP1		3	2	3	25	17
2		3	5	5	22	13
3		3	10	6	20	10
4		9	9	11	12	5
5		5	6	20	9	5
CS1						
2		2	2	2	30	10

Figure 4.2: Technology dimension frequencies by aspect

Appendix B shows the questionnaire and the coding is done for each dimension and its aspects.

4.5 Data cleaning and screening

A review of all the data populated on the Excel file was done against the original completed questionnaires collected from the respondents. This was to identify errors of omission and incorrect values well before the analysis. Questionnaires which did not have responses to most questions were eliminated from the analysis. Of the returned questionnaires, three had other pages of the questionnaire missing, four questionnaires had several responses marked for one question which rendered the seven spoilt. A total of 49 questionnaires were analysed and interpreted to address RO2 and RQ2.

4.6 Demographic profile of respondents

The respondents to the survey were drawn from five key activities of manufacturing, education, wholesale, retail, and service industries. The majority of the respondents operate in the service industry (38%), 30% were in manufacturing, 8% in wholesale, 17% in retail and 6% operate in the education industry. Figure 4.3 shows the respondents grouped by industry type.

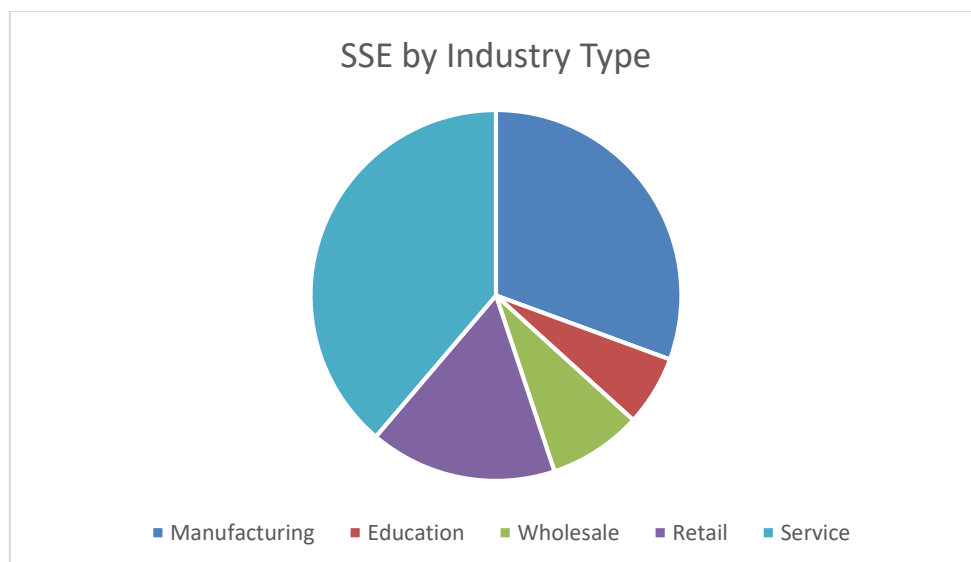


Figure 4.3: Responding SSEs by Industry Type

In their report, the Namibian Ministry of Trade and Industry (2015) mentioned that the size of an organisation may be defined by the number of employees. One (1) SSE was a sole proprietor, where the owner managed and carried out operations on his own. Three (3) organisations had between 40 and 99 employees and only 3 SSEs employed over 100 employees. 29% of the SSEs had 5 to 9 employees, 20% employed 2 to 4 employees and 16 % represented SSEs that employ 15 to 39 employees. The number of employees in the responding SSEs is summarised in Figure 4.4 below.

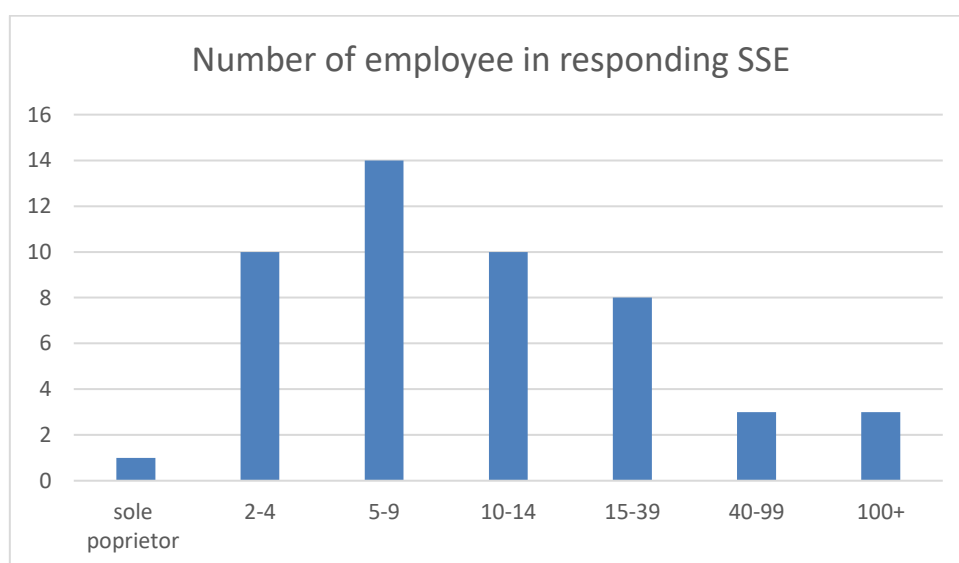


Figure 4.4: Number of employees in SSEs

Results show that SSEs use computers and some software for generating reports, decision-making, data analysis, sales and marketing, planning and control as well as for storing data (databases). An analysis of the SSE's activities supported by computer software was done to further understand their operations. Some 19 SSEs agreed that they use computer software for decision making, 19 disagreed and 7 were unsure (neutral). The majority of the SSEs generate their reports (41), conduct market research and sales forecasting (26) using computer software. About 8 SSEs were unsure which of their activities are supported by computer software. The data analysis activity is conducted using software by 20 SSEs whilst 25 do not use any software. This means that the majority of SSEs have not adopted any software to support their business activities thus affecting their score in the Compatibility dimension. Figure 4.5 summarises these results.

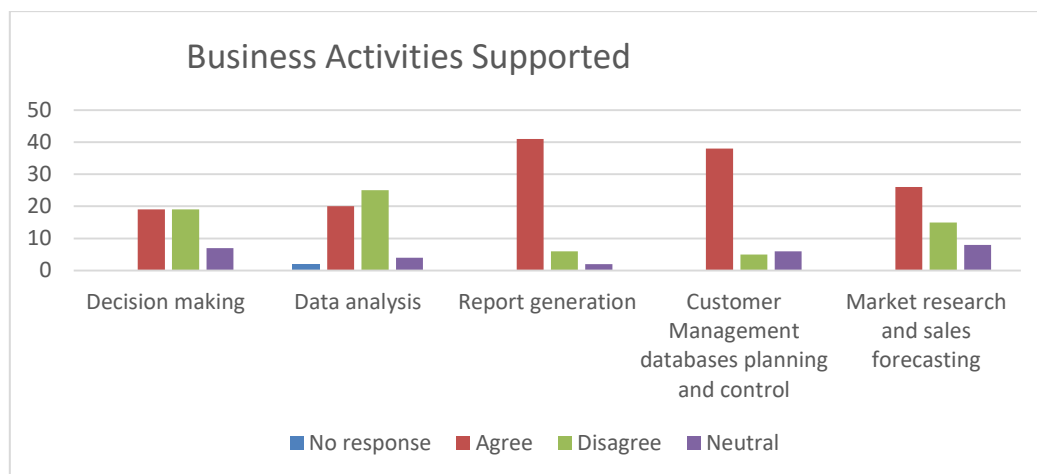


Figure 4.5: Business activities supported by computers.

4.7 Dimensions analysis and rating

To answer RO2 and RQ2 of this study, the responses collected from the questionnaire for each dimension and its corresponding aspects are analysed in this section. The dimensions and aspects were identified from the DOI and TOE theories as well as IEM. The responses were analysed per dimension and then rated on a scale of 1 to 5 based on the classifications shown in Table 4.2. The rating would show the state of the SSEs with regards to the aspects defined in a dimension.

Table 4.2: classification levels by dimension

Dimension and description	Level	Explanation
Relative Advantage	1	Lack of skills and resources required for decision making
Benefits of using BIS Availability of skills, hardware, and software resources	2	Some skills available, used across the organisation. Lack of infrastructure
	3	Lack of expert skills and Infrastructure available but not sufficient for BIS implementation. Improvement is required
	4	Expert skills for decision-making available in the organisation. Resources may be extended as required by most BISs.
	5	Expert skills available required hardware and software available
Compatibility		
Current systems compatibility with BISs Data storage, access, sharing and usage Availability of decision-making software and its security	1	The way data is stored and accessed is not centralised. No decision-making software is available. Data sharing is difficult within an organisation
	2	Data is regularly collected but dispersed, with no central storage making access difficult. Security to data compromised. No decision-making software is used.
	3	Data stored centrally in departments, departmental data sharing possible and analysed for decision making.
	4	There are software programs to store, manage and share data across the organisation. Data accessed for decision making
	5	The organisation has software to manage and handle data across the whole organisation ensuring ease of access and security. Data informs decision-making.
Complexity		
Data analysis skills Ability to use decision-making software	1	The majority of employees do not have the required skills
	2	The majority of employees have basic computer skills but no data analysis skills
	3	Most employees have basic computer skills and can do data analysis with close instructions.
	4	Some employees are experts in using decision-making software, other employees rely on them to get work done.

	5	The majority of employees are experts in using computers and decision-making software
Triability		
Employees' willingness to participate in BI Employees' ability to use software to handle and analyse data	1	Employees are resistant to change, not willing to participate in BI and cannot use any data analysis software
	2	Most employees are willing to participate in BI but rely on those with skills to manage and analyse data.
	3	The majority of employees are willing to participate in BI and possess basic skills for managing and analysing data
	4	Most employees can manage and analyse data using specialised software.
	5	Employees are experts in managing, handling, and analysing data using specialised software.
Observability		
Organisations are aware of the existence of BIS	1	The majority of employees in the organisation do not know of BIS
	2	The majority of employees are aware of the existence of BIS but have no understanding of its application in their organisation
	3	Employees in the organisation know of BI and its application
	4	Organisations are aware of BI and its application to their line of business
	5	Most organisations are aware of BI and its applications with some already using BIS.
Technology		
Available computer technologies	1	No computer technologies are in use in organisations. Individual employees have their data handling processes.
	2	Employees in departments follow some data handling processes and systems
	3	The data handling process and computer technology used across the whole organisation are the same
	4	Computer technologies and data handling processes match those used by competing organisations

	5	Computer technologies and data handling processes can be easily extended and modified to support new business processes
Organisation		
Expertise and human resource skills Change management Teamwork Management support	1	Employees fear change, lack of knowledge of BI and shortage of capital to invest in BIS
	2	Employees accept change if the benefit, are computer literate but have no capital to invest in BIS
	3	Employees embrace change and have basic BI and computer skills. Lack of management support for BIS initiatives
	4	Employees embrace change and have BI knowledge and computer skills. Capital is available but little management support is available.
	5	Expertise in BI among employees who regard change as a growth opportunity which succeeds through teamwork. Capital available.
Environment		
Organisations' fears about BISs	1	The majority of organisations fear the cost of implementing BIS, lack knowledge and skills and feel that BISs do not match their business operations
	2	The majority of organisations fear the high cost of BISs and do not have the knowledge and skills to effectively use BIS
	3	Costs deter organisations from implementing BIS though basic knowledge and skills of BIS are available among employees
	4	Capital is available, skills and knowledge can be acquired but fears of losing valuable organisational information
	5	Capital is available, an acceptable level of knowledge and skills with a high push to adopt BISs

The classification of the levels was informed by the IEM defined by SAS which classifies organisations into 5 levels, operate, consolidate, integrate, optimise, and innovate [9]. The description of this model was detailed in Chapter 2 of this document. Responses to questionnaires based on the dimensions identified from DOI and TOE theories were analysed to establish the state of SSEs in Namibia with regard to BIS adoption. Criteria were defined for each level and the responses were measured against the criteria to determine the level at which

an organisation is. Definition of the criteria was informed by IEM for BI level classification defined by [9].

4.7.1 Relative Advantage dimension

Some 80% of the respondents agreed that investing in BIS would benefit the SSEs. About 97% of responses indicated that BIS would help SSEs to improve operational efficiency, reduce costs, increase competitive advantage as well as facilitate faster and informed decision-making. The results further indicated that 44% of the SSEs already have software that they use for their business activities however a few of their employees have the required skills as indicated by 69% who disagree with aspect HC6. Table 4.3 shows responses to the Relative Advantage aspects.

Table 4.3: relative advantage responses

	1	2	3	4	5
A6i	0	1	3	22	23
6ii	0	1	6	22	20
6iii	0	1	3	23	22
6iv	0	1	2	23	23
6v	0	1	1	24	23
IC 1	1	0	1	17	30
IC2	13	5	2	14	15
HC5	12	13	4	13	7
HC6	14	18	3	12	2
Total	40	41	25	170	165
Total Disagree	81				
total agree	335				
Average disagree%	19				
Average agree%	81				

From the analysis of Relative Advantage aspects, we can conclude that SSEs believe that investing in BIS would help their businesses to perform better. The SSEs use computers and store data in personal computers as shown by the frequencies for responses to aspects IC1 and IC2 in table 4. BISs require hardware that can store huge volumes of data that is analysed and used to inform decisions. Software to analyse data is a requirement for success. The resources available in Namibian SSEs are insufficient to support the requirements of BISs available in the market as evidenced by the high frequency of responses that organisations rely on outsourcing data analysis services. It means that organisations must upgrade and modify their hardware and software in order to adopt BIS successfully.

4.7.2 Compatibility dimension

Table 4.4 shows the responses for the compatibility aspects. The compatibility dimension defines aspects relating to the compatibility of systems currently used by SSEs to BISs, that is whether the current systems would allow an easy transition to using a BIS. The aspects address the key requirements for ease of adopting BIS and they include the availability of hardware resources and how data is stored, accessed, shared and used in the current operations. The dimension also covers the software resources in terms of availability of decision-making software, security of the data and availability of data analysis software.

Table 4.4: Compatibility aspect responses

	1	2	3	4	5
IC3	6	10	2	12	19
4	4	11	0	15	19
5	1	5	8	20	15
6	3	3	11	20	12
7	3	12	5	15	13
8	2	0	8	23	16
HC5	12	13	4	13	7
CS3	3	2	6	25	13

4	5	4	4	21	15
5	6	9	8	15	11
6	8	11	4	15	11
A5v	6	14	9	11	6
Iv	6	9	8	17	5
Total	49		77		
Total Disagree	168				629
total agree	384				
Average disagree%	26.70906				
Average agree%	61.04928				
neutral%	12.24165				

Results show that 61% of the SSEs have secure systems in place which facilitate easy execution of queries and data analysis that can easily be migrated to a BIS platform. In their study, [63] concluded that when a company's hardware, software and data requirements are available and easy to migrate, then the company may consider adopting new technology. In this study, most SSEs agreed that they have working systems as shown by the high frequency of 4 as a response to most of the aspects defined in the compatibility dimension. Figure 4.6 shows the trend of responses.

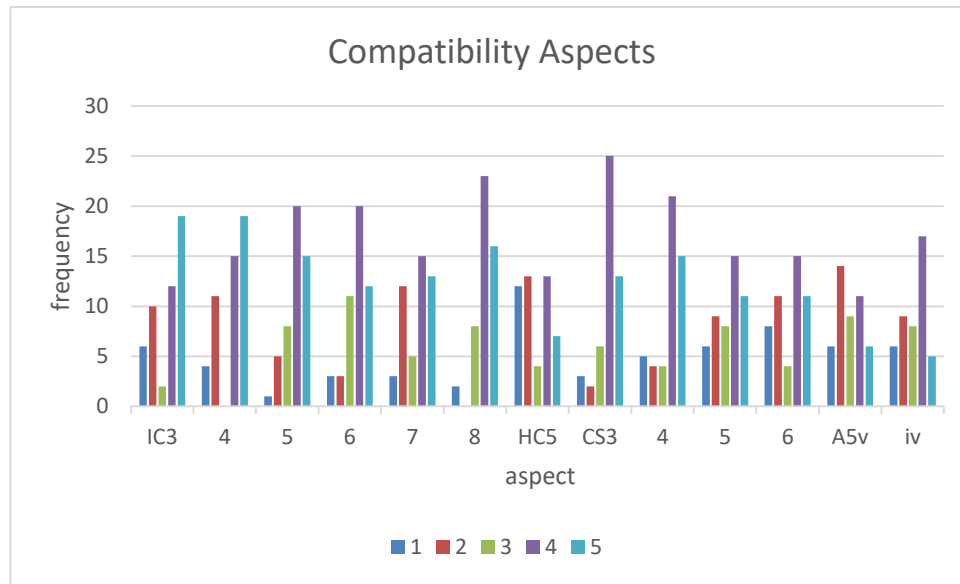


Figure 4.6: Compatibility aspects responses

The results, therefore, show that most of the respondents are at level 4 and that organisational data is collected regularly, centrally stored and considered in the decision-making process. Some 28 respondents agreed that employees in the SSEs have easy access to organisational data which is recorded as transactions are processed. This means that 61% of the responding SSEs in Namibia have the resources required to adopt a BIS and can be said to be at level 2, requiring improvements to already existing infrastructure as well as acquiring human resources with skills on BISs.

The response rate shows that the SSEs have secure systems that they use for data handling, manipulation and analysis that can easily be migrated to a BIS platform. The high frequency of 'Agree' to the aspects defined in the compatibility dimension is evidence that Namibian SSEs can migrate to BISs given the resources that they have. However, in some industries, there is a need to improve and upgrade if they are to successfully implement BISs.

4.7.3 Complexity dimension

The successful adoption of BIS is highly influenced by the availability of expert skills in a company. Table 4.5 shows the results for the complexity dimension. Many SSEs have not adopted BIS because of a lack of expertise in their organisations [2]. Some 50% of the

respondents agreed that their employees lack relevant skills required to adopt BIS whilst 15% remained neutral. The results show that the majority of the employees lack computer and data analysis skills which are required for the successful implementation of BIS. The complexity of BISs requires organisations to have experts who will put the BIS to its optimal use and help organisations to earn profits and perform better.

Table 4.5: complexity responses

		complex	1	2	3	4	5
HC2			6	10	15	15	2
6			15	18	4	10	2
OC4			0	1	4	24	20
Total			21	29	23	49	24
totalDisAgree			50				
total agree			73				146
Average disagree%			34.24658				
Average agree%			50				
neutral%			15.75342				

Namibian SSEs can thus be classified as level 2 given the frequency of responses for the complexity aspects. This means that SSEs do not have a central storage of their data such that its security may be compromised. BISs require high capacity infrastructure to store the huge amounts of data which is not available in Namibian SSEs.

4.7.4 Triability Dimension

This dimension considers employees' willingness to participate in BI and their ability to use software to manage and analyse data. The results show that 65% of the respondents are willing to participate in BI. About 13% of responses were neutral which may mean they are not sure of their position with regard to using BISs. Some 53% of the respondents stated that most of their employees cannot use computer software to manage and analyse data. Despite the

willingness to participate in BIS, SSEs in Namibia lack the skills to manage and analyse data using computer software. It can thus be interpreted that SSEs in Namibia are at level 2, the majority of employees have basic computer skills and lack the expertise required for successful implementation of BISs. Figure 4.7 summarises the responses to the triability aspects.

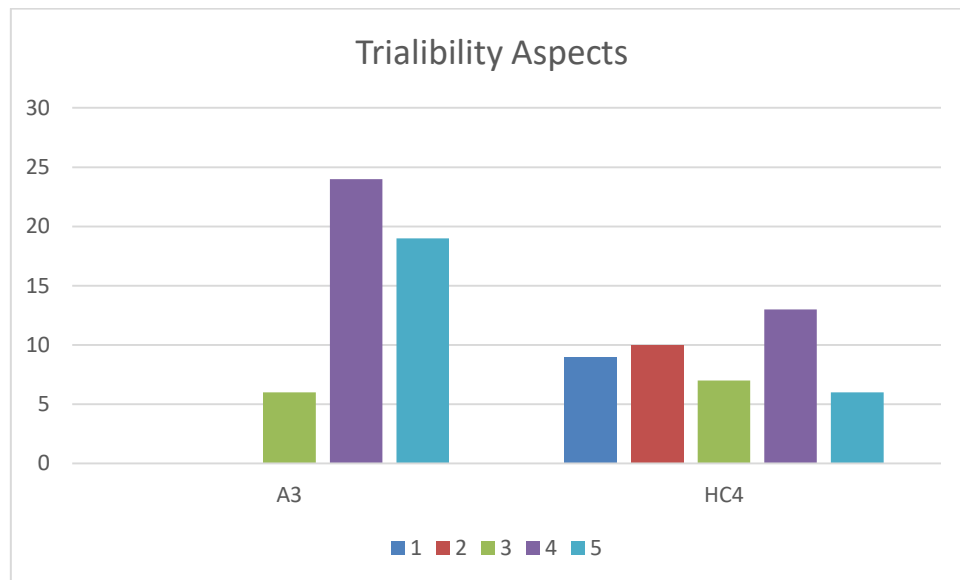


Figure 4.7: Responses to Triability aspects

4.7.5 Observability Dimension

A total of 24 respondents stated that they have not heard about BIS and 25 responded that they are aware of BIS thus striking a balance on this aspect. These results shown in table 4.6 are commensurate to the high willingness to participate in BI which was identified in the triability dimension. The results may be interpreted to mean that not all organisations know BIS and their application, rating Namibian SSEs to level 2 for this dimension. The fact that most respondents are not aware of BIS, makes it difficult for the SSEs to adopt a technology they do not know about. Awareness campaigns could help educate SSEs about BIS and its benefits.

Table 4.6: Observability aspects responses

observability	1	2	3	4	5
A1	17	3	4	16	9
A2	3	5	24	10	7
Total	20	8	28	26	16

4.7.6 Technology Dimension

Technology is a dimension defined in the TOE framework as a critical requirement in BIS adoption [32]. The success of the adoption is highly dependent on the available computer technologies, data, data handling systems and processes as well as the availability of software to handle the data and support business processes. The results show that respondents have defined procedures for systematically handling data with 20 out of 49 respondents selecting ‘agree’ as their response to question KP3 as shown in Table 4.7.

Table 4.7: technology aspect responses

	technological	1	2	3	4	5
IC9		4	3	6	24	12
10		0	0	1	21	25
KP1		3	2	3	25	17
2		3	5	5	22	13
3		3	10	6	20	10
4		9	9	11	12	5
5		5	6	20	9	5
CS1						
2		2	2	2	30	10
Total		29	37	54	163	97

Table 4.8: commonly used software.

Software	Number of SSEs using it
Microsoft Office Excel	30
IQ Retail	2
Pastel	10
ERP	1
Syspro	2
Unicenta	1
Others (Quiver, Dynamics, Vector, legal suit, FIA)	5

The common software programs identified in this study are shown in Table 4.8. Some SSEs used more than one software, they had software dedicated to specific business activities. Most SSEs use Microsoft Office Excel for handling their data. Microsoft Office Excel is a data analysis package which allows SSEs to analyse the data they generate and use it to inform their decisions. The results of the HC aspects show that employees do not have the data analysis skills which means that the software remains underutilised. The fact that they use Excel, increases the chances of benefitting from BIS adoption given that BISs can also be used for analysis among other functions. To benefit from BISs, companies must have clear data handling procedures which are in turn configured on the BIS for effective and efficient performance [9]. The results show that 22 respondents out of 30 use the same data management process and 25 of the responding SSEs use the same data handling system across their departments. A total of 20 SSEs already use specialised software like IQ Retail, Pastel, Syspro and Quiver, among others. The results suggest that they have some technologies in place which may require upgrade instead of starting their acquisition from scratch, thus addressing the fear of a huge capital requirement. This means that the SSEs in Namibia can be classified at level 3 where they can incorporate the already used data management procedures in the BIS if they choose to adopt one. Defining parameters in the BIS would be much easier with relevant data management details available.

4.7.7 Organisation Dimension

A total frequency of 157 was recorded as responses to aspects A5i to A5vi where SSEs in Namibia agreed to have heard about BISs. However, 102 responses disagreed with aspects HC1, HC2, HC3 and HC4, showing that the SSEs consider costs, lack of knowledge and skills and failure by BISs to match their business operations as their greatest fears which hinder the adoption of BISs. Results in Table 4.9 show that employees do not have data analysis skills with a few who are computer literate as shown by the frequencies to aspects HC1, HC2, HC3 and HC4.

Table 4.9: Organisation aspect responses

	org	1	2	3	4	5
A5i		3	5	6	23	12
5ii		1	8	8	19	11
5iii		6	7	11	16	9
5iv		6	9	8	17	5
5v		6	14	9	11	6
5vi		4	10	7	13	15

HC1		7	8	8	16	10
2		6	10	15	15	2
3		5	10	7	14	10
4		9	10	7	13	6
OC1		1	2	3	18	25
2		2	3	5	18	20
3		3	2	9	18	15
5		7	14	16	9	1
6		5	1	9	19	15
		disagree	Agree	neutral		
	A	79	157	49	128	
	HC	65	86	37	102	
	OC	40	158	42	82	

The authors in [9], in their study, identified computer literacy and skills as critical to the successful adoption of BISs. However, results show that employees in Namibian SSEs lack these skills, such that they outsource the data analysis services.

Management support and teamwork are critical success factors in the adoption of BIS [75]. Employees in Namibian SSEs work in teams, have the freedom to express their ideas and would embrace change if it benefits them as shown by the responses to aspects OC1, OC2 and OC3 in Table 4.9. However, 37 respondents agree that their projects have failed to make it difficult for the SSEs to gain confidence that BIS adoption projects would be successful. We may, by this, conclude that SSEs are aware of BIS but the lack of skills and the fear of the projects failing have discouraged Namibian SSEs from adopting BISs. The levels for the organisational aspects are summarised in Table 4.10.

Table 4.10: levels for organisational aspects

Aspects	Level	Explanation
Awareness (A5i-vi)	4	Employees have BI knowledge
Human Capital (HC1- HC4)	2	Lack BIS expert skills required
Organisational culture (OC1,2,3,5,6)	3	Employees embrace change but lack of management support
Average level	3	

The results show a rating of level 3 for Namibian SSEs. Overall, the human capital issues of expertise must be addressed in order for SSEs in Namibia to consider adopting BISs.

4.7.8 Environment Dimension

Respondents agreed that the cost of implementing BISs, lack of knowledge and skills as well as the possible failure of BIS to match business operations are their fears about adopting BIS. Some 7 respondents stated time delays as the reason why they are hesitant to adopt BISs. Loss of information, failure of BISs and loss of jobs were cited by 3, 1 and 3 respondents, respectively. The results of these aspects are shown in tables 4.11 and 4.12.

Table 4.11: reasons for not using BISs.

Reason	Number of respondents
Time consuming	7
Failure of system	1
Loss of information	3

Table 4.12: Environment aspect responses

	Responses	SD	D	N	A	SA
environment		1	2	3	4	5
A4i		2	5	8	20	10
4ii		3	12	7	16	8
4iii		6	7	13	11	9
HC3		5	10	7	14	10
Total		16	34	35	61	37

In their work, [2] highlighted that organisations have been reluctant to adopt BISs because of the high cost of infrastructure and high knowledge and expertise requirements to successfully implement and use BISs. SSEs in Namibia are no exception and can be classified at level 2.

4.8 State of Namibian SSEs

To answer RQ2 and RO2, the analysed data shows that SSEs in Namibia are at different maturity levels for the different dimensions identified as critical for the implementation of

BISs. The dimensions and aspects identified from the DOI, TOE and IEM were analysed into categories and rated on a scale of 1 to 5 as defined in Table 4.2. The scores for each of the dimensions are summarised in Table 4.13.

Table 4.13: Scores for each dimension

Dimension	Level	Explanation
Relative Advantage	2	Some skills available, used across the organisation. Lack of infrastructure
Compatibility	4	There are software programs to store, manage and share data across the organisation. Data accessed for decision making
Complexity	2	The majority of employees have basic computer skills but no data analysis skills
Triability	2	Most employees are willing to participate in BI but rely on those with skills to manage and analyse data.
Observability	2	The majority of employees are aware of the existence of BIS but have no understanding of its application in their organisation
Technology	3	The data handling process and computer technology used across the whole organisation are the same
Organisation	3	Employees embrace change and have basic BI and computer skills. Lack of management support for BIS initiatives
Environment	2	The majority of organisations fear the high cost of BISs and do not have the knowledge and skills to effectively use BIS

The average levels for all dimensions show that SSEs in Namibia are at level 3. This means that there are equal chances of successfully implementing BIS and failing. In other words, the SSEs may invest in BIS successfully if they address the aspects where they are rated low (levels 1 and 2) and embrace aspects with high ratings of 4 and 5. Some 5 out of 8 dimensions were rated at level 2 showing that SSEs have not adopted BISs.

4.9 Conclusion

The chapter presented the data collected in the study. A description of how data was coded, prepared, and screened is detailed in the first section of the chapter. The classification of levels was done based on the enhanced IEM by [9] for each of the dimensions identified from DOI, TOE and IEM. Specific criteria were defined at each level to make the classifications easy to follow and apply. Data analysis was done, and graphs were generated to represent the results in the second section of the chapter. The results of the study show that the SSEs in Namibia have not adopted BIS, they are at level 3 which requires them to upgrade and improve their rating.

SSEs in Namibia need to improve on aspects with a rating of 1 and 2 and ensure that aspects with ratings 3, 4, and 5 are maintained at that standard or improved. It can be thus concluded that the SSEs have not adopted BIS and must improve on identified dimensions if they are to undertake successful BIS implementation projects. The next chapter is a discussion of the framework design.

CHAPTER 5 FRAMEWORK DESIGN AND DEVELOPMENT

5.1 Introduction

This chapter is a description of the framework design and development. The first section of the chapter presents the methodology that was followed to define the framework. The complete framework and the guidelines for using it are presented in the second section of the chapter.

5.2 Framework design

A framework is a description of how to implement, create or manage a process [76]. The framework depicts the aspects to be considered and how they must be evaluated in order to ascertain the SSE's readiness to implement a BIS. Aspects defined by the DOI and TOE dimensions and their evaluation make up the components of the framework.

5.2.1 Framework design methodology

A methodology outlines the activities followed to achieve the target objective. In this study, the methodology followed to plan the framework design was defined by [56] and [57]. They defined a step-by-step guideline that may be adopted when solving a design research problem. The steps were described in detail in Chapter 2 as illustrated in Figure 2.2. Each step is defined by several activities whose application shall be demonstrated as part of the framework design.

5.2.1.1 Problem definition

The framework development is a response to RQ3 and RO3 of this study. The problem of this study is that SSEs generate lots of data that are not put into use because they are disintegrated from various sources [16]. The complexity of BIS technology and the challenges faced by SSEs in implementing BISs contribute to the motivation to conduct the study. The application of the steps defined by Edwards et al. [56] is to design a BIS implementation framework using DOI and TOE theories. The resultant framework would enable SSEs to determine their readiness to adopt BISs by assessing the organisation's resources against the identified adoption dimensions.

5.2.1.2 Development of the high-level framework

The framework is based on the DOI and TOE theories which defined several aspects that SSEs must consider as part of a decision to adopt new technology. Generally, the framework consists of DOI and TOE aspects as shown in figure 5.1.

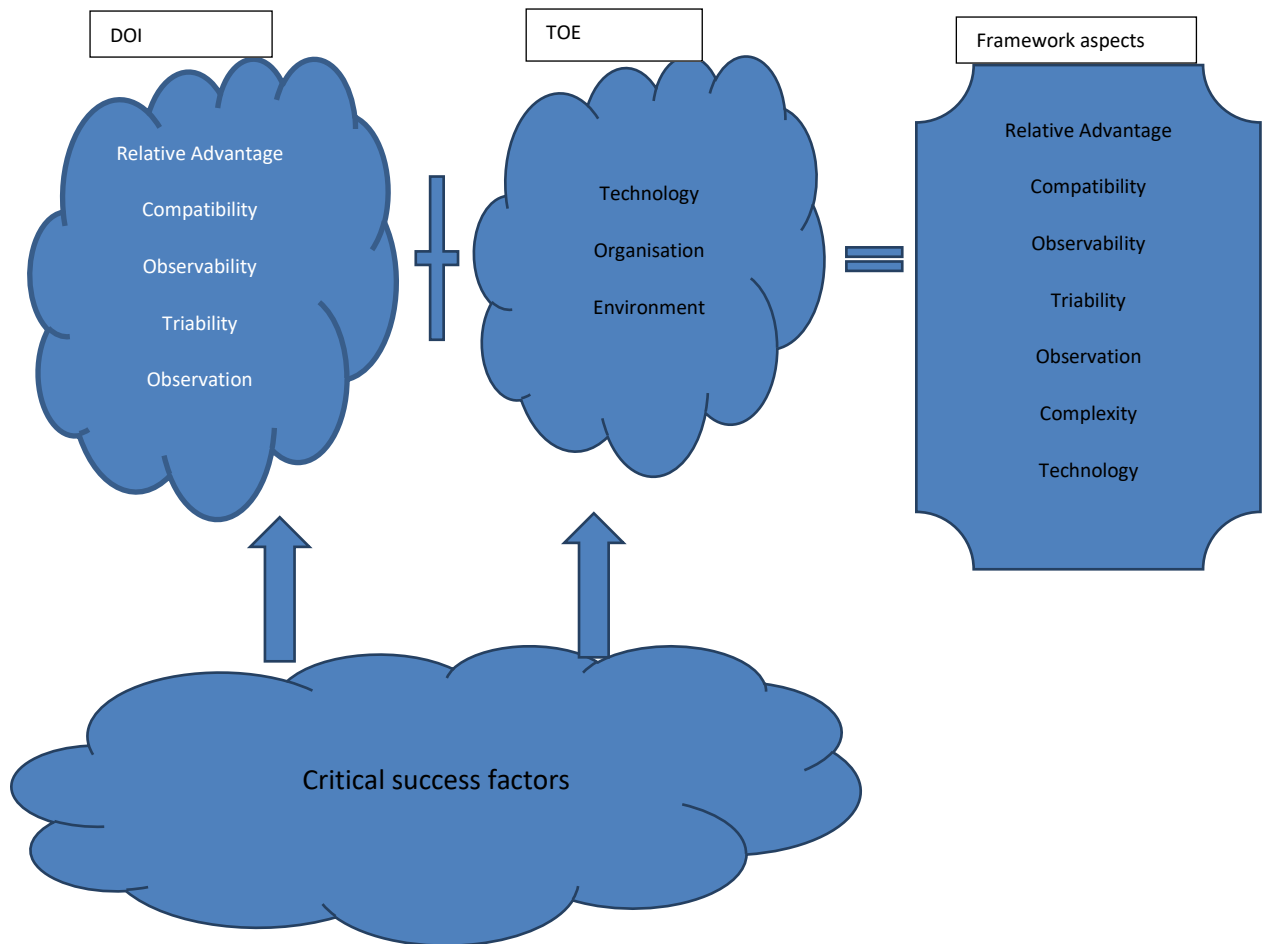


Figure 5.1: Aspects defined from DOI and TOE

The dimensions to be included in the framework were a combination of DOI dimensions, which are relative advantage, compatibility, observability, triability, observation and complexity and the TOE dimensions namely, technology, organisation and environment.

5.2.1.3 Refine specifications of the framework

The objective of developing the framework is to identify and evaluate the factors that influence an organisation's decision to adopt BIS. The framework must include the DOI and TOE aspects that are critical in accessing an SSE's readiness to adopt a BIS in their operations. Each of the aspects must be evaluated to assess the extent of availability inline with the thresholds identified in Chapter 2 of the study. An SSE may be informed of its readiness based on the evaluation of aspects defined in the DOI and TOE theories of adoption. Table 5.1 summarises the objectives of the framework development task.

Table 5.1: Summary of framework specification objectives

Objective	Description
1	Identify framework components from DOI and TOE theories
2	Define evaluation criteria for each aspect identified in objective 1
3	Decide on the readiness status of a given SSE.

5.2.1.4. Design of the framework

The design step involves identifying the components that will be used to formulate a complete framework. The activities to achieve the objectives are thus described in the following paragraphs:

5.2.1.4.1 Identify framework components

DOI and TOE theories of adoption define dimensions that organisations must consider if they are to introduce new technology in their operations. DOI theory was defined by [34] to include relative advantage, observability, compatibility, triability and complexity dimensions. The TOE theory is a consideration of technology, organisation and environment issues that affect an SSE's decision to adopt technology [7]. Each of the dimensions has aspects that must be satisfied in order for an organisation to be considered ready to adopt a specified technology. The set of dimensions and their aspects were drawn from these two theories and are shown in

Table 5.2. A review of BIS manuals confirmed these aspects as discussed in Chapter 2 and Chapter 3 of this thesis.

Table 5.2: Framework components based on DOI and TOE theories

	Dimension	Aspects
DOI DIMENSIONS	Relative Advantage	• Improve operational efficiency • Reduce operational costs • Improve organisational performance • Increase Competitive advantage • Improve decision making • Availability of data storage platforms
	Compatibility	• Availability of hardware and software resources for BIS use • Data storage and accessibility • Use of data in the decision-making process • Impact of new technologies on data management • Change process in the organisation
	Observability	• Prior BIS knowledge • BIS usage by competitors
	Triability	• Participate in BI-related issues
	Complexity	• BIS expertise in organisation • Data analysis expertise in organisation
TOE DIMENSIONS	Technology	• Currently used systems and hardware • Ease of use of current software, security • Software license issues • Availability of data analysis software • Defined data handling procedures and adherence • Review of data handling procedures
	Organisation	• Factors hindering BIS adoption • Knowledge in BIS • Capital requirements • Readiness to migrate • Availability of BIS that support the processes • Change and reception of change by organisational stakeholders

	Environment	• Availability of data analysis service in house • Competitors using BISs • Funding capital requirements • Availability of BIS support • Availability of BIS relevant to operations
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5.2.1.4.2 Define evaluation criteria for identified framework components

Each dimension has several aspects defined to inform the SSE of its status for that dimension. The SSE's score may be calculated as follows:

1. The aspect, for each dimension, may be rated by providing one response on a Likert scale of Strongly Disagree to Strongly Agree.
2. The Likert Scale responses for each aspect are translated to values as shown in Table 5.3.

Table 5.3: Likert scale responses translation

Likert Scale	Value
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

3. An average for a dimension, Avg is calculated as

$$AvgXX = \frac{\text{Sum of responses}}{\text{number of aspects}}$$

Equation 4: Average for dimension calculation

The average is calculated for each of the dimensions defined in the framework.

4. Match the resultant dimension average to the classification level as defined in Table 5.4 to determine the status of the SSE resources to adopt BIS.
5. Decide on the overall status for the concerned SSE by considering the averages for each of the dimensions and advise on whether the organisation is ready to adopt BIS or not.

To define the organisation's status, the scores for each of the dimensions are calculated. An organisation may be considered ready to adopt BIS only when all the dimensions are rated as ready. In case a dimension is not ready, a recommendation may be given to the SSE to improve their resources defined by the aspects in the failing dimension.

5.2.1.4.3 Decide on the readiness status

The readiness levels are defined based on the IEM as proposed by SAS. The model helps to classify organisations into one of 5 levels of maturity [33]. In this study, an organisational score for a dimension is computed as the average score for all the aspects defined in that dimension. The average dimension score determines the maturity level of that dimension for the SSE under consideration. The average score is calculated for every dimension to determine its maturity level. So the IEM model was used to establish an organisation readiness level, dimension by dimension. For instance the average score for

Technology aspects are used to determine how ready the organisation is with regards to the aspects defined for the Technology dimension. The adopted readiness levels and their description are shown in Table 5.4

Table 5.4: classification levels by dimension

Dimension and description	Level	Explanation
Relative Advantage	1	Lack of skills and resources required for decision making
Benefits of using BIS Availability of skills, hardware, and software resources	2	Some skills available, used across the organisation. Lack of infrastructure
	3	Lack of expert skills and infrastructure available but not sufficient for BIS implementation. Improvement is required
	4	Expert skills for decision-making available in the organisation. Resources may be extended as required by most BISs.
	5	Expert skills available required hardware and software available
Compatibility		

Current systems compatibility with BISs Data storage, access, sharing and usage Availability of decision-making software and its security	1	The way data is stored and accessed is not centralised. No decision-making software is available. Data sharing is difficult within an organisation
	2	Data is regularly collected but dispersed, with no central storage making access difficult. Security to data compromised. No decision-making software is used.
	3	Data stored centrally in departments, departmental data sharing possible and analysed for decision making.
	4	There are software programs to store, manage and share data across the organisation. Data accessed for decision making
	5	The organisation has software to manage and handle data across the whole organisation ensuring ease of access and security. Data informs decision-making.
Technology		
Available computer technologies	1	No computer technologies are in use in organisations. Individual employees have their data handling processes.
	2	Employees in departments follow some data handling processes and systems
	3	The data handling process and computer technology used across the whole organisation are the same
	4	Computer technologies and data handling processes match those used by competing organisations
	5	Computer technologies and data handling processes can be easily extended and modified to support new business processes
Organisation		
Expertise and human resource skills Change management Teamwork Management support	1	Employees fear change, lack of knowledge of BI, shortage of capital to invest in BIS
	2	Employees accept change if the benefit, are computer literate but have no capital to invest in BIS
	3	Employees embrace change and have basic BI and computer skills. Lack of management support for BIS initiatives

	4	Employees embrace change and have BI knowledge and computer skills. Capital is available but little management support is available.
	5	Expertise in BI among employees who regard change as a growth opportunity which succeeds through teamwork. Capital available.
Environment		
Organisations' fears about BISs	1	The majority of organisations fear the cost of implementing BIS, lack knowledge and skills and feel that BISs do not match their business operations
	2	The majority of organisations fear the high cost of BISs and do not have the knowledge and skills to effectively use BIS
	3	Costs deter organisations from implementing BIS though basic knowledge and skills of BIS are available amongst employees
	4	Capital is available, skills and knowledge can be acquired but fears losing valuable organisational information
	5	Capital is available, acceptable level of knowledge and skills with high push to adopt BISs

5.2.1.5 Review framework

A structured walkthrough is a testing technique that involves peers and/or experts to review the technical aspects of a development process. Peers were requested to check the logical flow of the framework. The aim was to test whether the proposed framework addresses the goals and objectives for which it was designed. The walkthroughs were done at each step of the development process to increase the correctness of the framework. Some of the tests involved verifying how the various aspects of DOI and TOE could be integrated into one framework. The process identified errors and was corrected them before the final framework was developed, ensuring that a quality product was developed.

5.2.1.6 Analysis of framework

The framework was a consideration of adoption aspects defined by the DOI and TOE theories, BIS manuals as well as the characteristics of Namibian SSEs. Each theory identifies dimensions and aspects to consider for each of the dimensions, thus indicating the requirements

that SSEs must satisfy if they are to implement a technology. These aspects have been considered to evaluate and guide an SSE on the successful implementation of BIS. Figures 5.2 and 5.3 show the identified dimensions and their respective aspects.

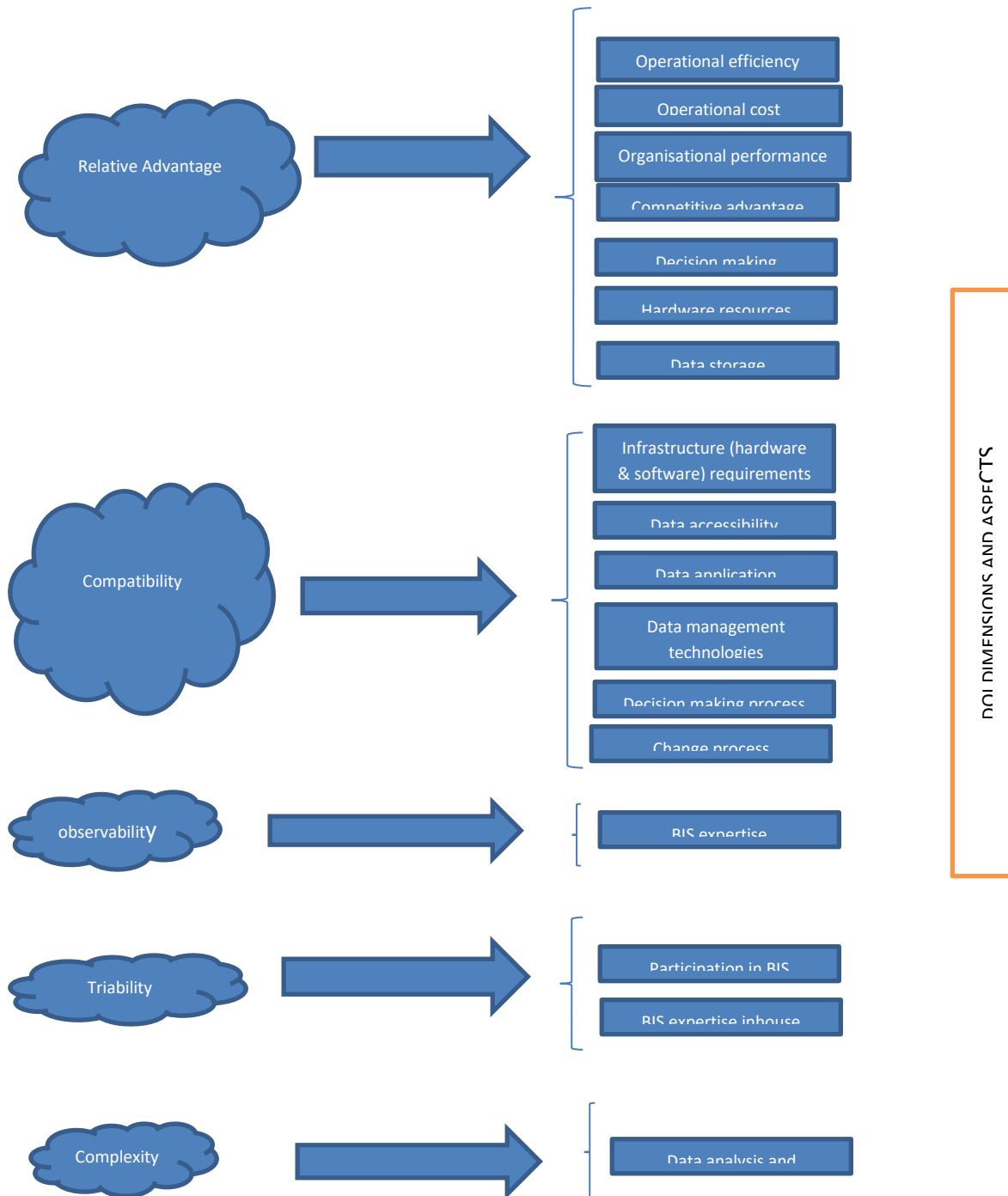


Figure 5.2: Dimensions and aspects defined from DOI Theory

Figure 5.2 shows the DOI dimensions and the various aspects identified for consideration by an SSE that seeks to implement a BIS. It was interesting to note that aspects may have a similar description yet they are in different dimensions. The analysis shows that it is important to consider an aspect in the context of the dimension in which it has been defined. An example is hardware and software resources that are defined in both the relative advantage and compatibility dimensions. In the relative advantage dimension, the organisation must evaluate the availability of hardware and software required for BIS implementation whilst in the compatibility dimension the thrust is on the ability of the existing hardware and software to be used with the BIS. In other words, the hardware and software aspects under compatibility, seek to establish the possibility of using already existing hardware and software with the BIS intended for implementation.

Table 5.2 outlined the framework's components as defined by the DOI and TOE theories. TOE theory defines the technology, organisation and environment dimensions which must be evaluated by assessing SSE's technological resources, organisational culture, human resources and processes as well as the characteristics of the environment in which the SSE operates. The detailed aspects of the TOE theory are depicted in Figure 5.3.

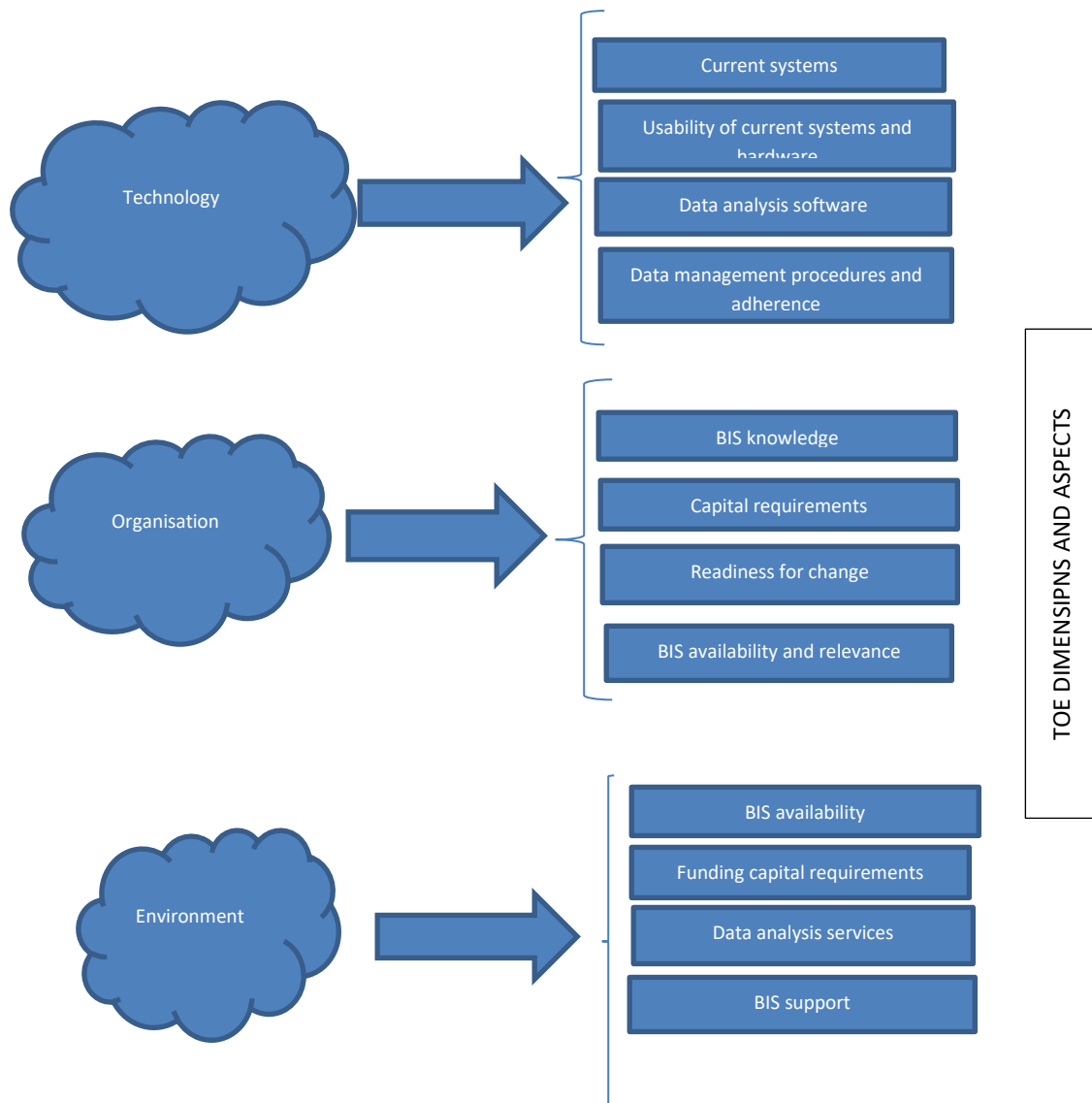


Figure 5.3: TOE Dimensions and aspects

5.2.1.7 Framework for BIS implementation

The proposed framework depicts all the components that indicate an SSE's readiness to adopt BIS. Figure 5.1 presents the framework that guides SSEs in BIS implementation. RQ 3 and RO4 are achieved by the definition of this framework. Following the walkthroughs that were conducted as part of testing the framework, experts recommended that the triability, complexity and observability dimensions be merged with the relative advantage and compatibility dimensions resulting in the framework shown in figure 5.4. An explanation of the merging is detailed in the walkthrough process.

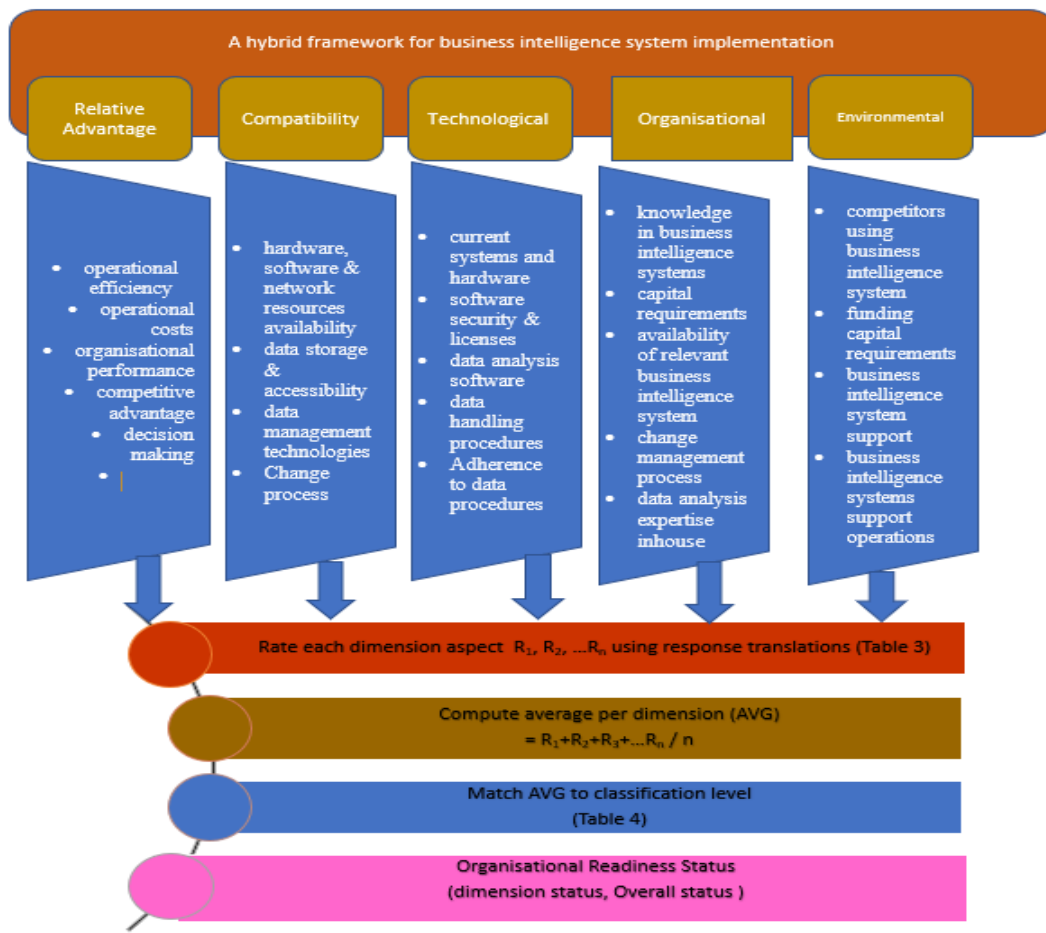


Figure 5.4: Hybrid framework for Business Intelligence Systems Implementation [77]

A detailed description of the framework components is in section 5.3 of this document.

5.2.1.8 Testing

Framework evaluation is aimed at judging its value and measuring its worthiness [67]. The evaluation process is aimed at identifying and correcting shortcomings in the framework before it is put into use. To achieve the best output product, the evaluation process was iterated at different levels of the framework design. Srivastava and Kim [41] emphasized the need to do testing more than once and it is conducted by other evaluators who are not the researcher.

In [69], Skiena described a good framework as one that is correct, efficient and easy to implement. A framework is logically correct, performing the tasks for which it was designed and it produces the desired outcomes [68]. Walkthroughs were adopted to evaluate the framework. In walkthroughs, the logic of the framework was tested to establish whether the framework supports the objectives set for its development. A peer checker conducted the

walkthrough whose aim was to find out what the algorithm could do. Table 5.5 summarises the walkthrough process conducted by peer reviewers.

Table 5.5: Walkthrough tests and results

Test aspect	Expected outcome	Result	comment
Aspects that inform the dimensions ²⁶	All aspects defined in the dimension must inform the status of the SSE	The aspects identified to measure the stated dimension for an SSE. The aspects are also part of the critical success factors identified in the literature review.	Aspects were adopted in the framework for the various dimensions
Aspects included in the DOI and TOE theories	Aspects covered in DOI and TOE theories	Some dimensions had aspects that are related to one or more dimensions in the framework. This was more of duplicated aspects. Triability, Observability and Complexity dimensions had one aspect defined for each of the dimensions. The aspects matched with those in Relative Advantage. The relating aspects were thus extended to incorporate the details specified in the other dimensions.	All identified duplicated aspects were removed from all duplicate dimensions to leave one occurrence of an aspect in the whole framework. Aspects defined in Triability, Observability and Complexity were incorporated into the Relative Advantage dimension. This eliminated these other 3 dimensions.
Aspects description clear to understand	Aspects are clearly described	The phrases are brief and clear with a few that require rephrasing	Rephrasing was done for the identified aspects.
Aspects are logically arranged	Aspects present a logical flow	The aspects are grouped by dimension and the dimensions	Aspects are grouped by dimension laid out in the order of the weights

		were laid out in the order of the weights assigned to the dimension	assigned to the dimension.
Logical relationship of dimensions	There is a logical flow in the dimensions	The dimensions were mixed up, not allowing proper consideration of each dimension.	Dimensions were rearranged to allow the evaluation of the aspects that require the same data source to be done progressively.
Are dimension weights assigned reasonable	Weights depict the importance of the dimension toward implementation readiness	Weights assigned to each dimension are justified.	The weights were maintained because they were a result of experts' participation in the walkthrough process.

As part of the walkthrough, the dimensions adopted from the DOI, TOE, IEM and CSFs were analysed to determine their logical relevance in the evaluation of an SSE's status to adopt BIS. The process revealed that some aspects appeared in more than one dimension causing redundancy in the evaluation process. The reviewers, therefore, eliminated any duplicate aspects in a dimension and combined the dimensions that evaluated similar aspects. For instance, the aspects defined for the triability, observability and complexity dimensions adopted from DOI were incorporated into the relative advantage and compatibility dimensions. This was done to ensure that an aspect appears only once in the whole framework. As a result, repeating aspects were eliminated from the framework and triability, observability and complexity dimensions were consolidated into Relative Advantage and Compatibility dimensions.

5.2.1.8.1 How the Framework can be used

The following section describes the guidelines of how the proposed framework may be used by SSEs. An SSE or its representative may use the framework to evaluate their business status to adopt a BIS. The steps may be executed in the order in which they are described in this thesis to ensure that accurate results are attained.

1. The SSE or its representative may provide responses to aspects defined in the various dimensions of the framework. They must select the most appropriate response for each

aspect from the given range of Strongly Disagree to Strongly Agree. A more detailed list of aspects for each dimension is included in Appendix B.

2. The responses Strongly Disagree to Strongly Agree are evaluated as 1 to 5 for purposes of applying the evaluation criteria. The evaluation criteria defined in section 5.1.1.4.2 are applied for each dimension to determine the organisation's status with regard to that dimension. The results of the evaluation criteria for each dimension are noted for use in the next step.
3. Decide on the SSE's readiness to adopt BIS.
4. Provide status of SSE with regards to each dimension as a way of guiding the SSE on dimensions that require improvement so that they may be ready to implement BIS.

The framework is a tool that SSEs may use to determine how ready they are to adopt BIS given the state of each of the defined dimensions. To gain a better understanding of the organisation's status, an SSE may use the model defined in Chapter 6 of this thesis for a much user-friendly and detailed evaluation process.

5.2.1.9 Documentation preparation

The steps followed to design and develop the framework have been documented and included in the different chapters of this thesis. Future developments on the proposed framework may be initiated from this documentation.

5.3 Framework components

The framework was defined by considering the DOI and TOE technology adoption theories as well as the critical success factors for BIS implementation. Aspects from the three sources were considered and resulted in the framework shown in Figure 5.4.

Relative advantage aspects seek to evaluate the impact of BIS on the SSE's operations. Operational efficiency indicates whether a business's core processes can be improved by adopting a BIS. Organisations that have adopted BIS have managed to reduce their operational costs and make informed decisions [18]. Measuring the impact of BIS adoption on costs and quality of decision-making would help an SSE evaluate the need for adopting a BIS. The framework suggests that an organization that wishes to improve on the defined aspects may adopt BIS in order to benefit from its features and improve organizational performance.

The Relative Advantage dimension aspects further evaluate whether an SSE has skilled personnel and whether they can afford to outsource the service. These are critical dimensions that need a holistic evaluation since the personnel are responsible for using the BIS. If they lack knowledge then the organization would not benefit from its implementation. The availability of skills within the organization is ideal as it reduces the costs of outsourcing, which could otherwise be too high for small businesses.

The compatibility dimension evaluates whether an SSE's current resources are adequate for the adoption of a BIS. The aspects measure the compatibility of the current resources with standard BISs by comparing the minimum requirements for successful implementation with what the SSE has. Infrastructure, data accessibility, management and application as well as the change management process are the key aspects of this dimension. An organization with defined data handling and management resources and procedures may be considered ready to adopt a BIS. In other words, the available resources must enable a smooth transition from current infrastructure and procedures to the adopted BIS.

BIS technology is complex and requires expert skills to implement [14]. The organizational dimension emphasizes this aspect as well, showing that it is a critical indicator of an SSE's readiness to adopt BISs. A successful implementation requires skilled personnel to manage and support it. The dimension focuses on the data analysis expertise within an organization. The aspects help to evaluate whether an SSE will be able to extract meaning from the data patterns. BIS supports complex calculations and patterns that require personnel to interpret and understand in order to make effective decisions. For an organization to be considered ready to adopt a BIS, personnel must possess data analysis expertise instead of outsourcing.

The Technology dimension focuses on evaluating the hardware, software and network resources of an SSE. The evaluation considers the information systems currently used by the SSE. Successful implementation of BIS involves migrating data from current systems onto the new BIS hence the need to evaluate whether the information can be migrated. Licensing, security and ease of use of current systems are critical in establishing the resources that may be required to successfully implement a BIS. An example of security is the physical security of hardware, network and software features that exist to ensure that these resources are not stolen or unlawfully compromised. User access, authorisation, authentication and roles need to be evaluated so as to determine the extent of security and make considerations. The current

status of these aspects also influences the choice of BIS. Ideally, the new BIS must support all of the functions of the current systems support and additional features.

A BIS requires hardware with high processing capacity [16] given the huge volumes of data generated in a business. It is for this reason that it is important to assess the available hardware. Hardware must be of a high processing speed, reliable and high storage capacity. Assessing an SSE's hardware helps in deciding which BIS to adopt, taking compatibility issues into account. The SSE's hardware resources must be able to meet the BIS requirements specification.

Efficient data processing requires clearly defined data handling procedures. The framework includes the data handling aspect in order to evaluate the SSE's readiness to use BIS. Most BIS implementations are considered ineffective due to the failure of SSEs to explore the vast functionalities [9]. Clear data handling procedures are required in order to purchase a BIS that will effectively support these procedures [3]. The compatibility and clear definition of the data procedures increases the pool of BISs that an SSE can choose for its operations.

The technology dimension also considers the network resources of an SSE. Network resources help to ensure that the BIS is accessible to the authorised users and data sharing may be made easy. The developed framework evaluates the network resources to inform the choice of BIS that will support the SSE's organisational structure and data sharing needs

The organisation dimension focuses on aspects that deal with human capital, organisational culture and policies. Lai [3] stated that a BIS must match the organisational culture, maintain and improve it. The introduction of a BIS is not expected to alter organisational culture but improve the process while maintaining the integrity and vision of its operations.

In the framework, human resources are a critical success factor for BIS implementation. An SSE requires employees with knowledge of BIS to lead the implementation of the chosen BIS. Employees will interact with the BIS as they carry out their duties. Lack of knowledge of BIS may result in a failed implementation, with BIS available but employees unable to perform their tasks on the system. It is thus important to assess the level of expertise in deciding whether to adopt a BIS as well as selecting the BIS that employees can easily understand after training.

The organisation's stakeholders' attitude and support towards change is another important aspect in deciding to implement a BIS. In 2012, [21] mentioned that of the large organisations that have adopted BIS, the BIS implementations are not successful because of a lack of

management support. If management attitude resists change, it becomes difficult to convince them of the need for technological change. The framework includes the organisational aspects, to assess whether management will be able to finance the project and if it is in their strategic plan. It is therefore important that an organisation dimension defined by [7] be included in the framework.

The framework includes the environment dimension with competitors, availability of BIS support, availability of relevant BISs and sources of funds as key aspects. It is important to note that an SSE requires a forecast of its activities/operations in order to go through an informative evaluation. The SSE's performance and its competitors' way of doing business often influence its decision. For instance, if competitors have implemented BISs, an SSE may decide to implement a BIS also to gain a competitive advantage.

The aspects defined in the dimensions must be holistically considered by an SSE that intends to implement or adopt a BIS. Considering all the aspects following the guidelines described in section 5.1.8.1 will improve the accuracy of the results.

5.4 Conclusion

The chapter focused on the design of the framework that SSEs may use to evaluate their status to adopt BIS to achieve RQ3 and RO3 of this study. The framework was developed following the steps defined by [56] and [57]. The methodology was chosen as it clearly describes the framework development process step by step. Walkthroughs were conducted at various phases of the development to ensure that the resultant framework is holistic and logically correct for use in SSEs. A description of the framework components and how they may be used is included in this chapter. The next chapter describes the design of a model that may be used to evaluate an SSE's status in fulfilment of RQ4 and RO4.

CHAPTER 6 MODEL DESIGN AND DEVELOPMENT

6.1 Introduction

The chapter is a description of how the model was designed and developed following the Agile methodology, Feature-Driven Development in particular. The explanation of the activities carried out follows the phases of the preferred methodology. Several UML diagrams have been included to support the analysis and development activities of the model.

6.2 Feature-Driven Development methodology

A feature is a small, function or primary requirement which is part of a complete system. Feature-Driven Development (FDD) is a process that involves five activities that are iterated. The five activities are to develop an overall model, build a features list, plan by feature, design by feature and build by feature. A more detailed description of the methodology is in Chapter 3 of this thesis. Figure 6.1 shows the FDD life cycle.

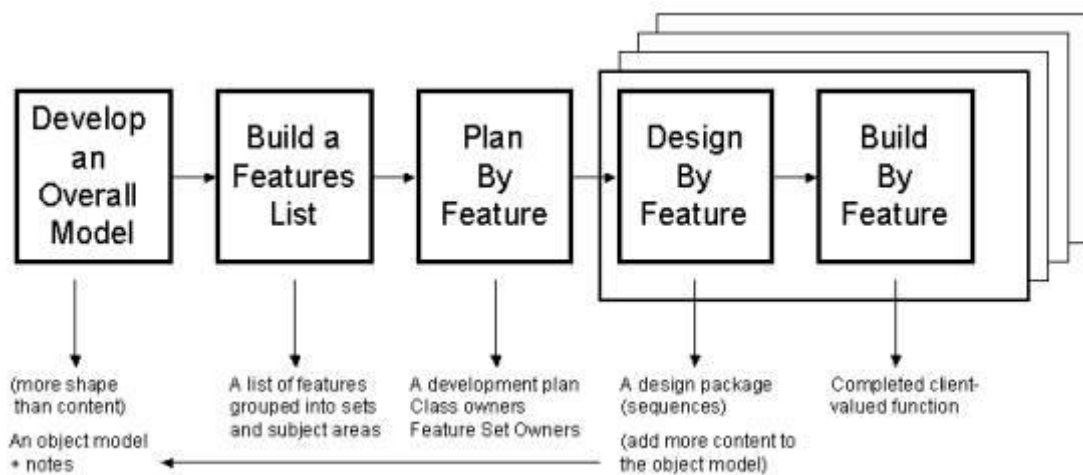


Figure 6.1: Feature Driven Development lifecycle [62]

Figure 6.1 shows that the phases of the lifecycle that may be iterated to ensure that a quality product is developed. The actual process of developing the model for guiding an SSE in deciding on whether to implement a BIS or not is described for each feature or function of the model.

6.2.1 Develop an overall model

The goal of this phase was to identify and understand the basic requirements for a system. The outcome of the phase was a high-level object model and notes. Pseudocode was written to outline the model features or functions.

Pseudocode is a high-level description of a program or model that is written in simple language that can be converted into programming statements [10]. The informal statements are abstract and exclude the non-essential details for easier understanding by the developers. This phase of the FDD methodology was iterated and one feature was developed at each iteration as described in the following paragraphs.

First iteration

In the first round of the development lifecycle, pseudocode was written to describe the input for the model. The statements describe how the dimensions and aspects for evaluating the SSE will be displayed as well as the input of the responses by the organisational representative.

Algorithm 6.1: Input Requirement

Repeat

1. Display dimensions and aspect questions
2. Enter responses to the questions/ aspects
3. Check if all questions/ aspects have a response
 - 3.1 If yes
 - 3.1.1 Display message “All questions answered”
 - 3.1.2 Save responses
 - 3.2 If No
 - 3.2.1 Display message “Please answer all questions”

Until all questions have been answered

4. Save Response

The algorithm 6.1 describes how the SSE representative will view the questions and enter the responses. The system will verify that all questions have been responded to before saving the responses that are used in displaying the guideline to implement BIS or not.

Second iteration

The first iteration resulted in an algorithm for capturing the responses to the aspects which are used as the input into the second feature of the model. The algorithm 6.2 describes how the scores for each dimension will be computed and stored for use in the next function of deciding on the SSE's status.

Algorithm 6.2: Compute Score

1. Extract responses saved for aspects
2. Compute the average score for each dimension
3. Save the average scores
4. The system sets weightings for each dimension
5. Compute weighted scores for each dimension
6. Save weighted average scores
7. Compute the total weighted average scores (all dimensions)
8. System Set Minimum Acceptable Threshold for each dimension
9. Compute Min Acceptable Threshold for all dimensions (MinAThresh)
10. Save MinAThresh

Third iteration

The third iteration of the first phase of the FDD methodology resulted in the algorithm to decide on the SSE's status. The function uses the output produced by the first two functions described earlier as its input and results in a decision on whether an SSE has the resources required for the successful implementation of a BIS.

Algorithm 6.3 Decide on sse status

1. Extract MinAThresh
2. Check MinAThresh against 60
 - 2.1 If MinAThresh < 60
 - 2.1.1 Display "Not ready, please review all dimensions"
 - 2.2 Else

2.2.1 If (MinAThresh > 60) and (ST > 20) and (SO >15) and (SE > 15)

2.2.2 Display “Ready to implement”

2.3 Else

2.3.1 If (MinAThresh > 60) and (ST > 20)

2.3.2.Display “Ready to implement but review the Technology aspects”

2.4 Else

2.4.1 If (ST > 20) AND (SO <15)

2.4.2 Display “Improve Organisation dimension, check environment”

2.5 Else

2.5.1 If (ST > 20) AND (SO >15) AND (SE< 15)

2.5.2 Display “Review Environment and Implement”

The final output of the phase

The output of the first phase of the FDD resulted in an algorithm. An algorithm is a set of steps to perform a task. To decide on whether an organization may implement BIS or not, the following steps may be followed. The algorithm defines the input, process and output of the evaluation process, showing the dimension/ category that the SSE must improve in order to be considered as BIS implementation ready.

Algorithm 6.4 SSE evaluation

1. Input responses for each question presented per category
2. Compute the Score for each category as
 - 2.1 RAScore= (RAQ1+ RAQ2+... RAQn)/n
 - 2.2 CAScore= (CAQ1+CAQ2+...CAQn)/n
 - 2.3 TQScore= (TQ1+TQ2+...TQn)/n
 - 2.4 OQScore=(OQ1+OQ2+...OQn)/n
 - 2.5 EQScore= (EQ1+EQ2+...EQn)/n
3. Compute the Weighted Score for each category as
 - 3.1 RAScore * 0.15 = RAWScore
 - 3.2 CAScore * 0.10 = CAWScore

- 3.3 $TScore * 0.30 = TWScore$
- 3.4 $OQScore * 0.25 = OQScore$
- 3.5 $EQScore * 0.20 = EQWScore$
4. Compute TotalWScore as
 $Sum(RAWScore, CAWScore, TWScore, OQScore, EQWScore)$
5. Set the Minimum Acceptable threshold for each category as
 - 5.1 $SRA = 0.10$
 - 5.2 $SCA = 0.05$
 - 5.3 $ST = 0.20$
 - 5.4 $SO = 0.15$
 - 5.5 $SE = 0.10$
6. Compute the Minimum Acceptable Threshold as
 $Sum(SRA, SCA, ST, SO, SE) = MinAThresh$
7. Determine decision-based on ($MinAThresh > 60$)
 - 7.1 If ($MinAThresh < 60$)
 - 7.1.1 Display “Not ready to review all dimensions”
 - 7.2 Else
 - 7.2.1 If ($MinAThresh > 60$) AND ($ST > 20$) AND ($SO > 15$) AND ($SE > 15$)
 - 7.2.2 Display “Ready to adopt”
 - 7.3 Else
 - 7.3.1 If ($MinAThresh > 60$) AND ($ST < 20$)
 - 7.3.2 Display “Ready to adopt, improve the Technology dimension and Implement”
 - 7.4 Else
 - 7.4.1 If ($ST > 20$) AND ($SO < 15$)
- Then
 - 7.4.2 Display “Improve Organisation dimension, check environment”
- 7.5 Else
 - 7.5.1 If ($ST > 20$) AND ($SO > 15$) AND ($SE < 15$)
- Then
 - 7.5.2 Display “Review Environment and Implement”

6.2.2 Build a features list

A features list identifies the functions of the proposed model specifying what it must perform. They may also be referred to as the functional requirements of the model. To increase the

problem of developing an effective and efficient model, requirements identification must be done through careful analysis of the problem.

The model seeks to guide SSEs on their readiness to implement BIS and guidelines on the status of each dimension. It will accept input as responses to the aspects defined by the DOI and TOE technology adoption dimensions, evaluate them and give a decision on whether to implement or improve a specific dimension as the output. The model uses predefined evaluation criteria to output a decision. Output includes the decision whether to implement BIS or not as well as the dimension that requires improvement. The functional requirements are listed in Table 6.1 below.

Table 6.1: Functional Requirements

Function	Description
Input organisation details	- The organisation representative enters the organisation details displayed - The details are stored - A menu is displayed for a user to choose - Perform organisation evaluation - View improvement guidelines for a previously evaluated organisation.
Display dimensions and aspects	- The list of questions, grouped per dimension are displayed - Organisation representative views aspects and guidelines for responses
Capture responses to aspects	- Organisation representative enters responses to the aspect. - The system ensures that all aspects in all dimensions have responses
Save responses to aspects	The responses are stored for use as input in calculating the organisational score
Calculate scores for the organisation	- Inputs are the responses stored in function 4 (save responses to aspects) - Average scores per dimension are calculated and stored - Weighted scores for each dimension calculated - Calculation of the total weighted score - The Minimum Acceptable Threshold is calculated

Display scores for the organisation	The calculated scores in Function 5 are all displayed for the organisation
Calculate BIS implementation status	- Input to this function is the calculated scores for the organisation. - The scores are compared to the criteria set in the system in order to determine the readiness status
Display the organisation's status	The results of the comparison are displayed dimension wise
Display improvement guidelines	- The dimensions to be improved are displayed - Aspects that need reconsideration before implementing a BIS are displayed. - Suggestions for improvement are displayed.
Set evaluation dimensions and aspect	- A set of questions, grouped by dimension are preset - The evaluation weights for each dimension are set - Implementation guidelines are set based on the evaluation scores

Non-functional requirements are desired system attributes that are not functions but enhance the system environment for the functional requirements to be achieved. Examples of non-functional requirements include the physical, verification and environmental parts of the system. The identified non-functional requirements for the model include:

1. Complete – At the end of the process, an SSE's status of whether to implement BIS or not must be displayed. This output shows that all the functions of the model have been executed successfully.
2. Correct – The suggested output must be a correct validation of the dimensions given the set evaluation criteria. The model's correctness may be verified by providing the same responses to the aspects and reviewing whether the output will be the same.
3. Finite – The model must terminate when all the execution steps have been executed. For example, the model must end when an SSE's status has been displayed and the suggested dimension of improvement is output.
4. Secure – The security of the model is an important requirement as it will capture an organisation's responses to its key characteristics and resources. There must be limited access to the source code of the model to secure the input as well as to ensure that the decision output is a correct evaluation of the input.

6.2.3 Plan by feature

This phase of FDD methodology involves developing a high-level plan of functions of the model under development. Functions of the same business value may be grouped together and developed concurrently. The high-level plan for the BIS implementation model is thus defined using various UML diagrams.

UML diagrams are notations that depict the objects and their interactions in software design. Various diagrams are drawn to show different functions and features of the model, incorporating the functional as well as the non-functional requirements. Use case, class, activity and sequence diagrams are presented to show how the model will work.

Use case diagrams

A use case diagram shows the tasks that are supported by the model and are executed by the users. The model requires input from an organisation representative in the form of responses to the various aspects defined by the DOI and TOE dimensions. The model processes the input and displays output for the user to view and learn of their organisation's legibility to implement BIS and dimensions for improvement

First iteration

The diagrams show the first feature of the model where the representative of an SSE responds to the questions defined for each dimension defined in the evaluation framework.

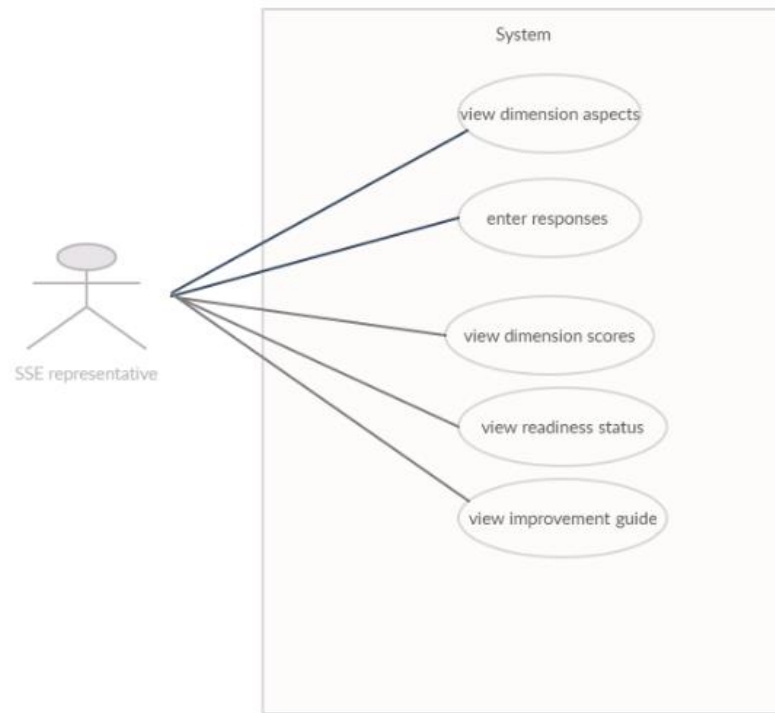


Figure 6.2: Use case diagram for the input of responses

The SSE representative will enter the SSE details after a successful login. The aspects defined in the framework for each dimension will be displayed to prompt the SSE representative to rate his or her organisation. The responses will be saved after verifying that all aspects have been responded to, otherwise the system will continue displaying the aspects. The system will perform some processes to a point where the user will be able to see their SSE scores, readiness status as well as guidelines for improvement in case the results of the evaluation show that the organisation is not yet ready.

Second iteration

All the aspects for all dimensions will be coded into a repository from which they will be displayed for an organisation's representative to enter responses. The criteria used to decide on the SSE's readiness are also defined in the system and saved for the evaluation process. When the SSE representative has responded to all aspects, the system will display the SSE's scores

which are a result of the calculation of average scores for each dimension. The average scores are matched to the already defined criteria to display a readiness status. The status shows whether the respondent SSE is ready to implement BIS or not. The system will also give guidelines for improvement of the evaluated SSE. Figure 6.3 depicts the processes that are performed by the system.

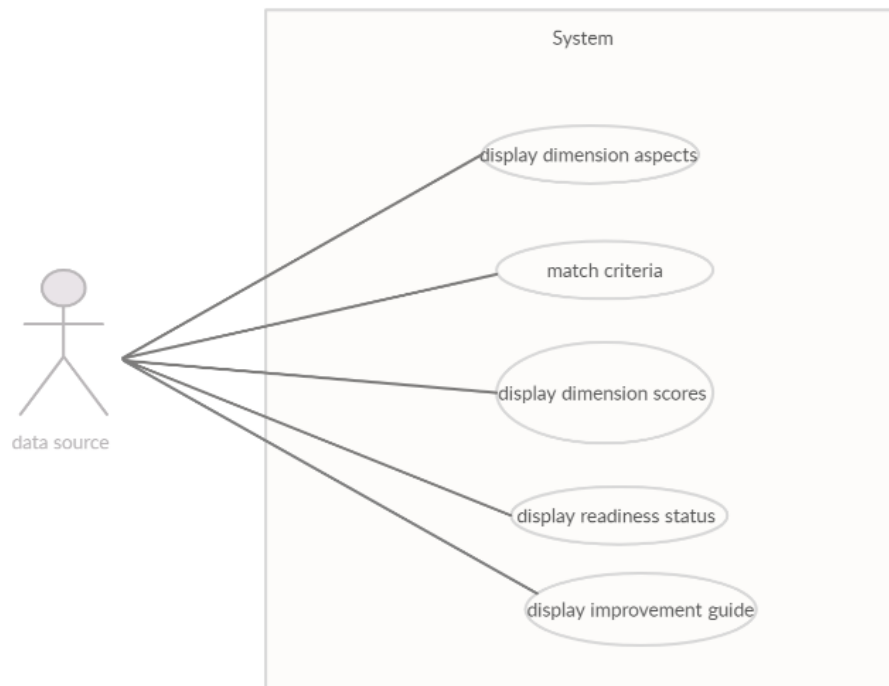


Figure 6.3: Use case diagram for System

Third iteration

Figure 6.4 shows all the users of the system as well as the tasks they will perform in the model.

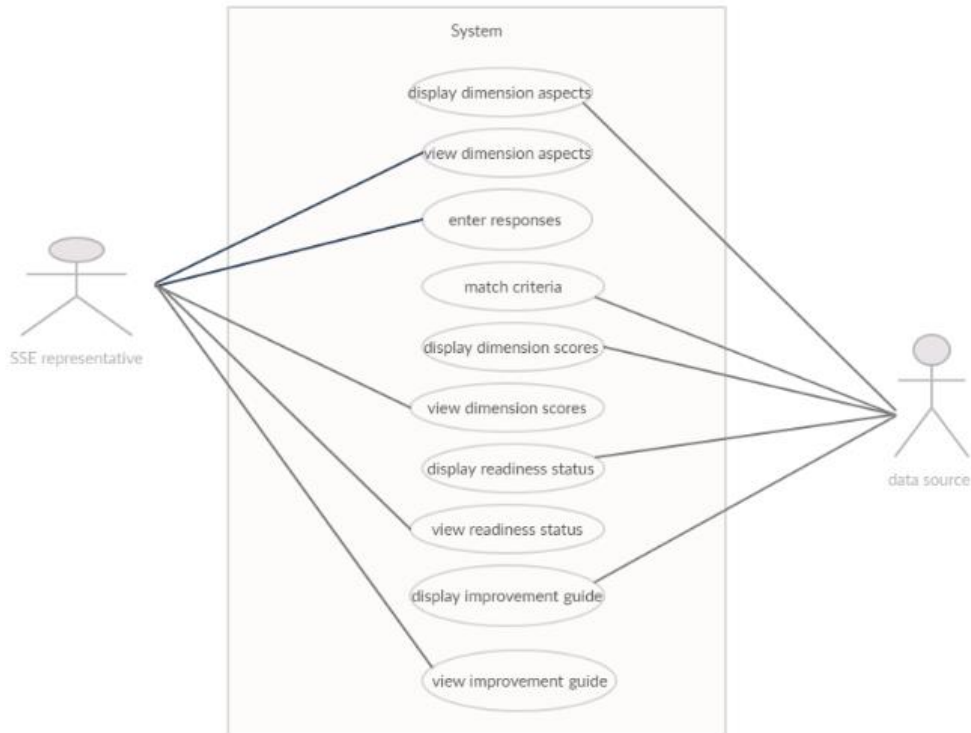


Figure 6.4: Use case diagram for the complete model

Activity diagrams

An activity diagram depicts the flow of control among the system activities [6]. Activity diagrams were drawn to give an idea of the key processes and functions that the model supports.

First iteration

Figure 6.5 is an activity diagram that depicts the key input function of the model. The aspects defined for each dimension would be displayed and responses input by the organisation's representative. All the responses would be stored as they are used in other processes.

Activity diagram for input requirements

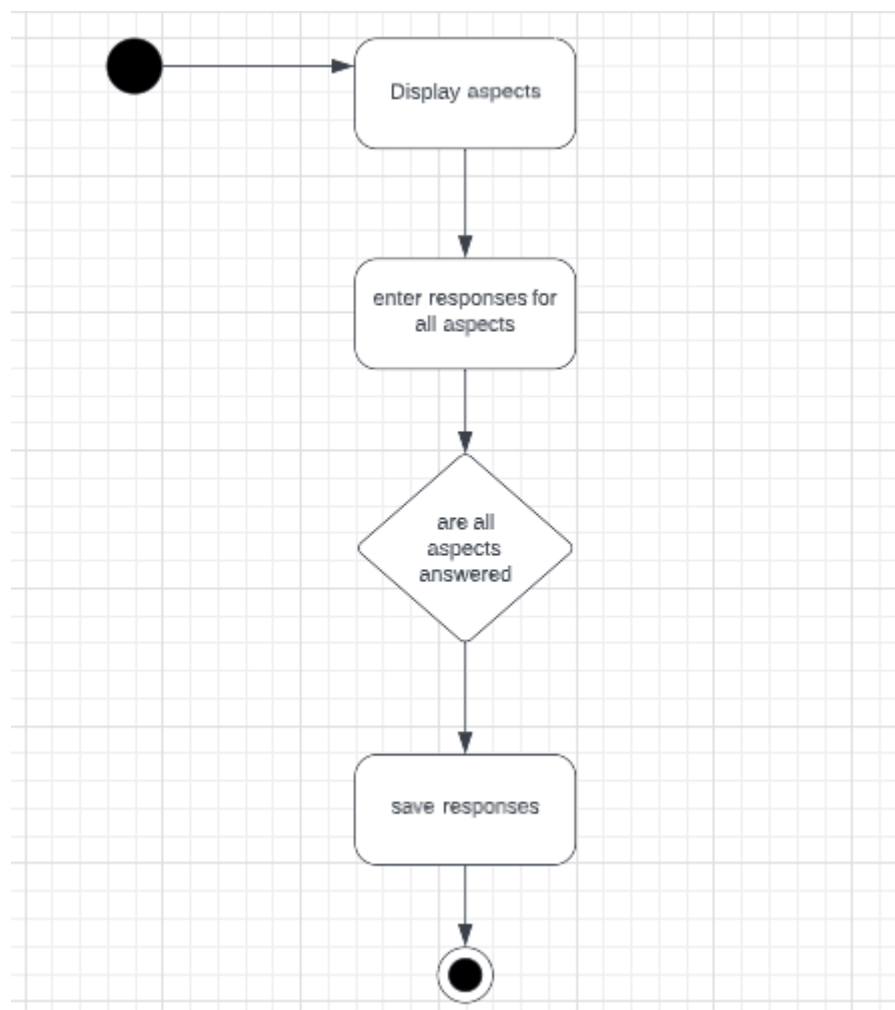


Figure 6.5: activity diagram for input

Second iteration

The model receives input from the SSE represented as shown in Figure 6.5. The input given is used to calculate the average scores as well as the weighted average score for each dimension. A total weighted average is then calculated by adding the weighted average scores for each dimension. The total weighted average is used to set the minimum acceptable threshold for each dimension and calculate the minimum threshold. In other words, Figure 6.5 summarises the process of computing scores for an SSE under evaluation.

Activity diagram to compute scores

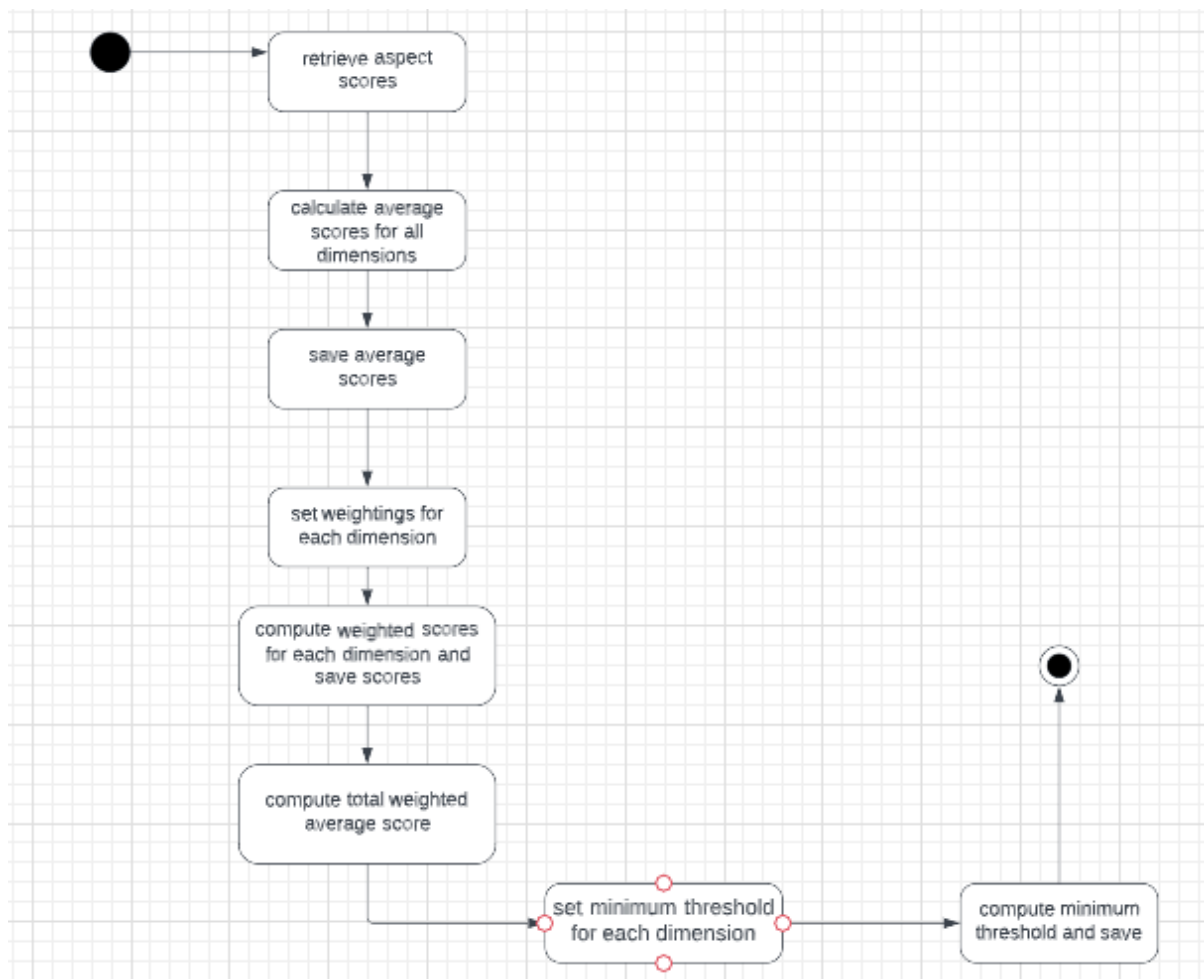


Figure 6.6: activity diagram to compute scores

Third iteration

Activity diagram to decide on sse status



Figure 6.7: activity diagram to decide on the status

Final output of phase

The activities of the model and their flow are depicted in Figure 6.8 below.

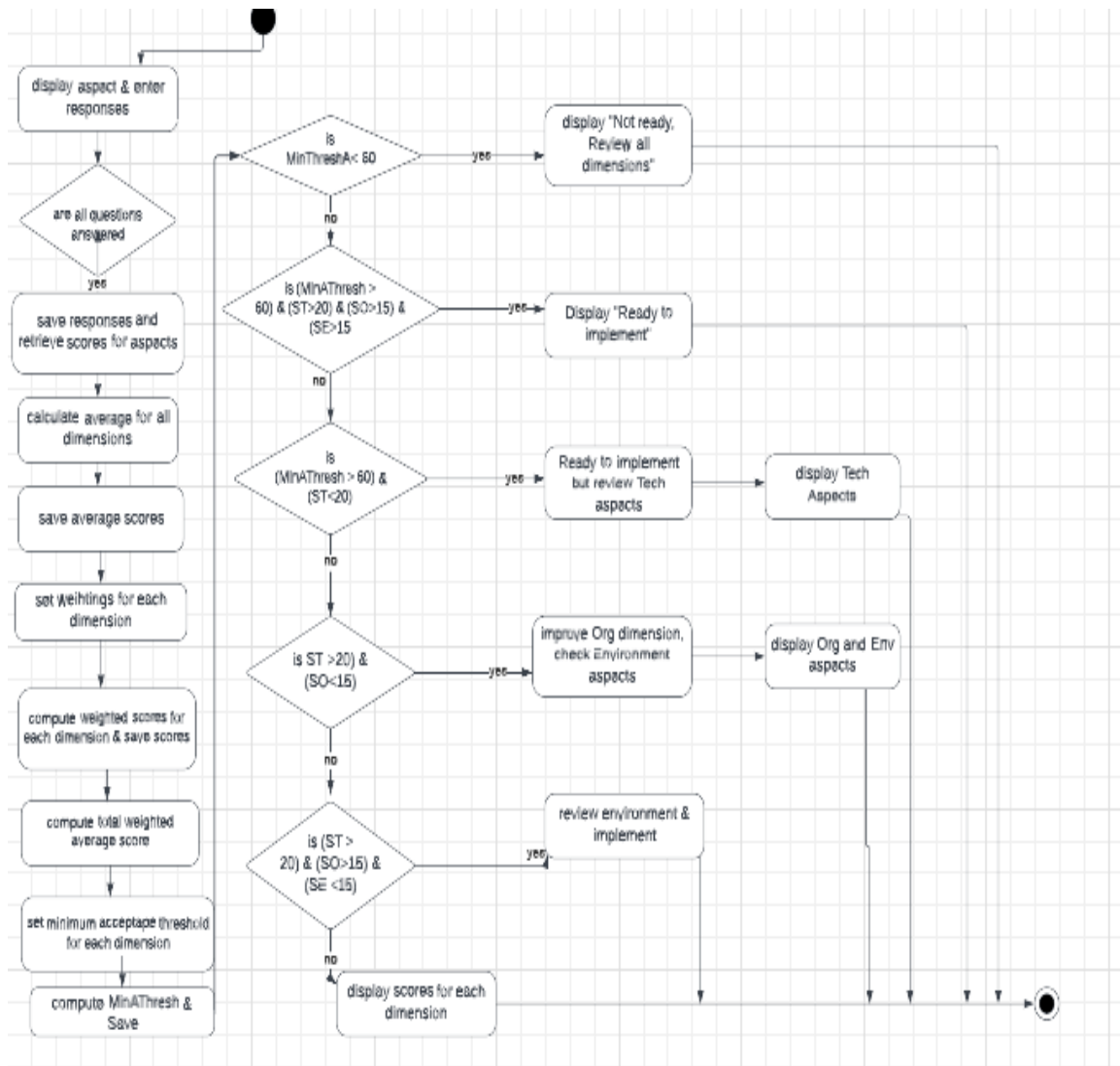


Figure 6.8: activity diagram for the whole model

6.2.4 Design by feature

The design phase involves developing alternative solutions that meet the model requirements to inform the implementation phase. Activity diagram, input and output interface sketches were drawn to depict the proposed model.

Activity diagrams

Figure 6.9 shows the model activities and their relationships.

First iteration

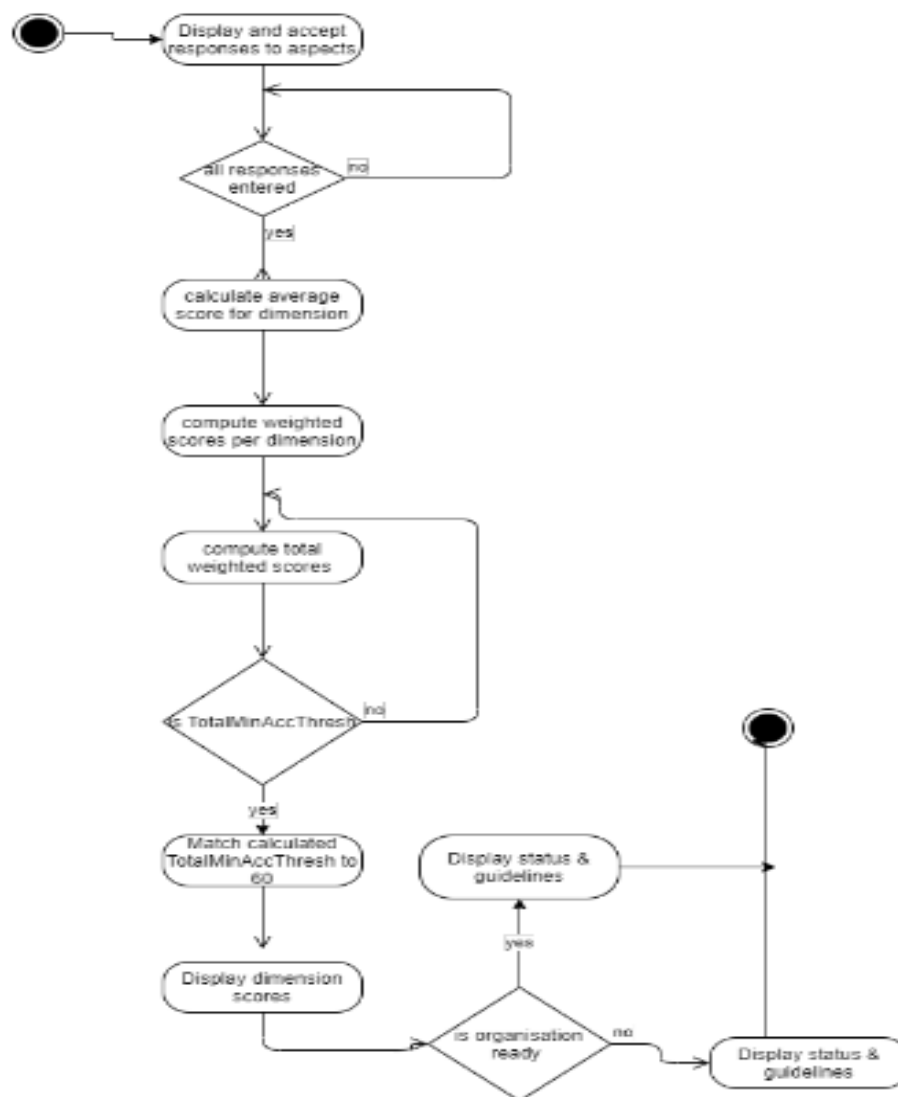
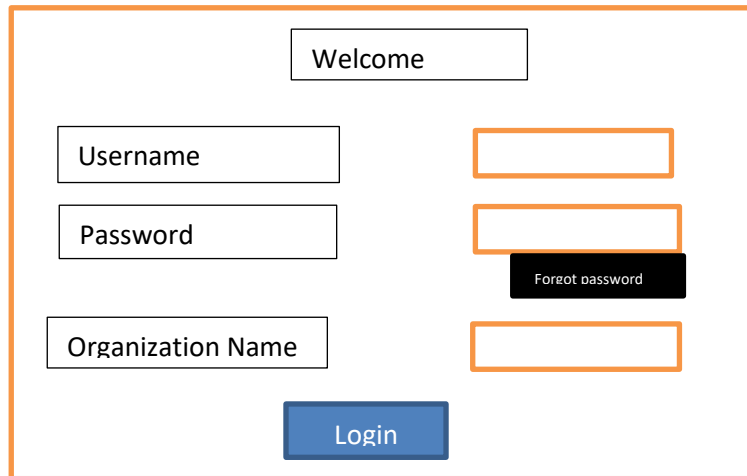


Figure 6.9: Activity diagram

Second iteration

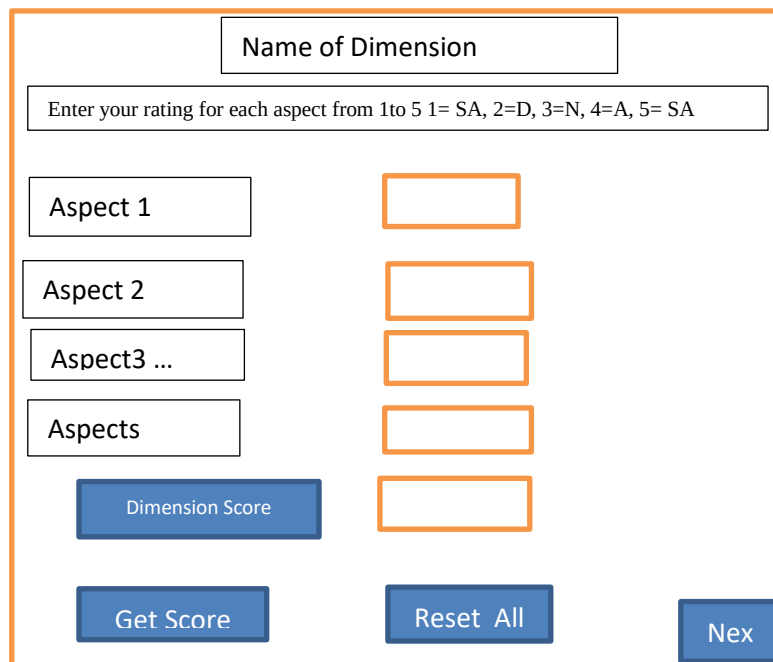
At this design stage, interface sketches were produced to inform the coding stage. The following figures show the designs of the input interfaces.



The login screen interface sketch is enclosed in an orange border. At the top center is a white box labeled "Welcome". Below it, on the left, are three stacked white input boxes labeled "Username", "Password", and "Organization Name". To the right of these are three corresponding orange-outlined input boxes. A black button labeled "Forgot password" is positioned between the "Password" and "Organization Name" input boxes. At the bottom center is a blue button labeled "Login".

Figure 6.10: Login Screen

The login screen in Figure 6.10 is the first interface that allows an organisational representative to enter their username, password and organisation name and access the evaluation process. A user can reset their password by clicking the forgot password button.



The input screen for dimension aspects rating interface sketch is enclosed in an orange border. At the top center is a white box labeled "Name of Dimension". Below it is a white box containing the instruction "Enter your rating for each aspect from 1to 5 1= SA, 2=D, 3=N, 4=A, 5= SA". Below this instruction are four stacked white input boxes labeled "Aspect 1", "Aspect 2", "Aspect3 ...", and "Aspects". To the right of these are four corresponding orange-outlined input boxes. Below the "Aspects" input box is a blue button labeled "Dimension Score". At the bottom are three blue buttons: "Get Score" on the left, "Reset All" in the center, and "Nex" on the right.

Figure 6.11: Input screen for dimension aspects rating

Figure 6.11 is the design for the input screen where the SSE representative would enter the rating for each aspect defined in a given dimension. The dimension name would be shown at the top of the screen and all the aspects listed. The number of aspects appearing on the screen depend on how many aspects were defined for that dimension. An input field will capture the score that the representative assigns for an aspect. The **Get Score** button displays the average score for the dimension as the value for the **Dimension Score** field. When all aspects have been rated, the **Next** button directs the user to the rating of the next dimension. In case of an error in entering the scores, the **Reset All** button allows the user to re-enter the ratings. A **Save** button will replace the **Next** button on the input screen for the last dimension to ensure that an SSE's scores are stored.

Third iteration

This phase of design involves making improvements to existing designs, ensuring that the feedback from evaluators and other stakeholders is considered and effected in the design. Refinements were made to the input screens and output screens were designed as shown in the following figures.

Decision	
Relative Advantage	
Compatibility	
Technology	
Organisation	
Environment	
View Decision	

Figure 6.12: Results for each dimension

The outcomes for each dimension are displayed as shown in Figure 6.12. The decision of whether the SSE is ready to implement a BIS considering a dimension will be printed against the dimension name. The “View Decision” button may be used to view a consolidated report about the whole evaluation. Figure 6.13 shows the report interface.

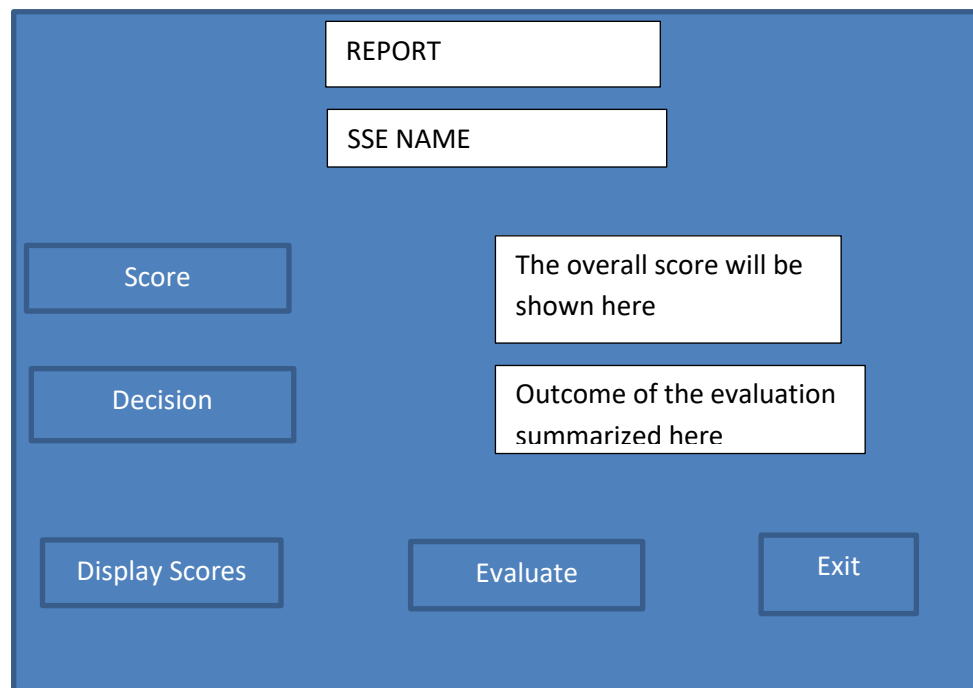


Figure 6.13: Interface for evaluation report

The interface shown in Figure 6.13 is displayed when the user selects the “View decision” button in figure 6.12. It shows the name of the SSE, its overall Score calculated from all the dimensions as well as the final decision. The SSE’s representative may view specific scores by selecting the “Display Scores” button, selecting the “Evaluate” to start a new evaluation and may use “Exit” to log out and exit the evaluation process.

6.2.5 Build by feature

This phase involves creating the features of the system and ultimately coding the model. At the end of this phase, a complete model is presented. Various tools used in building the model features are described below.

Class diagram

A class diagram shows the objects that make up the model in the form of classes, methods and key variables in each class. The key classes for the model are shown in Figure 6.14. The key functions were translated to classes in coding using the Java programming language.

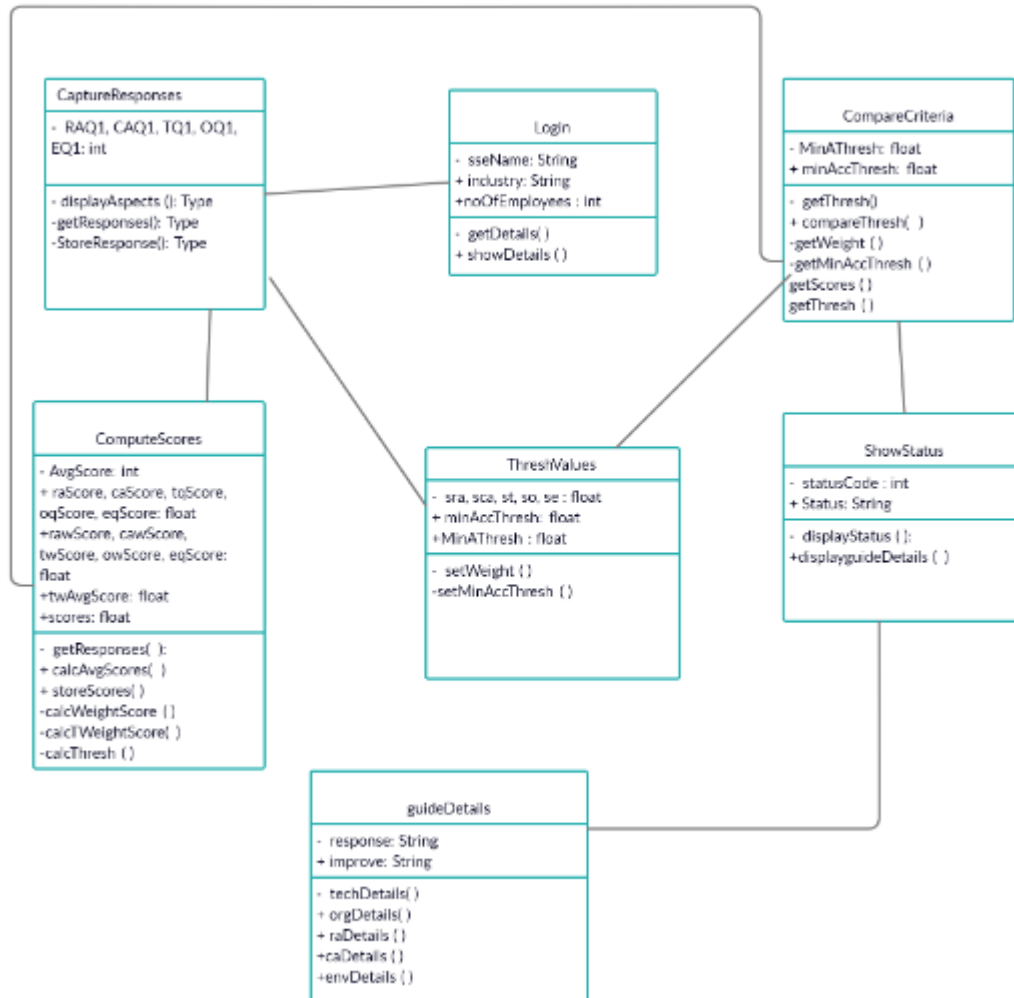


Figure 6.14: Class diagram for Proposed model

Code snippets

The model was implemented in Java programming language. The extracts of code to implement the key features of the model are included in Appendix G and labelled Code Snippets. The code for the whole model is in Appendix E.

It is important to note that the methodology adopted to implement this model allows for several iterations of this design phase. The final code only has been included in this thesis.

6.3 Model testing

Testing is the process of verifying whether the model accepts the intended input, processes it and produces the expected output. Desk checking and walkthroughs were suggested by [40] as methods that may be used to test models. In desk checking, the model had different data

responses from the responding SSEs as inputs, the model executed with the test input and the outcome noted. Different inputs were entered, and the test was conducted several times to verify the validity of the results produced by the model. In essence, desk checking was conducted to test the validity, consistency and accuracy of the model. The fact that the model produced the same output given a specific input is evidence that the model is consistent and accurate.

The test plan describes the activities that were carried out throughout the model's design and development to identify and correct the model's malfunctions and errors. The activities were aimed at ensuring that the designed model is correct, efficient, consistent and complete. Several test cases were designed and executed at various stages of the model's design and development.

6.3.1 Unit Test cases

A detailed outline of activities that must be carried out or conducted on a prototype is referred to as a test case [6]. Table 6.2 summarises the test cases that were conducted to ensure that the model units are properly functional based on the correctness, efficiency, consistency and completeness dimensions. The test cases described may be called unit tests as they test the different functionalities of the system/ model independently.

Table 6.2: Unit Test cases and results

Test description	Expected outcome	Dimension tested	Test results
Questions grouped by dimensions	Each dimension displays the correct number of aspects defined in that dimension.	Correctness, completeness	All aspects are displayed under the correct dimension.
Confirm weights are set for dimensions	Weights for each dimension stored in a system	Correctness, completeness	Dimension weights displayed proving that they were set.
Check if correct thresholds for dimensions are set	Thresholds for all dimensions set and displayed	Correctness, completeness	All thresholds are set for dimensions.
Capture organisational details	Prompt to enter SSE details	Correctness	The screen displayed a prompt for SSE details

All the questions displayed to prompt responses	Display aspect questions by dimension	Correctness, efficiency, completeness	Answer options for every question are displayed on a likert scale.
User responses are saved in the system	Responses to each question to be saved for later retrieval	Correctness, accuracy	Responses are stored in the system without errors.
Display user responses	User responses to all aspects retrieved and displayed	Correctness, accuracy	List of responses displayed per dimension.
Display dimension weights	Correct weights displayed for each dimension	Correctness. Accuracy, consistency, completeness.	Set dimension weights were displayed and compared to what was captured.
calculate average score	The average score value is correct given the responses per aspect	Correctness, accuracy, consistency, completeness	Average scores for each dimension were calculated and stored.
Compute dimension weighted scores	The correct value of the weighted score calculated for each dimension	Accuracy, correctness, validity, consistency	Dimension weighted scores are correctly calculated and stored.
Compute the total weighted score	Correct total weighted score	Accuracy, validity, correctness	The total weighted score was calculated for all dimensions and stored.
Compare total weighted scores to the threshold for each dimension	Correct outcome after comparison displayed.	Accuracy, validity	Total weighted scores matched to thresholds and results were verified.
Display dimension scores	Correct scores for each dimension are displayed	Correctness, Accuracy, completeness.	All scores for all dimensions are displayed correctly.
Display status	Display SSE readiness status based on the calculated scores	Correctness, Accuracy, Efficiency, validity	A statement of whether the SSE is ready or not to implement BIS is displayed.
Guidelines for dimension improvements	Display the guidelines for improvements for	Accuracy, Correctness, completeness.	Guidelines on dimensions that need

	dimensions that scored below the threshold.		to be improved are displayed.
--	---	--	-------------------------------

The testing process was iterated to ensure that the model is refined as many times as possible and is acceptable. The first test was to verify if all the aspects of the framework had been captured in the model. Verification of the aspects by dimension was conducted by comparing what the model prototype displayed to the components of the framework as outlined in Chapter 5. The test results displayed that all the aspects had been incorporated under the correct dimensions as shown in Figure 6.15 for the Environment dimension

Environment

Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AN 5 is STRONGLY DISAGREE

Availability of data analysis service in house	
Competitors using BISs	
Funding capital requirements	
Availability of BIS support	
Availability of BIS relevant to operations	

Score : 0

Figure 6.15: Aspects of the Environment dimension

The readiness of an SSE to implement BIS is largely influenced by the availability of resources and satisfaction with the critical success factors. The weights assigned to the dimensions help to assess the SSE hence the importance of the task to set the weights for each dimension. The test case involved verifying the setting of these weights to ensure that the correct weight was assigned to the desired dimension. Figure 6.16 shows the results of this test.

```

public void setMinnumThreshold(){
    double SRA = 0.10;
    double SCA = 0.05;
    double ST = 0.20;
    double SO = 0.15;
    double SE = 0.10;

    double MinATHresh = SRA+SCA+ST+SO+SE;

    if(totalWeightedAverageScore < MinATHresh){
        decision.setText("Not ready review all dimensions");
    }
    else if(totalWeightedAverageScore>0.6 & tech > 0.2 & org >0.15 & env > 0.1){
        decision.setText("Ready to adopt");
    }
    else if(totalWeightedAverageScore>.06 & tech < 0.2 ){
        decision.setText("Ready to adopt, improve the Technology dimension and Implement");
    }
    else if(tech > 0.2 & org <0.15 ){
        decision.setText("Improve Organisation dimension, check environment");
    }
    else if(tech > 0.2 & org >0.15 & env < 0.1){
        decision.setText("Review Environment and Implement");
    }
}

```

Figure 6.16: setting weights for dimensions

Setting the dimension thresholds is another important aspect of the model, which contributes to the final SSE evaluation for readiness. The test involved querying the model for the thresholds to verify if the result set was consistent with the thresholds defined in the developed framework. Results show that all thresholds were appropriately mapped to the dimensions as shown in Figure 6.16.

The model is designed to evaluate one SSE at a given instance by capturing that SSE's responses to the various aspects in dimensions. It is important to record the SSE details so that appropriate guidelines may be suggested as part of the evaluation process. To address this feature, a test to save the SSE details and retrieve them was conducted. The details displayed as the output were the same as what was input suggesting that the model is correct and efficient in this regard.

A test was conducted to check if all aspects and response fields could be displayed. The results in Figure 6.17 show that the model displays the aspects and prompts the SSE representative for responses by rating his or her organisation against the displayed Likert scale responses.

Organisation

Enter your rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY DISAGREE

Factors hindering BES adoption	
Knowledge in BES	
Capital requirements	
Readiness to migrate	
Availability of BES that support the processes	
Change and reception of change by organisational stakeholders	

Compatibility

Enter your rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY DISAGREE

Availability of hardware and software resources for BES use	
Data storage and accessibility	
Use of data in decision making process	
Impact of new technologies on data management	
Change process in organisation	
Prior BES knowledge	
BES usage by competitors	
Participate in BI related issues	
BIS expertise in organisation	
Data analysis expertise in organisation	

Technology

Enter your rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY DISAGREE

Currently used systems and hardware	
Ease of use of current software, security	
Software license issues	
Availability of data analysis software	
Defined data handling procedures and adherence	
Review of data handling procedures	

Figure 6.17: Dimensions, aspects and Likert Scale response fields

To ensure the correctness of the model, a test was done to check if the SSE representative's responses are saved by the system. To further prove that the model has completed the saving process, another test to retrieve the stored responses was done. The results of the retrieved test are shown in Figure 6.18.

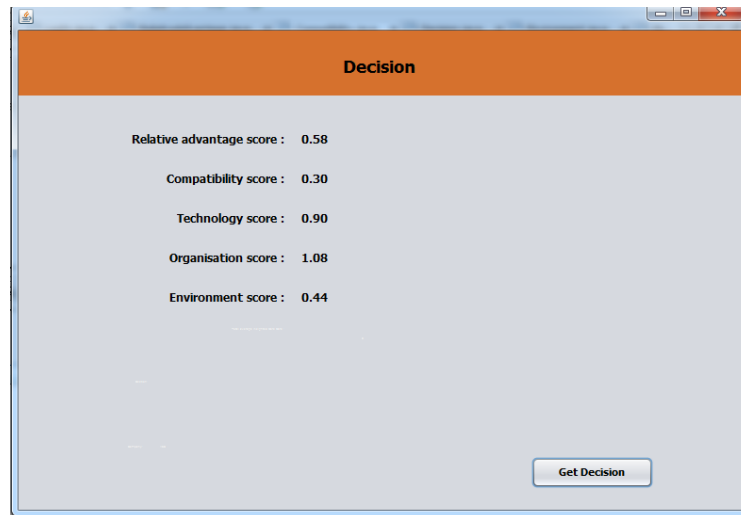


Figure 6.18 Test to display scores from stored responses

A calculation of the average score for dimensions is another test case conducted for the model. The test involved retrieving the scores captured as responses to the aspects and computing the average. A comparison of the model results to the manual calculation showed the same results. When the same responses were captured in another instance, they returned the same average. These results are evidence that the model is accurate and consistent.

The other test was to calculate the total weighted score and compare it to the set threshold. Manually calculated values were compared to those computed by the system and they were similar. The comparison resulted in a display of a readiness status for the SSE as shown in Figure 6. 17.

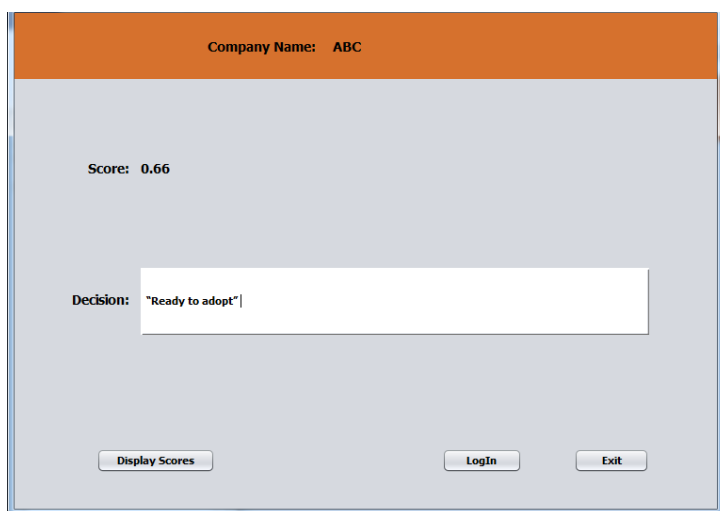


Figure 6.19 Total Score and Readiness status for SSE

One of the objectives of the model is to guide an SSE on the improvements they need to make if they are to implement a BIS successfully. A test was done to check if the system displayed the guidelines for the SSE based on the calculated total weighted score and comparison to the threshold. The test results in Figure 6.19 showed that the calculations were correct and appropriate guidelines displayed.

Appendix F contains more screenshots generated during the testing phase of the model.

6.3.2 Integration testing

Integration testing is done to link all the model functions and units together. The aim is to ensure that the units flow logically from start to end of the system. Results of the integration tests are shown as part of the system testing in section 6.3 where every function is tested as part of the whole system simulation.

6.3.3 System testing

System testing is a test of the whole integrated systems functions or requirements. The system is tested from the first function to the last function and includes testing the non-functional requirements [41].

Table 6.3: System testing

Test description	Expected Outcome	Dimension tested
Users can login	Users must login using valid credentials	First line security-authentication
View the main menu	Display of the main menu after clicking OK from the Login screen	Correctness- logical flow of model activities
Display aspects for dimensions	Display aspects and response prompts for each dimension else display error	Correctness- is the system able to retrieve the aspects and dimensions as expected
Check if responses entered are saved	Responses were captured and scores were allocated for each aspect. A summary of the scores is to be displayed on the show summary screen.	Correctness and completeness- The model is expected to support this feature by giving correct results.

	If no results are shown, then the process has errors or cannot be completed correctly The technique called desk checking may be used to give input and record results. Test conducted several times to verify if the same outcome will be produced. Test with the same responses and with different responses	Efficiency and consistency
Verify if response scores are correct	The score details must match the score summary details A mismatch suggests improper scoring functionality	Correctness and completeness- does the model perform the scoring as expected and does it perform this function in addition to other expected functions?
Button and option functions	All buttons and options to perform what they are meant to perform. The walkthrough technique is used by a different person from the developer.	Correctness- the buttons are expected to work as defined. Logic – are the functions flowing and doing what they are supposed to do.
Logical check Display aspects and rating scale Save responses Comparison check of scores to set criteria Display scores for dimensions Display overall decision Display improvement guidelines Exit if the exit command is clicked	The model must be able to support these activities as they should flow in their order of execution The model must terminate after suggesting a decision based on the responses to the aspects and dimensions. Walkthrough conducted by another person other than the developer or researcher.	Logical correctness and completeness. completeness
Errors during execution	No errors are expected	Correctness and efficiency
Model Speed	Use a timing device to count how many operations may be performed by the model within the stated time Calculate time efficiency as	Time and Efficiency

	$T_n = C_{op}C_n$ where T_n is running time, C_{op} execution time for basic operation and C_n number of times the basic operation is executed. Use worst case, best case and an average case for different input sizes.	
--	---	--

6.4 Model simulation

To test the complete functionality of the model, one SSE's responses were used as input into the model and the results of the evaluation process were noted. A questionnaire was randomly selected from the responses collected during the data collection stage and the responses that were given were input for the various aspects as defined in the dimensions. The model, considering the input, displayed the scores for each dimension, the overall decision of the SSE's readiness to adopt BIS as well as guidelines of the dimensions that required improvement if the SSE could implement a BIS.

A set of screenshots, showing the step-by-step simulation is in Appendix F together with a manual of how prospective users may use the model.

6.5 Conclusion

The chapter described the design and development of the model that SSEs can use to evaluate their resources for possible BIS adoption. Activities carried out at each phase of the FDD methodology were outlined as well as the results of each phase. To ensure the efficiency and effectiveness of the model, different types of testing were done to ensure that all aspects of the model design were confirmed. The next chapter is a conclusion and evaluation of the whole study.

CHAPTER 7 SUMMARY, CONCLUSION, AND RECOMMENDATIONS

7.1 Introduction

The chapter is a discussion of how the research questions were answered and the extent to which the research objectives were attained. An explanation of how each objective was attained, the challenges faced during the study, the limitations, recommendations and future work are included in this final chapter of the thesis.

7.2 Accomplished objectives

The objectives of this research were stated in Chapter 1 of the thesis as

RO1: critically review existing literature on current BIS in SSE models,

RO2: investigate the extent of BI adoption by SSEs in Namibia,

RO3: design a framework for BI implementation,

RO4: develop a hybrid model for implementing BI in SSEs,

RO5: evaluate the performance of the framework and model for correctness as a proof of concept.

Objective one, RO1 was attained through reviewed literature on the state of BIS adoption by SSEs and how BI implementation models may be designed, developed and implemented. Literature on the state of BIS adoption by SSEs globally revealed that the usage and adoption of BIS were low yet large organisations are using BISs in their operations. Lack of technical expertise to choose the right tools, the high cost of the BISs and the complexity of the BIS emerged as the key contributors to the low implementation rates. The results of this objective, discussed in Chapter 2 of this thesis, were used to inform the other objectives defined in this research. A discussion of how the other objectives were attained follows.

The second objective (RO2) was to investigate the extent of BIS adoption by SSEs in Namibia. The DOI and TOE theories and the IEM were identified from the literature as the main tools used to assess technology adoption hence the aspects defined by the theories were used to develop the questionnaire (Appendix B) that was distributed to SSEs in Namibia in an effort to measure the extent to which they have adopted BIS. The results in Chapter 4 of the thesis show that the SSEs in Namibia have not adopted BIS but may invest in BISs successfully if they embrace the aspects where they are well rated and address the aspects where they are lowly rated.

A hybrid framework for assessing an SSEs readiness to implement BIS marked the attainment of the third research objective (RO3). The aspects defined in DOI and TOE theories, the IEM and CSFs for BIS implementation identified from the literature were consolidated to produce a comprehensive framework. The more diverse aspects included in the framework ensured that the limitations of one adoption theory are addressed by the other theory. A discussion of the framework design is outlined in Chapter 5 of the thesis.

Research objective 4 (RO4) was to develop a model for BIS implementation. The outcome of RO3 was the blueprint for the model. Literature helped to identify the approaches that may be followed to develop and implement a model. The dimensions and aspects defined in the framework were implemented following the FDD methodology and implemented in Java programming language to produce software that SSEs could easily use to assess their readiness to adopt BIS. Chapter 6 of the thesis details how the objectives were achieved,

Intensive testing and simulation of the resultant model are evidence of the attainment of the fifth research objective. The framework and model were tested during development and evaluated by experts and the test results show that the model is correct and can help SSEs to evaluate their readiness to implement a BIS.

The achievements discussed in the preceding paragraphs show that all the research objectives defined for this study were attained.

7.3 Challenges faced

Like every other research, several challenges were encountered and the researchers were able to address all of them leading to the successful completion of the study.

The COVID- 19 pandemic posed the greatest threat to the study as it emerged that the data collection stage. The researchers had distributed questionnaires to other regions outside of their base area so as to collect responses from SSEs in Namibia, but it was difficult to collect all of the distributed ones since movement into and out of the region was restricted. The researchers analysed the collected questionnaires from those regions and noted a repetitive pattern in responses and no new data could be drawn from the new responses. We then decided to conclude the data collection process at that stage.

The nature of the model requirements delayed the speed of implementation of the model using Java. The features took time to implement and give satisfactory test results. The researchers

had to engage reviewers to give feedback for each feature implemented before integrating the whole model as the FDD methodology allowed iterations of the design and coding activities.

7.4 Research delimitations and limitations

The delimitations and limitations of the study include the following:

- i. the model was implemented using Java which has its limitations as a language.
- ii. The framework and model focus on the evaluation of the readiness of SSEs following a set of dimensions defined by the DOI and TOE theories, CSFs and IEM which are not the only theories for technology adoption.
- iii. The framework and model were designed for SSEs and may not be appropriate for medium to large-scale enterprises.

7.5 Conclusion

This study was aimed at evaluating the extent of BIS adoption by SSEs in Namibia and developing a framework and model that SSEs could use to evaluate their readiness to successfully adopt BIS. A review of literature highlighted the DOI, TOE theories as common tools for assessing an organisation's readiness to adopt technology. These theories were analysed to identify factors influencing the adoption of BIS. Other relevant factors were derived from the CSFs that other researcher identified in their work. This study thus combined factors identified from the theories (DOI and TOE), CSFs with the IEM to derive the proposed hybrid framework.

The findings from literature helped the researchers to evaluate the extent of BIS adoption by SSEs in Namibia. The results showed that SSEs lack infrastructure, skills and finances required for BIS implementation. The few that use some software, for example Microsoft Office to store and manage the data generated in their operations. Although employees are willing to participate in BIS, technology, organisation and environment factors hinder the BIS adoption. The evaluation showed that Namibian SSEs have not adopted BISs despite the chances that BISs could improve their performance as summarised in Table 4.13 of this thesis.

The results of the survey also informed the definition of a framework and model that SSEs could use with ease, to evaluate their readiness to adopt BISs. The framework was developed following guidelines defined by [57], the FDD Agile methodology followed to design the model and Java was used to implement the model. Desk checking and walkthroughs by peer

experts were conducted to test the outputs for correctness, efficiency and accuracy. A simulation of the model using one of the SSE's responses to the questionnaire was some as part of testing.

The whole study can be regarded successful as all the RQs were answered and ROs attained as explained in section 7.2 of this thesis. Like all studies, challenges were experiences (section 7.3), limitations identified (section 7.4) which may be addressed by future work as suggested in section 7.6 of this thesis.

7.6 Recommendations and future work

Future research in the area of BIS implementation may focus on evaluating the benefits that SSEs could realise from adopting the BIS. Researchers may review the proposed framework to include more dimensions that may not have been included. The addition of dimensions to the framework will make it more comprehensive and increase its relevance for use by organisations the world over, who intend to undertake BIS implementation projects. The readiness assessment tool produced in this study may be adopted to inform the design of new tools that may be used to guide the implementation as well as measure the benefits that the SSEs would realise as a result of a successful implementation. We therefore recommend the SSEs to use our tool to evaluate their readiness to reduce the risks and costs of implementation failures.

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APPENDICES

APPENDIX A- Ethics approval letter of study



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: 018 299-1111/2222
Fax: 018 299-4810
Web: <http://www.nwu.ac.za>
Senate Committee for Research Ethics
Tel: 018 299-4849
Email: nkosi@ethics.nwu.ac.za

ETHICS APPROVAL LETTER OF STUDY

Based on the review by the **Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)**, the Committee hereby clears your study as no ethical risk. This implies that the FNASREC grants permission that, provided the general conditions specified below are met, the study may be initiated, using the ethics number below.

Study title: A hybrid framework for business intelligence systems adoption by small scale enterprises in Namibia	
Study Leader/Supervisor: Prof BM Esietarienne	
Student: TT Chikohora	
Ethics number:	N W U - 0 1 2 4 7 - 1 9 - A 9
Institution Study Number Year Session	
Study: E = Submission; R = Re-Submission; P = Pre-submission; A = Approval	
Application type: Single	Risk Category: No Risk
Commencement date: 01/02/2019	
Expiry date: 31/08/2023	

General conditions:

The following general terms and conditions apply:

- The commencement date indicates the date when the study may be started.
- In the interest of ethical responsibility, the NWU-SCRE and FNASREC reserves the right to:
 - request access to any information or data at any time during the course or after completion of the study;
 - to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;
 - withdraw or postpone approval if:
 - any unethical principles or practices of the study are revealed or suspected;
 - it becomes apparent that any relevant information was withheld from the FNASREC or that information has been false or misrepresented;
 - submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or
 - new institutional rules, national legislation or international conventions deem it necessary.
- FNASREC can be contacted for further information or any report templates via Roelof.Burger@nwu.ac.za 018 299 4269

The FNASREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the FNASREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely,

Prof Roelof Burger
Chairperson Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)

APPENDIX B- Questionnaire

Name of organisation.....

Region Number of employees.....

Please indicate the extent to which you agree or disagree with the following statements.
Mark your response with an 'X'.

SD= Strongly Disagree D= Disagree N= Neutral A= Agree SA= Strongly Agree

	SD	D	N	A	SA
Awareness					
1. Have you heard about Business Intelligence Systems?					
2. Are competing businesses using Business Intelligence Systems?					
3. If a Business Intelligence programme is conducted, are you willing to participate					
4. What fears do you have about Business Intelligence Systems					
i. Cost					
ii. Knowledge and skills					
iii. Failure of Business Intelligence System to match business operations					
iv. Other , specify					
1. 3.					
2. 4.					
5. What has hindered the adoption of BIS in your organisation					
i. Lack of knowledge on BI benefits					
ii. Shortage of expertise to implement BI					
iii. Investment capital					
iv. Difficult to migrate to new system					
v. Failure by available BIS to support business processes					
vi. Resistance to change (prefer to work with what we are used to)					
6. Investing in BI will :					
i. Improve operational efficiency					

ii. Reduce operational costs					
iii. Improve performance					
iv. Increase competitive advantages					
v. Improve decision making					
Information Characteristics					
1. The organisation uses computers					
2. Data is stored in employees' personal computers					
3. There is a computer in every department that stores all data generated in that department					
4. All organisational data is centrally stored					
5. Data is collected regularly					
6. Collected data is analysed to inform decisions					
7. Employees can easily access organisational data when required to					
8. Data is stored in a format that may be easily understood					
9. It is easy to convert data into formats required by regulatory authorities					
10. Investing in computer technologies will improve the way data is managed in your business					
Knowledge process					
1. There is a regular and systematic way of handling data					
2. Employees in the same department follow the same process to manage data.					
3. All employees in the organisation use the same data handling system.					
4. There are plans to introduce new data handling processes.					
5. Data handling process is in line with other enterprises					
Human Capital					
1. Majority of employees are computer literate					
2. Most of the employees do not have data analysis skills					
3. The organisation relies on outsourcing data analysis services					
4. Most employees can use computer software to manage and analyse data					

5. Decision making software is available in the organisation.					
6. Majority of employees can use advanced decision making software					
Organisational Culture					
1. Employees work in teams					
2. Employees have freedom to express their ideas					
3. Employees embrace change					
4. Most employees will accept change if it benefits them					
5. Many projects to change business processes failed					
6. Employees take change as an opportunity rather than a threat to their jobs.					
Current systems					
1. Organisation uses basic software to generate reports State software names i. ii. iii.					
2. There is software to keep data in standard formats					
3. The software allows users to easily execute queries					
4. The software upholds the rights and permissions to data based on user role in business processes.					
5. There is software that helps in analysing data to show patterns and relationships in the data.					
6. There is software that helps employees to track business activities and reports exceptions.					

End

APPENDIX C- Research participant consent letter

Consent form for research participants

I _____ of _____ hereby
give my consent to participate in the study " A hybrid framework for business intelligence
systems adoption by small scale enterprises in Namibia" being conducted by Teresa T.
Chikohora a student at North West University under the supervision of Professor B. M.
Esiefarienhe and Professor N. Gasela.

I certify that the research objectives and study have been explained hence my consent to
complete the questionnaire and respond to interview questions if need be. I understand that I
can withdraw from this study at any time without any victimisation and that the information I
provide will be kept confidential.

Signed :

Date :

Any queries may be directed to:

1. Teresa T. Chikohora

Telephone 0813984421

teressachiko@gmail.com.

2. Prof Esiefarienhe

email Michael.Esiefarienhe@nwu.ac.za

APPENDIX D- Research introduction letter

North West University

Mmabatho

Mafikeng

South Africa

Dear _____

I am carrying out a study on "A hybrid framework for business intelligence systems adoption by small scale enterprises in Namibia" in partial fulfilment of the requirements of the PhD in Computer Science at North West University, Mafikeng, South Africa. The study is aimed at assessing the adoption of Business Intelligence Systems by Small Scale Enterprises in Namibia and developing a framework and model that SSEs may use as a guideline to successfully implement BIS in their enterprises.

Attached is a questionnaire which contains 3 pages and may take less than 15 minutes to complete. Please fill out the form at your earliest convenience, the researcher will collect the completed forms. Your consent to participate in this study will be greatly appreciated. A consent form is also attached if you decide to be part of this study which will go a long way in the development of SSEs in Namibia.

Please contact the undersigned for any queries.

Yours faithfully

Teresa Chikohora teressachiko@gmail.com

PhD Computer Science Candidate

North West University

Mafikeng

South Africa

APPENDIX E- Model source code

The code for the model is presented feature by feature as it was done following methodology.

Log in page

```
/*
 * 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 Dimension;

import static Dimension.Compatibility.WSOutput;
import java.io.BufferedWriter;
import java.io.FileWriter;
import java.io.IOException;
import javax.swing.*;

/**
 *
 */

/**
 * Creates new form LogIn
 */
public class LogIn() {
    initComponents();
}
FileWriter fileWriter;

/**
 * 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() {

    jPanel1 = new javax.swing.JPanel();
    jPanel2 = new javax.swing.JPanel();
    jLabel1 = new javax.swing.JLabel();
    jLabel2 = new javax.swing.JLabel();
    jUsername = new javax.swing.JTextField();
    jPassword = new javax.swing.JPasswordField();
    CompanyName = new javax.swing.JLabel();
    jCheckBox1 = new javax.swing.JCheckBox();
    jLabel4 = new javax.swing.JLabel();
    jButton2 = new javax.swing.JButton();
    jLabel7 = new javax.swing.JLabel();
    CompanyNameTextFeild = new javax.swing.JTextField();
    jLabel6 = new javax.swing.JLabel();

    setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

    jPanel2.setBackground(new java.awt.Color(247, 243, 242));

    jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
    jLabel1.setText("Welcome Back");

    jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel2.setText("Username");

    jUsername.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jUsername.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jUsernameActionPerformed(evt);
        }
    });

    jPassword.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N

    CompanyName.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    CompanyName.setText("Company Name");

    jCheckBox1.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
    jCheckBox1.setText("Remember Me");

    jLabel4.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
    jLabel4.setForeground(new java.awt.Color(255, 0, 0));
    jLabel4.setText("Forget your password");

    jButton2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jButton2.setText("Login ");
    jButton2.setBorder(null);
    jButton2.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButton2ActionPerformed(evt);
        }
    });

    jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
```

```

jLabel7.setText("Password");

CompanyNameTextFeild.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N

javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
jPanel2.setLayout(jPanel2Layout);
jPanel2Layout.setHorizontalGroup(
    jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
            .add(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(jLabel1)
                .addGroup(jPanel2Layout.createSequentialGroup()
                    .add(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .add(jPanel2Layout.createSequentialGroup()
                            .addGap(159, 159, 159)
                            .addComponent(jLabel1))
                        .addGroup(jPanel2Layout.createSequentialGroup()
                            .addGap(80, 80, 80)
                            .addGroup(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)
                                .addComponent(jLabel2)
                                .addComponent(jUsername, javax.swing.GroupLayout.DEFAULT_SIZE, 267, Short.MAX_VALUE)
                                .addComponent(CompanyName)
                                .addComponent(jButton2, javax.swing.GroupLayout.DEFAULT_SIZE, 267, Short.MAX_VALUE)
                                .addComponent(jLabel7)
                                .addGroup(jPanel2Layout.createSequentialGroup()
                                    .addComponent(jCheckBox1)
                                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                                    .addComponent(jLabel4))
                                .addComponent(jPasswordField, javax.swing.GroupLayout.DEFAULT_SIZE, 267, Short.MAX_VALUE)
                                .addComponent(CompanyNameTextFeild))))
                            .addContainerGap(77, Short.MAX_VALUE)))
            .addContainerGap())
);

jPanel2Layout.setVerticalGroup(
    jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
            .add(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(jLabel1)
                .addGroup(jPanel2Layout.createSequentialGroup()
                    .addGap(23, 23, 23)
                    .addComponent(jLabel2)
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                    .addComponent(jUsername, javax.swing.GroupLayout.PREFERRED_SIZE, 35, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(29, 29, 29)
                    .addComponent(jLabel7)
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                    .addComponent(jPasswordField, javax.swing.GroupLayout.PREFERRED_SIZE, 37, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                    .addGroup(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                        .addComponent(jCheckBox1)
                        .addComponent(jLabel4))
                    .addGap(31, 31, 31)
                    .addComponent(CompanyName)
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                    .addComponent(CompanyNameTextFeild, javax.swing.GroupLayout.PREFERRED_SIZE, 37, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(45, 45, 45)
                    .addComponent(jButton2, javax.swing.GroupLayout.PREFERRED_SIZE, 35, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addContainerGap(81, Short.MAX_VALUE)))
            .addContainerGap())
);

jLabel6.setIcon(new javax.swing.ImageIcon(getClass().getResource("/images/Rating.jpg"))); // NOI18N

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .add(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addGap(18, 18, 18)
                .addComponent(jLabel6, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                .addGap(20, 20, 20))
            .addContainerGap())
);

jPanel1Layout.setVerticalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .add(jPanel2, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addComponent(jLabel6)
            .addGap(109, 109, 109))
);

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, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
);
layout.setVerticalGroup(
    layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
);

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

private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
    // TODO add your handling code here:
}

```

```

private void jButton2ActionPerformed(java.awt.event.ActionEvent evt) {
    String userName = jUsername.getText();
    String password = jPassword.getText();
    String companyName = CompanyName.getText();
    if (userName.trim().equals("admin") && password.trim().equals("admin") && !companyName.trim().equals(" ")) {

        try {
            FileWriter = new FileWriter("Sheet.txt", true);
            FileWriter.write("\n"+"n"+CompanyName.getText() + " : " +CompanyNameTextFeild.getText() +"\n"+"n");
            FileWriter.close();

            RelativeAdvantage rel = new RelativeAdvantage();
            RelativeAdvantage.CompNameText.setText(Login.CompanyNameTextFeild.getText());
            rel.setVisible(true);

        } catch (IOException ex) {
            JOptionPane.showMessageDialog(this, " Database connection failed....!!! ");
        }

        //this.dispose();
        setVisible(false);

    } else if(companyName.trim().equals(null)) {
        JOptionPane.showMessageDialog(this, " Please enter the Company Name.. ");
    } else{
        JOptionPane.showMessageDialog(this, " Invalid user.. ");
        jUsername.setText("");
        jPassword.setText(null);
        CompanyName.setText(null);
    }
}

/**
 * @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
public javax.swing.JLabel CompanyName;
public static javax.swing.JTextField CompanyNameTextFeild;
private javax.swing.JButton jButton2;
private javax.swing.JCheckBox jCheckBox1;
private javax.swing.JLabel jLabel1;
private javax.swing.JLabel jLabel2;
private javax.swing.JLabel jLabel4;
private javax.swing.JLabel jLabel6;
private javax.swing.JLabel jLabel7;
private javax.swing.JPanel jPanel1;
private javax.swing.JPanel jPanel2;
private javax.swing.JPasswordField jPasswordField;
private javax.swing.JTextField jUsername;
// End of variables declaration
}

Relative Advantage Dimension
/*
 * 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 Dimension;

import java.awt.event.ActionEvent;
import java.awt.event.KeyEvent;
import java.io.FileWriter;

```

```

import java.io.IOException;
import java.text.DecimalFormat;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
import javax.swing.JSpinner;
import javax.swing.SpinnerNumberModel;

/**
 *

 */

public class RelativeAdvantage extends javax.swing.JFrame {

    /**
     * Creates new form Technology
     */
    public RelativeAdvantage() {
        initComponents();

    }
    DecimalFormat dc = new DecimalFormat("0.00");

    public void actionPerformed(){
        int one =Integer.parseInt(input1.getText());
        int two =Integer.parseInt(input2.getText());
        int three =Integer.parseInt(input3.getText());
        int four =Integer.parseInt(input4.getText());
        int five =Integer.parseInt(input5.getText());
        int six =Integer.parseInt(input6.getText());

        int sum = one+two+three+four+five+six;

        double average = sum/6f;
        averageOutput.setText(String.valueOf(dc.format(average)));

        double weightedScore = average*0.15f;
        WSoutput.setText(String.valueOf(dc.format(weightedScore)));
    }
    FileWriter fileWriter;

    /**
     * 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() {

        jPanel1 = new javax.swing.JPanel();
        jLabel2 = new javax.swing.JLabel();
        jPanel2 = new javax.swing.JPanel();
        jLabel1 = new javax.swing.JLabel();
        input1 = new javax.swing.JTextField();
        jLabel3 = new javax.swing.JLabel();
        jLabel4 = new javax.swing.JLabel();
        jLabel5 = new javax.swing.JLabel();
        jLabel6 = new javax.swing.JLabel();
        jLabel7 = new javax.swing.JLabel();
        input4 = new javax.swing.JTextField();
        input5 = new javax.swing.JTextField();
        input2 = new javax.swing.JTextField();
        input6 = new javax.swing.JTextField();
        input3 = new javax.swing.JTextField();
        jLabel8 = new javax.swing.JLabel();
        jButtonNext = new javax.swing.JButton();
        jLabel9 = new javax.swing.JLabel();
        jButtonRestAll = new javax.swing.JButton();
        jButtonGetAverage = new javax.swing.JButton();
        jLabel10 = new javax.swing.JLabel();
        averageOutput = new javax.swing.JLabel();
        WSoutput = new javax.swing.JLabel();
        CompName = new javax.swing.JLabel();
        CompNameText = new javax.swing.JLabel();

        setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

        jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel2.setText("Improve operational efficiency");

        jPanel2.setBackground(new java.awt.Color(214, 113, 45));

        jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
        jLabel1.setText("Relative Advantage");

        javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
        jPanel2.setLayout(jPanel2Layout);
        jPanel2Layout.setHorizontalGroup(
            jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)

```

```

        .addGroup(jPanel2Layout.createSequentialGroup()
        .addGap(307, 307, 307)
        .addComponent(jLabel1)
        .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
    );
    jPanel2Layout.setVerticalGroup(
        jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
        .addGap(30, 30, 30)
        .addComponent(jLabel1)
        .addContainerGap(36, Short.MAX_VALUE))
    );

    input1.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            input1ActionPerformed(evt);
        }
    });
    input1.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input1KeyTyped(evt);
        }
    });

    jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel3.setText("Reduce operational costs");

    jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel4.setText("Improve organisational performance");

    jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel5.setText("Increase Competitive advantage");

    jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel6.setText("Improve decision making");

    jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel7.setText("Availability of data storage platforms");

    input4.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input4KeyTyped(evt);
        }
    });

    input5.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input5KeyTyped(evt);
        }
    });

    input2.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input2KeyTyped(evt);
        }
    });

    input6.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input6KeyTyped(evt);
        }
    });

    input3.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input3KeyTyped(evt);
        }
    });

    jLabel8.setText("Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE");

    jButtonNext.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jButtonNext.setText("Next");
    jButtonNext.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButtonNextActionPerformed(evt);
        }
    });

    jLabel9.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel9.setText("Score :");

    jButtonRestAll.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jButtonRestAll.setText("Rest All");
    jButtonRestAll.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButtonRestAllActionPerformed(evt);
        }
    });

    jButtonGetAverage.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jButtonGetAverage.setText("Get Score");
    jButtonGetAverage.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButtonGetAverageActionPerformed(evt);
        }
    });

```

```

    }
});

jLabel10.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
jLabel10.setForeground(new java.awt.Color(240, 240, 240));
jLabel10.setText("Weighted score :");

averageOutput.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
averageOutput.setText("0");

WSoutput.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
WSoutput.setForeground(new java.awt.Color(240, 240, 240));
WSoutput.setText("0");

CompName.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompName.setForeground(new java.awt.Color(240, 240, 240));
CompName.setText("Company:");

CompNameText.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompNameText.setForeground(new java.awt.Color(240, 240, 240));
CompNameText.setText("0");

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel2, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
                    .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(26, 26, 26)
                    .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(223, 223, 223))
                .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
                    .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(46, 46, 46))))
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addGap(86, 86, 86)
            .addComponent(jLabel8)
            .addContainerGap(109, Short.MAX_VALUE)
            .addGroup(jPanel1Layout.createSequentialGroup()
                .addGap(65, 65, 65)
                .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addGroup(jPanel1Layout.createSequentialGroup()
                        .addComponent(CompName)
                        .addGap(18, 18, 18)
                        .addComponent(CompNameText, javax.swing.GroupLayout.PREFERRED_SIZE, 69, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                            .addGroup(jPanel1Layout.createSequentialGroup()
                                .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                                .addComponent(WSoutput, javax.swing.GroupLayout.PREFERRED_SIZE, 34, javax.swing.GroupLayout.PREFERRED_SIZE)
                                .addGroup(jPanel1Layout.createSequentialGroup()
                                    .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                                    .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 47, javax.swing.GroupLayout.PREFERRED_SIZE)))
                            .addGap(272, 272, 272)))
                    .addGroup(jPanel1Layout.createSequentialGroup()
                        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                            .addComponent(jLabel7)
                            .addComponent(jLabel3)
                            .addComponent(jLabel2)
                            .addComponent(jLabel4)
                            .addComponent(jLabel5)
                            .addComponent(jLabel6))
                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)
                            .addComponent(input2, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
                            .addComponent(input4, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
                            .addComponent(input3, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
                            .addComponent(input1, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
                            .addComponent(input5, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
                            .addComponent(input6, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE))
                        .addGap(217, 217, 217))))
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .add(jPanel1Layout.createSequentialGroup()
                    .addComponent(jLabel2)
                    .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                        .addComponent(jLabel3)
                        .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                            .addComponent(jLabel4)

```

```

        .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addGroup(jPanel1Layout.createParallelGroup(GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addGap(14, 14, 14)
            .addComponent(jLabel5))
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
            .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
    .addGroup(jPanel1Layout.createParallelGroup(GroupLayout.Alignment.BASELINE)
        .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel6))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(GroupLayout.Alignment.BASELINE)
        .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel7))
    .addGap(21, 21, 21)
    .addGroup(jPanel1Layout.createParallelGroup(GroupLayout.Alignment.BASELINE)
        .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 19, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel9, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(GroupLayout.Alignment.BASELINE)
        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 27, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(CompName)
        .addComponent(CompNameText))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
    .addGroup(jPanel1Layout.createParallelGroup(GroupLayout.Alignment.BASELINE)
        .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addGap(8, 8, 8)
    .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(50, 50, 50))
);

javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
getContentPane().setLayout(layout);
layout.setHorizontalGroup(
    layout.createParallelGroup(GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
);
layout.setVerticalGroup(
    layout.createParallelGroup(GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.PREFERRED_SIZE)
);

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

private void input1KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input2KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input3KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input4KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input5KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input6KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
    }
}

```

```

        evt.consume();
    }
}

private void jButtonResetActionPerformed(java.awt.event.ActionEvent evt) {
    input1.setText(null);
    input2.setText(null);
    input3.setText(null);
    input4.setText(null);
    input5.setText(null);
    input6.setText(null);
    averageOutput.setText(null);
    WSoutput.setText(null);
}

private void input1ActionPerformed(java.awt.event.ActionEvent evt) {
    //if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5){
    //JOptionPane.showMessageDialog(this, " Enter only numbers from 1 to 5 ");
    //JSpinner spinner = new JSpinner();
    //spinner.setModel(new SpinnerNumberModel(0, null, 10, 1));

    //}
}

private void jButtonGetAverageActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        if(input1.getText().length()<=0 ||
            input2.getText().length()<=0 ||
            input3.getText().length()<=0 ||
            input4.getText().length()<=0 ||
            input5.getText().length()<=0 ||
            input6.getText().length()<=0){
            JOptionPane.showMessageDialog(null, " Please answer all the question...!!! ");
        }
        if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5 ||
            Integer.parseInt(input2.getText())<=0 || Integer.parseInt(input2.getText())>5 ||
            Integer.parseInt(input3.getText())<=0 || Integer.parseInt(input3.getText())>5 ||
            Integer.parseInt(input4.getText())<=0 || Integer.parseInt(input4.getText())>5 ||
            Integer.parseInt(input5.getText())<=0 || Integer.parseInt(input5.getText())>5 ||
            Integer.parseInt(input6.getText())<=0 || Integer.parseInt(input6.getText())>5){
            JOptionPane.showMessageDialog(this, " Please only enter numbers from 1 to 5...!!! ");
        }

        actionPerformed();

    }catch(Exception e){
    }

}

private void jButtonNextActionPerformed(java.awt.event.ActionEvent evt) {

    try {
        fileWriter = new FileWriter("Sheet.txt", true);
        //fileWriter.write(CompName.getText() + " : " + CompNameText.getText() + "\n");
        fileWriter.write("1. " + jLabel1.getText() + "\n" + "\n");
        fileWriter.write(jLabel2.getText() + " : " + input1.getText() + "\n");
        fileWriter.write(jLabel3.getText() + " : " + input2.getText() + "\n");
        fileWriter.write(jLabel4.getText() + " : " + input3.getText() + "\n");
        fileWriter.write(jLabel5.getText() + " : " + input4.getText() + "\n");
        fileWriter.write(jLabel6.getText() + " : " + input5.getText() + "\n");
        fileWriter.write(jLabel7.getText() + " : " + input6.getText() + "\n");
        fileWriter.write(jLabel9.getText() + averageOutput.getText() + "\n");
        fileWriter.write(jLabel10.getText() + WSoutput.getText() + "\n" + "\n" + "\n");

        fileWriter.close();
    } catch (IOException ex) {
        JOptionPane.showMessageDialog(this, " Database connection failed...!!! ");
    }

    Compatibility comp = new Compatibility();

    Compatibility.RAAS.setText(RelativeAdvantage.WSoutput.getText());
    Compatibility.CompNameText.setText(RelativeAdvantage.CompNameText.getText());
    comp.setVisible(true);
    setVisible(false);
}

/**
 * @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(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
} catch (InstantiationException ex) {
    java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
} catch (IllegalAccessException ex) {
    java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
} catch (javax.swing.UnsupportedLookAndFeelException ex) {
    java.util.logging.Logger.getLogger(Technology.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 Technology().setVisible(true);
    }
});
}

```

```

// Variables declaration - do not modify
public javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel WSOutput;
private javax.swing.JLabel averageOutput;
private javax.swing.JTextField input1;
private javax.swing.JTextField input2;
private javax.swing.JTextField input3;
private javax.swing.JTextField input4;
private javax.swing.JTextField input5;
private javax.swing.JTextField input6;
private javax.swing.JButton jButtonGetAverage;
private javax.swing.JButton jButtonNext;
private javax.swing.JButton jButtonRestAll;
private javax.swing.JLabel jLabel1;
private javax.swing.JLabel jLabel10;
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;
// End of variables declaration
}

```

Technology Dimension function

```

/*
 * 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 Dimension;

```

```

import java.awt.event.ActionEvent;
import java.awt.event.KeyEvent;
import java.io.File;
import java.io.FileWriter;
import java.io.IOException;
import java.text.DecimalFormat;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
import javax.swing.JSpinner;
import javax.swing.SpinnerNumberModel;

/**
 *
 */

public class Technology extends javax.swing.JFrame {

    /**
     * Creates new form Technology
     */
    public Technology() {
        initComponents();

    }
    DecimalFormat dc = new DecimalFormat("0.00");

    public void actionPerformed(){
        int one =Integer.parseInt(input1.getText());
        int two =Integer.parseInt(input2.getText());
        int three =Integer.parseInt(input3.getText());
        int four =Integer.parseInt(input4.getText());
        int five =Integer.parseInt(input5.getText());
        int six =Integer.parseInt(input6.getText());

        int sum = one+two+three+four+five+six;

        double average = sum/6f;
        averageOutput.setText(String.valueOf(dc.format(average)));
    }
}

```

```

        double weightedScore = average*0.30f;
        WsOutput.setText(String.valueOf(dc.format(weightedScore)));
    }
    FileWriter fileWriter;

    /**
     * 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() {

        jPanel1 = new javax.swing.JPanel();
        jLabel2 = new javax.swing.JLabel();
        jPanel2 = new javax.swing.JPanel();
        jLabel1 = new javax.swing.JLabel();
        input1 = new javax.swing.JTextField();
        jLabel3 = new javax.swing.JLabel();
        jLabel4 = new javax.swing.JLabel();
        jLabel5 = new javax.swing.JLabel();
        jLabel6 = new javax.swing.JLabel();
        jLabel7 = new javax.swing.JLabel();
        input4 = new javax.swing.JTextField();
        input5 = new javax.swing.JTextField();
        input2 = new javax.swing.JTextField();
        input6 = new javax.swing.JTextField();
        input3 = new javax.swing.JTextField();
        jLabel8 = new javax.swing.JLabel();
        jButtonNext = new javax.swing.JButton();
        jLabel9 = new javax.swing.JLabel();
        jButtonRestAll = new javax.swing.JButton();
        jButtonGetAverage = new javax.swing.JButton();
        jLabel10 = new javax.swing.JLabel();
        averageOutput = new javax.swing.JLabel();
        WsOutput = new javax.swing.JLabel();
        RAAS2 = new javax.swing.JLabel();
        CompAS = new javax.swing.JLabel();
        CompNameText = new javax.swing.JLabel();
        CompName = new javax.swing.JLabel();

        setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

        jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel2.setText("Currently used systems and hardware");

        jPanel2.setBackground(new java.awt.Color(214, 113, 45));

        jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
        jLabel1.setText("Technology");

        javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
        jPanel2.setLayout(jPanel2Layout);
        jPanel2Layout.setHorizontalGroup(
            jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(jPanel2Layout.createSequentialGroup()
                    .addGroup(jPanel2Layout.createSequentialGroup()
                        .addGroup(jPanel2Layout.createSequentialGroup()
                            .addGap(335, 335, 335)
                            .addComponent(jLabel1)
                            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
                        .addGroup(jPanel2Layout.createSequentialGroup()
                            .addGap(29, 29, 29)
                            .addComponent(jLabel1)
                            .addContainerGap(37, Short.MAX_VALUE))
                    )
                );

        input1.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                input1ActionPerformed(evt);
            }
        });
        input1.addKeyListener(new java.awt.event.KeyAdapter() {
            public void keyTyped(java.awt.event.KeyEvent evt) {
                input1KeyTyped(evt);
            }
        });

        jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel3.setText("Ease of use of current software, security");

        jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel4.setText("Software license issues");

        jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel5.setText("Availability of data analysis software ");

        jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N

```

```

jLabel6.setText("Defined data handling procedures and adherence");

jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel7.setText("Review of data handling procedures");

input4.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input4KeyTyped(evt);
    }
});

input5.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input5KeyTyped(evt);
    }
});

input2.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input2KeyTyped(evt);
    }
});

input6.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input6KeyTyped(evt);
    }
});

input3.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input3KeyTyped(evt);
    }
});

jLabel8.setText("Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE");

jButtonNext.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonNext.setText("Next");
jButtonNext.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonNextActionPerformed(evt);
    }
});

jLabel9.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel9.setText("Score :");

jButtonRestAll.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonRestAll.setText("Rest All");
jButtonRestAll.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonRestAllActionPerformed(evt);
    }
});

jButtonGetAverage.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonGetAverage.setText("Get Score");
jButtonGetAverage.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonGetAverageActionPerformed(evt);
    }
});

jLabel10.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
jLabel10.setForeground(new java.awt.Color(240, 240, 240));
jLabel10.setText("Weighted score :");

averageOutput.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
averageOutput.setText("0");

WSoutput.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
WSoutput.setForeground(new java.awt.Color(240, 240, 240));
WSoutput.setText("0");

RAAS2.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
RAAS2.setForeground(new java.awt.Color(240, 240, 240));

CompAS.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompAS.setForeground(new java.awt.Color(240, 240, 240));

CompNameText.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompNameText.setForeground(new java.awt.Color(240, 240, 240));
CompNameText.setText("0");

CompName.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompName.setForeground(new java.awt.Color(240, 240, 240));
CompName.setText("Campany:");

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel2, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
            .addGap(0, 0, 0)

```

```

.addGap(65, 65, 65)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addComponent(jLabel7)
    .addComponent(jLabel3)
    .addComponent(jLabel2)
    .addComponent(jLabel4)
    .addComponent(jLabel5)
    .addComponent(jLabel6))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGap(217, 217, 217))
.addGroup(jPanel1Layout.createSequentialGroup())
.addGap(86, 86, 86)
.addComponent(jLabel8)
.addContainerGap(109, Short.MAX_VALUE))
.addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
.addContainerGap(119, Short.MAX_VALUE)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
        .addComponent(CompName)
        .addGap(53, 53, 53)
        .addComponent(CompNameText, javax.swing.GroupLayout.PREFERRED_SIZE, 69, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(146, 146, 146)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
            .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 34, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
            .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 47, javax.swing.GroupLayout.PREFERRED_SIZE)))
    .addGap(272, 272, 272))
.addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
.addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
.addGap(217, 217, 217))
.addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addComponent(RAAS2, javax.swing.GroupLayout.PREFERRED_SIZE, 49, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(CompAS, javax.swing.GroupLayout.PREFERRED_SIZE, 49, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addGap(46, 46, 46))))
);
jPanel1Layout.setVerticalGroup(
jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
.addGroup(jPanel1Layout.createSequentialGroup())
    .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(18, 18, 18)
    .addComponent(jLabel8)
    .addGap(40, 40, 40)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jLabel2)
            .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGap(12, 12, 12)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jLabel3)
            .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)))
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addComponent(RAAS2, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
        .addComponent(CompAS, javax.swing.GroupLayout.PREFERRED_SIZE, 22, javax.swing.GroupLayout.PREFERRED_SIZE)))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addComponent(jLabel4)
    .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addGap(14, 14, 14)
        .addComponent(jLabel5))
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
        .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jLabel6))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jLabel7))
.addGap(21, 21, 21)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 19, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)

```

```

        .addGroup(jPanel1Layout.createSequentialGroup())
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addComponent(WSoutput, javax.swing.GroupLayout.PREFERRED_SIZE, 27, javax.swing.GroupLayout.PREFERRED_SIZE)))
        .addGroup(jPanel1Layout.createSequentialGroup())
        .addGap(23, 23, 23)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(CompNameText)
            .addComponent(CompName)))
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGap(8, 8, 8)
        .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(23, 23, 23))
    );

    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, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    );
    layout.setVerticalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    );

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

private void input1KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input2KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input3KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input4KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input5KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input6KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void jButtonRestAllActionPerformed(java.awt.event.ActionEvent evt) {
    input1.setText(null);
    input2.setText(null);
    input3.setText(null);
    input4.setText(null);
    input5.setText(null);
    input6.setText(null);
    averageOutput.setText(null);
    WSoutput.setText(null);
}

private void input1ActionPerformed(java.awt.event.ActionEvent evt) {
    //if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5){

```

```

        //JOptionPane.showMessageDialog(this, " Enter only numbers from 1 to 5 ");
        //Spinner spinner = new JSpinner();
        //spinner.setModel(new SpinnerNumberModel(0, null, 10, 1));

    //}

private void jButtonGetAverageActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        if(input1.getText().length()<=0 ||
            input2.getText().length()<=0 ||
            input3.getText().length()<=0 ||
            input4.getText().length()<=0 ||
            input5.getText().length()<=0 ||
            input6.getText().length()<=0){
            JOptionPane.showMessageDialog(null, " Please answer all the question...!!! ");

        }
        if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5 ||
            Integer.parseInt(input2.getText())<=0 || Integer.parseInt(input2.getText())>5 ||
            Integer.parseInt(input3.getText())<=0 || Integer.parseInt(input3.getText())>5 ||
            Integer.parseInt(input4.getText())<=0 || Integer.parseInt(input4.getText())>5 ||
            Integer.parseInt(input5.getText())<=0 || Integer.parseInt(input5.getText())>5 ||
            Integer.parseInt(input6.getText())<=0 || Integer.parseInt(input6.getText())>5){
            JOptionPane.showMessageDialog(this, " Please only enter numbers from 1 to 5....!!! ");
        }

        actionPerformed();

    }catch(Exception e){
    }

}

private void jButtonNextActionPerformed(java.awt.event.ActionEvent evt) {

    try {
        fileWriter = new FileWriter("Sheet.txt", true);

        fileWriter.write("3: "+jLabel1.getText()+"\n"+"");
        fileWriter.write(jLabel2.getText() + " : " +input1.getText() +"\n");
        fileWriter.write(jLabel3.getText() + " : " +input2.getText() +"\n");
        fileWriter.write(jLabel4.getText() + " : " +input3.getText() +"\n");
        fileWriter.write(jLabel5.getText() + " : " +input4.getText() +"\n");
        fileWriter.write(jLabel6.getText() + " : " +input5.getText() +"\n");
        fileWriter.write(jLabel7.getText() + " : " +input6.getText() +"\n");
        fileWriter.write(jLabel9.getText() + averageOutput.getText() +"\n");
        fileWriter.write(jLabel10.getText() + WSoutput.getText() +"\n"+"");

        fileWriter.close();
    } catch (IOException ex) {
        JOptionPane.showMessageDialog(this, " Database connection failed....!!! ");
    }
    Organisation org = new Organisation();

    Organisation.RAAS3.setText(Technology.RAAS2.getText());
    Organisation.CompAS2.setText(Technology.CompAS.getText());
    Organisation.TechAS.setText(Technology.WSoutput.getText());
    Organisation.CompNameText.setText(Technology.CompNameText.getText());
    org.setVisible(true);
    //new Technology().setVisible(true);
    setVisible(false);

}

/**
 * @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(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Technology.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 Technology().setVisible(true);
    }
    });
}

// Variables declaration - do not modify
public static javax.swing.JLabel CompAS;
public static javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel RAAS2;
public static javax.swing.JLabel WSOoutput;
private javax.swing.JLabel averageOutput;
private javax.swing.JTextField input1;
private javax.swing.JTextField input2;
private javax.swing.JTextField input3;
private javax.swing.JTextField input4;
private javax.swing.JTextField input5;
private javax.swing.JTextField input6;
private javax.swing.JButton jButtonGetAverage;
private javax.swing.JButton jButtonNext;
private javax.swing.JButton jButtonRestAll;
private javax.swing.JLabel jLabel1;
private javax.swing.JLabel jLabel10;
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;
// End of variables declaration
}

```

Compatibility Dimension

```

/*
 * 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 Dimension;

import java.awt.event.ActionEvent;
import java.awt.event.KeyEvent;
import java.io.File;
import java.io.FileWriter;
import java.io.IOException;
import java.text.DecimalFormat;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
import javax.swing.JSpinner;
import javax.swing.SpinnerNumberModel;

/**
 *
 */
public class Compatibility extends javax.swing.JFrame {

    /**
     * Creates new form Technology
     */
    public Compatibility () {
        initComponents();

    }

    DecimalFormat dc = new DecimalFormat("0.00");

    public void actionPerformed(){
        int one =Integer.parseInt(input1.getText());
        int two =Integer.parseInt(input2.getText());
        int three =Integer.parseInt(input3.getText());
        int four =Integer.parseInt(input4.getText());
        int five =Integer.parseInt(input5.getText());
        int six =Integer.parseInt(input6.getText());

        int seven =Integer.parseInt(input7.getText());
        int eight =Integer.parseInt(input8.getText());
        int nine =Integer.parseInt(input9.getText());
        int ten =Integer.parseInt(input10.getText());

        int sum = one+two+three+four+five+six+seven+eight+nine+ten;

        double average = sum/10f;
        averageOutput.setText(String.valueOf(dc.format(average)));

        double weightedScore = average*0.10f;
        WSOoutput.setText(String.valueOf(dc.format(weightedScore)));;
    }
}

```

```

FileWriter fileWriter;

/**
 * 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() {

    jPanel1 = new javax.swing.JPanel();
    jLabel2 = new javax.swing.JLabel();
    jPanel2 = new javax.swing.JPanel();
    jLabel1 = new javax.swing.JLabel();
    input1 = new javax.swing.JTextField();
    jLabel3 = new javax.swing.JLabel();
    jLabel4 = new javax.swing.JLabel();
    jLabel5 = new javax.swing.JLabel();
    jLabel6 = new javax.swing.JLabel();
    jLabel7 = new javax.swing.JLabel();
    input4 = new javax.swing.JTextField();
    input5 = new javax.swing.JTextField();
    input2 = new javax.swing.JTextField();
    input6 = new javax.swing.JTextField();
    input3 = new javax.swing.JTextField();
    jLabel8 = new javax.swing.JLabel();
    jButtonNext = new javax.swing.JButton();
    jLabel9 = new javax.swing.JLabel();
    jButtonResetAll = new javax.swing.JButton();
    jButtonGetAverage = new javax.swing.JButton();
    jLabel10 = new javax.swing.JLabel();
    averageOutput = new javax.swing.JLabel();
    WsOutput = new javax.swing.JLabel();
    jLabel11 = new javax.swing.JLabel();
    input7 = new javax.swing.JTextField();
    jLabel12 = new javax.swing.JLabel();
    input8 = new javax.swing.JTextField();
    jLabel13 = new javax.swing.JLabel();
    input9 = new javax.swing.JTextField();
    jLabel14 = new javax.swing.JLabel();
    input10 = new javax.swing.JTextField();
    RAAS = new javax.swing.JLabel();
    CompNameText = new javax.swing.JLabel();
    CompName = new javax.swing.JLabel();

    setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

    jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel2.setText("Availability of hardware and software resources for BIS use");

    jPanel2.setBackground(new java.awt.Color(214, 113, 45));

    jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
    jLabel1.setText("Compatibility");

    javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
    jPanel2.setLayout(jPanel2Layout);
    jPanel2Layout.setHorizontalGroup(
        jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel2Layout.createSequentialGroup()
                .addContainerGap()
                .addGroup(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addComponent(jLabel1)
                    .addComponent(input1, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input2, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input3, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input4, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input5, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input6, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input7, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input8, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input9, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(input10, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(RAAS, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(CompNameText, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                    .addComponent(CompName, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                )
            )
    );

    input1.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            input1ActionPerformed(evt);
        }
    });
    input1.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input1KeyTyped(evt);
        }
    });

    jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel3.setText("Data storage and accessibility");

    jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel4.setText("Use of data in decision making process");

    jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel5.setText("Impact of new technologies on data management");

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```

jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel6.setText("Change process in organisation");

jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel7.setText("Prior BIS knowledge");

input4.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input4KeyTyped(evt);
    }
});

input5.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input5KeyTyped(evt);
    }
});

input2.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input2KeyTyped(evt);
    }
});

input6.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input6KeyTyped(evt);
    }
});

input3.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input3KeyTyped(evt);
    }
});

jLabel8.setText("Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE");

jButtonNext.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonNext.setText("Next");
jButtonNext.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonNextActionPerformed(evt);
    }
});

jLabel9.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel9.setText("Score :");
jLabel9.setToolTipText("");

jButtonRestAll.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonRestAll.setText("Rest All");
jButtonRestAll.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonRestAllActionPerformed(evt);
    }
});

jButtonGetAverage.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonGetAverage.setText("Get Score");
jButtonGetAverage.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonGetAverageActionPerformed(evt);
    }
});

jLabel10.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
jLabel10.setForeground(new java.awt.Color(240, 240, 240));
jLabel10.setText("Weighted score :");

averageOutput.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
averageOutput.setText("0");

WSoutput.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
WSoutput.setForeground(new java.awt.Color(240, 240, 240));
WSoutput.setText("0");

jLabel11.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel11.setText("BIS usage by competitors ");

input7.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input7KeyTyped(evt);
    }
});

jLabel12.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel12.setText("Participate in BI related issues");

input8.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input8KeyTyped(evt);
    }
});

```

```

jLabel13.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel13.setText("BIS expertise in organisation");

input9.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input9KeyTyped(evt);
    }
});

jLabel14.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel14.setText("Data analysis expertise in organisation");

input10.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input10KeyTyped(evt);
    }
});

RAAS.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
RAAS.setForeground(new java.awt.Color(240, 240, 240));

CompNameText.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompNameText.setForeground(new java.awt.Color(240, 240, 240));
CompNameText.setText("0");

CompName.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompName.setForeground(new java.awt.Color(240, 240, 240));
CompName.setText("Company:");

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel2, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
            .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
                .addGap(65, 65, 65)
                .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addComponent(jLabel7)
                    .addComponent(jLabel3)
                    .addComponent(jLabel2)
                    .addComponent(jLabel4)
                    .addComponent(jLabel5)
                    .addComponent(jLabel6)
                    .addComponent(jLabel11)
                    .addComponent(jLabel12)
                    .addComponent(jLabel13)
                    .addComponent(jLabel14))
                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, 7, Short.MAX_VALUE)
            )
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input7, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input8, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addGap(223, 223, 223))
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addGap(74, 74, 74)
            .addComponent(jLabel8)
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addComponent(RAAS, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addGap(46, 46, 46))
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup()
            .addGap(52, 52, 52)
            .addComponent(CompName)
            .addGap(32, 32, 32)
            .addComponent(CompNameText, javax.swing.GroupLayout.PREFERRED_SIZE, 69, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED))
                    .addComponent(WSOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 34, javax.swing.GroupLayout.PREFERRED_SIZE))
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                    .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 47, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(18, 18, 18)
                    .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(39, 39, 39)
                    .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)))
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
);
jPanel1Layout.setVerticalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)

```

```

.addGap(18, 18, 18)
.addComponent(jLabel8)
.addGap(21, 21, 21)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(jLabel2)
    .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(jLabel3)
    .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(RAAS, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addComponent(jLabel4)
    .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
    .addGap(14, 14, 14)
    .addComponent(jLabel5))
.addGroup(jPanel1Layout.createSequentialGroup())
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jLabel6))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jLabel7))
.addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
    .addComponent(input7, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addComponent(jLabel11))
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input8, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel12))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input9, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel13))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input10, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel14))
    .addGap(17, 17, 17)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 19, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel9, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addComponent(CompNameText)
        .addComponent(CompName)
        .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 27, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addContainerGap(124, Short.MAX_VALUE))
.addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(137, 137, 137)))
);

javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
getContentPane().setLayout(layout);
layout.setHorizontalGroup(
    layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
);
layout.setVerticalGroup(
    layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
);

pack();
setLocationRelativeTo(null);
}

private void input1KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input2KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

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    }
}

private void input3KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input4KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input5KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input6KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void jButtonRestAllActionPerformed(java.awt.event.ActionEvent evt) {
    input1.setText(null);
    input2.setText(null);
    input3.setText(null);
    input4.setText(null);
    input5.setText(null);
    input6.setText(null);
    input7.setText(null);
    input8.setText(null);
    input9.setText(null);
    input10.setText(null);
    averageOutput.setText(null);
    WSoutput.setText(null);
}

private void input1ActionPerformed(java.awt.event.ActionEvent evt) {
    //if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5){
    //OptionPane.showMessageDialog(this, " Enter only numbers from 1 to 5 ");
    //JSpinner spinner = new JSpinner();
    //spinner.setModel(new SpinnerNumberModel(0, null, 10, 1));
    //}
}

private void jButtonGetAverageActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        if(input1.getText().length()<=0 ||
            input2.getText().length()<=0 ||
            input3.getText().length()<=0 ||
            input4.getText().length()<=0 ||
            input5.getText().length()<=0 ||
            input6.getText().length()<=0 ||

            input7.getText().length()<=0 ||
            input8.getText().length()<=0 ||
            input9.getText().length()<=0 ||
            input10.getText().length()<=0){
            JOptionPane.showMessageDialog(null, " Please answer all the question...!!! ");
        }
        if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5 ||
            Integer.parseInt(input2.getText())<=0 || Integer.parseInt(input2.getText())>5 ||
            Integer.parseInt(input3.getText())<=0 || Integer.parseInt(input3.getText())>5 ||
            Integer.parseInt(input4.getText())<=0 || Integer.parseInt(input4.getText())>5 ||
            Integer.parseInt(input5.getText())<=0 || Integer.parseInt(input5.getText())>5 ||
            Integer.parseInt(input6.getText())<=0 || Integer.parseInt(input6.getText())>5 ||

            Integer.parseInt(input7.getText())<=0 || Integer.parseInt(input7.getText())>5 ||
            Integer.parseInt(input8.getText())<=0 || Integer.parseInt(input8.getText())>5 ||
            Integer.parseInt(input9.getText())<=0 || Integer.parseInt(input9.getText())>5 ||
            Integer.parseInt(input10.getText())<=0 || Integer.parseInt(input10.getText())>5){
            JOptionPane.showMessageDialog(this, " Please only enter numbers from 1 to 5....!!! ");
        }

        actionPerformed();
    }catch(Exception e){
    }
}

```

```

private void jButtonNextActionPerformed(java.awt.event.ActionEvent evt) {

    try {
        fileWriter = new FileWriter("Sheet.txt", true);
        fileWriter.write("2: " + jLabel1.getText() + "\n" + "\n");
        fileWriter.write(jLabel2.getText() + " : " + input1.getText() + "\n");
        fileWriter.write(jLabel3.getText() + " : " + input2.getText() + "\n");
        fileWriter.write(jLabel4.getText() + " : " + input3.getText() + "\n");
        fileWriter.write(jLabel5.getText() + " : " + input4.getText() + "\n");
        fileWriter.write(jLabel6.getText() + " : " + input5.getText() + "\n");
        fileWriter.write(jLabel7.getText() + " : " + input6.getText() + "\n");
        fileWriter.write(jLabel1.getText() + " : " + input7.getText() + "\n");
        fileWriter.write(jLabel12.getText() + " : " + input8.getText() + "\n");
        fileWriter.write(jLabel13.getText() + " : " + input9.getText() + "\n");
        fileWriter.write(jLabel14.getText() + " : " + input10.getText() + "\n");

        fileWriter.write(jLabel9.getText() + averageOutput.getText() + "\n");
        fileWriter.write(jLabel10.getText() + WsOutput.getText() + "\n" + "\n" + "\n");

        fileWriter.close();
    } catch (IOException ex) {
        JOptionPane.showMessageDialog(this, " Database connection failed....!!! ");
    }
    Technology tech = new Technology();

    Technology.RAAS2.setText(Compatibility.RAAS.getText());
    Technology.CompAS.setText(Compatibility.WSOutput.getText());
    Technology.CompNameText.setText(Compatibility.CompNameText.getText());
    tech.setVisible(true);
    //new Technology().setVisible(true);
    setVisible(false);
}

private void input7KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input8KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input9KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input10KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

/**
 * @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(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Technology.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 Technology().setVisible(true);
            }
        });
    }
}

// Variables declaration - do not modify
public javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel RAAS;
public static javax.swing.JLabel WsOutput;
private javax.swing.JLabel averageOutput;
private javax.swing.JTextField input1;
private javax.swing.JTextField input10;
private javax.swing.JTextField input2;
private javax.swing.JTextField input3;
private javax.swing.JTextField input4;
private javax.swing.JTextField input5;
private javax.swing.JTextField input6;
private javax.swing.JTextField input7;
private javax.swing.JTextField input8;
private javax.swing.JTextField input9;
private javax.swing.JButton jButtonGetAverage;
private javax.swing.JButton jButtonNext;
private javax.swing.JButton jButtonRestAll;
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 jLabel14;
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;
// End of variables declaration
}

```

Environment Dimension

```

/*
 * 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 Dimension;

import java.awt.event.ActionEvent;
import java.awt.event.KeyEvent;
import java.io.FileWriter;
import java.io.IOException;
import java.text.DecimalFormat;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
import javax.swing.JSpinner;
import javax.swing.SpinnerNumberModel;

/**
 *
 */
public class Environment extends javax.swing.JFrame {

    /**
     * Creates new form Technology
     */
    public Environment() {
        initComponents();
    }

    DecimalFormat dc = new DecimalFormat("0.00");

    public void actionPerformed(){
        int one =Integer.parseInt(input1.getText());
        int two =Integer.parseInt(input2.getText());
        int three =Integer.parseInt(input3.getText());
        int four =Integer.parseInt(input4.getText());
        int five =Integer.parseInt(input5.getText());

        int sum = one+two+three+four+five;

        double average = sum/5f;
        averageOutput.setText(String.valueOf(dc.format(average)));
    }
}

```

```

        double weightedScore = average*0.20f;
        WsOutput.setText(String.valueOf(dc.format(weightedScore)));
    }
    FileWriter fileWriter;

/**
 * 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() {

    jPanel1 = new javax.swing.JPanel();
    jLabel2 = new javax.swing.JLabel();
    jPanel2 = new javax.swing.JPanel();
    jLabel1 = new javax.swing.JLabel();
    input1 = new javax.swing.JTextField();
    jLabel3 = new javax.swing.JLabel();
    jLabel4 = new javax.swing.JLabel();
    jLabel5 = new javax.swing.JLabel();
    jLabel6 = new javax.swing.JLabel();
    input4 = new javax.swing.JTextField();
    input5 = new javax.swing.JTextField();
    input2 = new javax.swing.JTextField();
    input3 = new javax.swing.JTextField();
    jLabel8 = new javax.swing.JLabel();
    jButtonSave = new javax.swing.JButton();
    jLabel9 = new javax.swing.JLabel();
    jButtonRestAll = new javax.swing.JButton();
    jButtonGetAverage = new javax.swing.JButton();
    jLabel10 = new javax.swing.JLabel();
    averageOutput = new javax.swing.JLabel();
    WsOutput = new javax.swing.JLabel();
    RAAS4 = new javax.swing.JLabel();
    CompAS3 = new javax.swing.JLabel();
    TechAS2 = new javax.swing.JLabel();
    OrgAS = new javax.swing.JLabel();
    CompNameText = new javax.swing.JLabel();
    CompName = new javax.swing.JLabel();

    setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

    jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel2.setText("Availability of data analysis service in house");

    jPanel2.setBackground(new java.awt.Color(214, 113, 45));

    jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
    jLabel1.setText("Environment");

    javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
    jPanel2.setLayout(jPanel2Layout);
    jPanel2Layout.setHorizontalGroup(
        jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel2Layout.createSequentialGroup()
                .addContainerGap()
                .addGroup(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addComponent(jLabel1)
                    .addComponent(input1, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(input2, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(input3, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(input4, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(input5, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jButtonSave, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jButtonRestAll, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jButtonGetAverage, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel2, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel3, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel4, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel5, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel6, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel8, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel9, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(jLabel10, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(averageOutput, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(WsOutput, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(RAAS4, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(CompAS3, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(TechAS2, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(OrgAS, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(CompNameText, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                    .addComponent(CompName, javax.swing.GroupLayout.DEFAULT_SIZE, 150, Short.MAX_VALUE)
                )
                .addContainerGap())
    );
    input1.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            input1ActionPerformed(evt);
        }
    });
    input1.addKeyListener(new java.awt.event.KeyAdapter() {
        public void keyTyped(java.awt.event.KeyEvent evt) {
            input1KeyTyped(evt);
        }
    });

    jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel3.setText("Competitors using BISs");

    jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel4.setText("Funding capital requirements");

    jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel5.setText("Availability of BIS support");

    jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel6.setText("Availability of BIS relevant to operations");

```

DD

```

        .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGroup(jPanel1Layout.createSequentialGroup())
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)
            .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addComponent(CompName)
                .addGap(18, 18, 18)
                .addComponent(CompNameText, javax.swing.GroupLayout.PREFERRED_SIZE, 69, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addGap(119, 119, 119)
                .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)))
        .addGap(27, 27, 27)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
                    .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 47, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(59, 59, 59))
                .addComponent(WSOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 34, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addComponent(jButtonRestAll, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.PREFERRED_SIZE, 106,
javax.swing.GroupLayout.PREFERRED_SIZE)))
        .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addGap(67, 67, 67)
                .addComponent(TechAS2, javax.swing.GroupLayout.PREFERRED_SIZE, 40, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addGap(79, 79, 79)
                .addComponent(OrgAS, javax.swing.GroupLayout.PREFERRED_SIZE, 40, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addGap(18, 18, 18)
                .addComponent(jButtonSave, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)))
        .addGap(46, 46, 46))
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addGap(65, 65, 65)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(jLabel8)
                .addGroup(jPanel1Layout.createSequentialGroup())
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addComponent(jLabel3)
                        .addComponent(jLabel2)
                        .addComponent(jLabel4)
                        .addComponent(jLabel5)
                        .addComponent(jLabel6))
                    .addGap(372, 372, 372)
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)
                        .addComponent(RAAS4, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.DEFAULT_SIZE, 51, Short.MAX_VALUE)
                        .addComponent(CompAS3, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))))
            .addContainerGap(24, Short.MAX_VALUE))
);
jPanel1Layout.setVerticalGroup(
jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(18, 18, 18)
        .addComponent(jLabel8)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addGap(43, 43, 43)
                .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                    .addComponent(jLabel2)
                    .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)))
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
                .addComponent(RAAS4, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addComponent(jLabel3)
            .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGap(18, 18, 18)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addComponent(jLabel4)
            .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGap(18, 18, 18)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addComponent(jLabel5)
            .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGap(13, 13, 13)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                    .addComponent(jLabel6)
                    .addComponent(CompAS3, javax.swing.GroupLayout.PREFERRED_SIZE, 30, javax.swing.GroupLayout.PREFERRED_SIZE))
                .addGap(13, 13, 13)
                .addComponent(TechAS2, javax.swing.GroupLayout.PREFERRED_SIZE, 37, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addGap(18, 18, 18)
                .addComponent(OrgAS, javax.swing.GroupLayout.PREFERRED_SIZE, 38, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
                .addComponent(jButtonSave, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
            .addGroup(jPanel1Layout.createSequentialGroup())
                .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                    .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 19, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addComponent(jLabel9, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
                .addContainerGap(24, Short.MAX_VALUE))
    )
);

```

```

        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addComponent(WSoutput, javax.swing.GroupLayout.PREFERRED_SIZE, 27, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addComponent(CompNameText)
            .addComponent(CompName))
        .addGap(91, 91, 91)))
    );

    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.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
    );
    layout.setVerticalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(layout.createSequentialGroup()
                .addComponent(jPanel1, javax.swing.GroupLayout.PREFERRED_SIZE, 530, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addContainerGap(20, Short.MAX_VALUE))
    );

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

private void input1KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input2KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input3KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input4KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input5KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void jButtonRestAllActionPerformed(java.awt.event.ActionEvent evt) {
    input1.setText(null);
    input2.setText(null);
    input3.setText(null);
    input4.setText(null);
    input5.setText(null);
    averageOutput.setText(null);
    WSoutput.setText(null);
}

private void input1ActionPerformed(java.awt.event.ActionEvent evt) {
    //if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5){
    //OptionPane.showMessageDialog(this, " Enter only numbers from 1 to 5 ");
    //JSpinner spinner = new JSpinner();
    //spinner.setModel(new SpinnerNumberModel(0, null, 10, 1));

    //}
}

private void jButtonGetAverageActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        if(input1.getText().length()<=0 ||
            input2.getText().length()<=0 ||
            input3.getText().length()<=0 ||
            input4.getText().length()<=0 ||

```

```

        input5.getText().length()<=0){
JOptionPane.showMessageDialog(null, " Please answer all the question...!!! ");

    }

    if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5 ||
        Integer.parseInt(input2.getText())<=0 || Integer.parseInt(input2.getText())>5 ||
        Integer.parseInt(input3.getText())<=0 || Integer.parseInt(input3.getText())>5 ||
        Integer.parseInt(input4.getText())<=0 || Integer.parseInt(input4.getText())>5 ||
        Integer.parseInt(input5.getText())<=0 || Integer.parseInt(input5.getText())>5){
JOptionPane.showMessageDialog(this, " Please only enter numbers from 1 to 5...!!! ");
    }

    actionPerformed();

} catch (Exception e) {
}

}

private void jButtonSaveActionPerformed(java.awt.event.ActionEvent evt) {

    try {
        fileWriter = new FileWriter("Sheet.txt", true);
        fileWriter.write("5: "+jLabel1.getText()+"\n"+"");
        fileWriter.write(jLabel2.getText()+" : " +input1.getText()+"\n");
        fileWriter.write(jLabel3.getText()+" : " +input2.getText()+"\n");
        fileWriter.write(jLabel4.getText()+" : " +input3.getText()+"\n");
        fileWriter.write(jLabel5.getText()+" : " +input4.getText()+"\n");
        fileWriter.write(jLabel6.getText()+" : " +input5.getText()+"\n");
        fileWriter.write(jLabel9.getText() + averageOutput.getText()+"\n");
        fileWriter.write(jLabel10.getText() + WSoutput.getText()+"\n"+"");

        fileWriter.close();
    } catch (IOException ex) {
        JOptionPane.showMessageDialog(this, " Database connection failed...!!! ");
    }
    Decision dec = new Decision();

    Decision.jLabel7.setText(Environment.RAAS4.getText());
    Decision.jLabel8.setText(Environment.CompAS3.getText());
    Decision.jLabel9.setText(Environment.TechAS2.getText());
    Decision.jLabel10.setText(Environment.OrgAS.getText());
    Decision.jLabel11.setText(Environment.WSoutput.getText());
    Decision.CompNameText.setText(Environment.CompNameText.getText());

    dec.setVisible(true);

    setVisible(false);
}

/**
 * @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(Environment.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Environment.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Environment.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Environment.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() {
        public void run() {
            new Environment().setVisible(true);
        }
    });
}

// Variables declaration - do not modify
public static javax.swing.JLabel CompAS3;
public static javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel OrgAS;
public static javax.swing.JLabel RAAS4;
public static javax.swing.JLabel TechAS2;
public static javax.swing.JLabel WSoutput;

```

```

private javax.swing.JLabel averageOutput;
private javax.swing.JTextField input1;
private javax.swing.JTextField input2;
private javax.swing.JTextField input3;
private javax.swing.JTextField input4;
private javax.swing.JTextField input5;
private javax.swing.JButton jButtonGetAverage;
private javax.swing.JButton jButtonRestAll;
private javax.swing.JButton jButtonSave;
private javax.swing.JLabel jLabel1;
private javax.swing.JLabel jLabel10;
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 jLabel8;
private javax.swing.JLabel jLabel9;
private javax.swing.JPanel jPanel1;
private javax.swing.JPanel jPanel2;
// End of variables declaration
}

```

Organisation Dimension

```

/*
 * 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 Dimension;

import java.awt.event.ActionEvent;
import java.awt.event.KeyEvent;
import java.io.FileWriter;
import java.io.IOException;
import java.text.DecimalFormat;
import java.util.logging.Level;
import java.util.logging.Logger;
import javax.swing.JOptionPane;
import javax.swing.JSpinner;
import javax.swing.SpinnerNumberModel;

/**
 *
 */
public class Organisation extends javax.swing.JFrame {

    /**
     * Creates new form Technology
     */
    public Organisation() {
        initComponents();

    }
    DecimalFormat dc = new DecimalFormat("0.00");

    public void actionPerformed(){
        int one =Integer.parseInt(input1.getText());
        int two =Integer.parseInt(input2.getText());
        int three =Integer.parseInt(input3.getText());
        int four =Integer.parseInt(input4.getText());
        int five =Integer.parseInt(input5.getText());
        int six =Integer.parseInt(input6.getText());

        int sum = one+two+three+four+five+six;

        double average = sum/6f;
        averageOutput.setText(String.valueOf(dc.format(average)));

        double weightedScore = average*0.25f;
        WSOutput.setText(String.valueOf(dc.format(weightedScore)));

    }
    FileWriter fileWriter;

    /**
     * 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() {

        jPanel1 = new javax.swing.JPanel();
        jLabel2 = new javax.swing.JLabel();
        jPanel2 = new javax.swing.JPanel();
        jLabel1 = new javax.swing.JLabel();
        input1 = new javax.swing.JTextField();

```

```

jLabel3 = new javax.swing.JLabel();
jLabel4 = new javax.swing.JLabel();
jLabel5 = new javax.swing.JLabel();
jLabel6 = new javax.swing.JLabel();
jLabel7 = new javax.swing.JLabel();
input4 = new javax.swing.JTextField();
input5 = new javax.swing.JTextField();
input2 = new javax.swing.JTextField();
input6 = new javax.swing.JTextField();
input3 = new javax.swing.JTextField();
jLabel8 = new javax.swing.JLabel();
jButtonNext = new javax.swing.JButton();
jLabel9 = new javax.swing.JLabel();
jButtonRestAll = new javax.swing.JButton();
jButtonGetAverage = new javax.swing.JButton();
jLabel10 = new javax.swing.JLabel();
averageOutput = new javax.swing.JLabel();
WSoutput = new javax.swing.JLabel();
RAAS3 = new javax.swing.JLabel();
CompAS2 = new javax.swing.JLabel();
TechAS = new javax.swing.JLabel();
CompNameText = new javax.swing.JLabel();
CompName = new javax.swing.JLabel();

setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel2.setText("Factors hindering BIS adoption");

jPanel2.setBackground(new java.awt.Color(214, 113, 45));

jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
jLabel1.setText("Organisation ");

javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
jPanel2.setLayout(jPanel2Layout);
jPanel2Layout.setHorizontalGroup(
    jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
            .addGap(325, 325, 325)
            .addComponent(jLabel1)
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
        );
jPanel2Layout.setVerticalGroup(
    jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
            .addGap(31, 31, 31)
            .addComponent(jLabel1)
            .addContainerGap(35, Short.MAX_VALUE))
        );

input1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        input1ActionPerformed(evt);
    }
});
input1.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input1KeyTyped(evt);
    }
});

jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel3.setText("Knowledge in BIS");

jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel4.setText("Capital requirements ");

jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel5.setText("Readiness to migrate");

jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel6.setText("Availability of BIS that support the processes");

jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel7.setText("Change and reception of change by organisational stakeholders");

input4.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input4KeyTyped(evt);
    }
});

input5.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input5KeyTyped(evt);
    }
});

input2.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input2KeyTyped(evt);
    }
});

```

```

input6.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input6KeyTyped(evt);
    }
});

input3.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input3KeyTyped(evt);
    }
});

jLabel8.setText("Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE");

jButtonNext.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonNext.setText("Next");
jButtonNext.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonNextActionPerformed(evt);
    }
});

jLabel9.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel9.setText("Score :");

jButtonRestAll.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonRestAll.setText("Rest All");
jButtonRestAll.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonRestAllActionPerformed(evt);
    }
});

jButtonGetAverage.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonGetAverage.setText("Get Score ");
jButtonGetAverage.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonGetAverageActionPerformed(evt);
    }
});

jLabel10.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
jLabel10.setForeground(new java.awt.Color(240, 240, 240));
jLabel10.setText("Weighted score :");

averageOutput.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
averageOutput.setText("0");

WSoutput.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
WSoutput.setForeground(new java.awt.Color(240, 240, 240));
WSoutput.setText("0");

RAAS3.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
RAAS3.setForeground(new java.awt.Color(240, 240, 240));

CompAS2.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompAS2.setForeground(new java.awt.Color(240, 240, 240));

TechAS.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
TechAS.setForeground(new java.awt.Color(240, 240, 240));

CompNameText.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompNameText.setForeground(new java.awt.Color(240, 240, 240));
CompNameText.setText("0");

CompName.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompName.setForeground(new java.awt.Color(240, 240, 240));
CompName.setText("Company:");

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel2, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addComponent(jLabel7)
            .addComponent(jLabel3)
            .addComponent(jLabel2)
            .addComponent(jLabel4)
            .addComponent(jLabel5)
            .addComponent(jLabel6)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addComponent(CompName)
            .addGap(32, 32, 32)
            .addComponent(CompNameText, javax.swing.GroupLayout.PREFERRED_SIZE, 69, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)

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        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED))
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
        .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED))
    .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(39, 39, 39))))
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 34, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 47, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addComponent(RAAS3, javax.swing.GroupLayout.PREFERRED_SIZE, 53, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(CompAS2, javax.swing.GroupLayout.PREFERRED_SIZE, 53, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(TechAS, javax.swing.GroupLayout.PREFERRED_SIZE, 44, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addGap(79, 79, 79))))
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addGap(69, 69, 69)
        .addComponent(jLabel8)
        .addContainerGap(85, Short.MAX_VALUE)
    .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
        .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addComponent(jButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(98, 98, 98))
);
jPanel1Layout.setVerticalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
        .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(18, 18, 18)
        .addComponent(jLabel8)
        .addGap(43, 43, 43)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                .addComponent(jLabel2)
                .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                .addComponent(jLabel3)
                .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addComponent(RAAS3, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addGap(12, 12, 12)
            .addComponent(CompAS2, javax.swing.GroupLayout.PREFERRED_SIZE, 22, javax.swing.GroupLayout.PREFERRED_SIZE)))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)
        .addComponent(TechAS, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addComponent(jLabel4)
        .addComponent(input3, javax.swing.GroupLayout.DEFAULT_SIZE, 31, Short.MAX_VALUE))
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addGap(14, 14, 14)
            .addComponent(jLabel5))
        .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
            .addGap(3, 3, 3)
            .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel6))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel7))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 19, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel9, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 27, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup())
            .addGap(8, 8, 8)
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                .addComponent(jButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
                .addComponent(jButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE))
            .addGap(37, 37, 37))
    .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)

```

```

        .addComponent(CompNameText)
        .addComponent(CompName))
        .addGap(34, 34, 34)))
        .addComponent(JButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(19, 19, 19))
    );

    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, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    );
    layout.setVerticalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(layout.createSequentialGroup()
                .addComponent(JPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            )
    );

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

private void input1KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input2KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input3KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input4KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input5KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void input6KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!((Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE)){
        getToolkit().beep();
        evt.consume();
    }
}

private void jButtonRestAllActionPerformed(java.awt.event.ActionEvent evt) {
    input1.setText(null);
    input2.setText(null);
    input3.setText(null);
    input4.setText(null);
    input5.setText(null);
    input6.setText(null);
    averageOutput.setText(null);
    WSoutput.setText(null);
}

private void input1ActionPerformed(java.awt.event.ActionEvent evt) {
    //if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5){
    //JOptionPane.showMessageDialog(this, " Enter only numbers from 1 to 5 ");
    //JSpinner spinner = new JSpinner();
    //spinner.setModel(new SpinnerNumberModel(0, null, 10, 1));

    //}
}

private void jButtonGetAverageActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        if(input1.getText().length()<=0 ||

```

```

        input2.getText().length()<=0 ||
        input3.getText().length()<=0 ||
        input4.getText().length()<=0 ||
        input5.getText().length()<=0 ||
        input6.getText().length()<=0){
JOptionPane.showMessageDialog(null, " Please answer all the question....!! ");

    }
    if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5 ||
        Integer.parseInt(input2.getText())<=0 || Integer.parseInt(input2.getText())>5 ||
        Integer.parseInt(input3.getText())<=0 || Integer.parseInt(input3.getText())>5 ||
        Integer.parseInt(input4.getText())<=0 || Integer.parseInt(input4.getText())>5 ||
        Integer.parseInt(input5.getText())<=0 || Integer.parseInt(input5.getText())>5 ||
        Integer.parseInt(input6.getText())<=0 || Integer.parseInt(input6.getText())>5){
JOptionPane.showMessageDialog(this, " Please only enter numbers from 1 to 5....!! ");
    }

    actionPerformed();

}catch(Exception e){
}

}

private void jButtonNextActionPerformed(java.awt.event.ActionEvent evt) {

    try {
        fileWriter = new FileWriter("Sheet.txt", true);
        fileWriter.write("4: "+jLabel1.getText()+"\n"+"");
        fileWriter.write(jLabel2.getText() + " : " +input1.getText() +"\n");
        fileWriter.write(jLabel3.getText() + " : " +input2.getText() +"\n");
        fileWriter.write(jLabel4.getText() + " : " +input3.getText() +"\n");
        fileWriter.write(jLabel5.getText() + " : " +input4.getText() +"\n");
        fileWriter.write(jLabel6.getText() + " : " +input5.getText() +"\n");
        fileWriter.write(jLabel7.getText() + " : " +input6.getText() +"\n");
        fileWriter.write(jLabel9.getText() + averageOutput.getText() +"\n");
        fileWriter.write(jLabel10.getText() + WSoutput.getText() +"\n"+"n"+"n"+"n");

        fileWriter.close();
    } catch (IOException ex) {
        JOptionPane.showMessageDialog(this, " Database connection failed....!!! ");
    }
    Environment org = new Environment();

    Environment.RAAS4.setText(Organisation.RAAS3.getText());
    Environment.CompAS3.setText(Organisation.CompAS2.getText());
    Environment.TechAS2.setText(Organisation.TechAS.getText());
    Environment.OrgAS.setText(Organisation.WSoutput.getText());
    Environment.CompNameText.setText(Organisation.CompNameText.getText());
    org.setVisible(true);
    //new Technology().setVisible(true);
    setVisible(false);
}

/**
 * @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(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Technology.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 Technology().setVisible(true);
        }
    });
}

// Variables declaration - do not modify
public static javax.swing.JLabel CompAS2;
public static javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel RAAS3;

```

```

public static javax.swing.JLabel TechAS;
public static javax.swing.JLabel WSoutput;
private javax.swing.JLabel averageOutput;
private javax.swing.JTextField input1;
private javax.swing.JTextField input2;
private javax.swing.JTextField input3;
private javax.swing.JTextField input4;
private javax.swing.JTextField input5;
private javax.swing.JTextField input6;
private javax.swing.JButton jButtonGetAverage;
private javax.swing.JButton jButtonNext;
private javax.swing.JButton jButtonResetAll;
private javax.swing.JLabel jLabel1;
private javax.swing.JLabel jLabel10;
private javax.swing.JLabel jLabel12;
private javax.swing.JLabel jLabel13;
private javax.swing.JLabel jLabel14;
private javax.swing.JLabel jLabel15;
private javax.swing.JLabel jLabel16;
private javax.swing.JLabel jLabel17;
private javax.swing.JLabel jLabel18;
private javax.swing.JLabel jLabel19;
private javax.swing.JPanel jPanel1;
private javax.swing.JPanel jPanel2;
// End of variables declaration
}
Readiness Decision
/*
 * 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 Dimension;

import static Dimension.Organisation.WSoutput;
import java.io.File;
import java.io.FileWriter;
import java.io.IOException;
import java.text.DecimalFormat;
import javax.swing.JOptionPane;

/**
 *
 */
public class Decision extends javax.swing.JFrame {

    /**
     * Creates new form Decision
     */
    FileWriter fileWriter;
    public Decision() {
        initComponents();
    }
    public void setMinimumThreshold(){
        double SRA = 0.10;
        double SCA = 0.05;
        double ST = 0.20;
        double SO = 0.15;
        double SE = 0.10;
        double MinAThresh = SRA+SCA+ST+SO+SE;
        double rel = Double.parseDouble(jLabel7.getText());
        double comp = Double.parseDouble(jLabel8.getText());
        double tech = Double.parseDouble(jLabel9.getText());
        double org = Double.parseDouble(jLabel10.getText());
        double env = Double.parseDouble(jLabel11.getText());
        double totalWeightedAverageScore = (rel+comp+tech+org+env)/5;
        jLabel13.setText(String.valueOf(dc.format(totalWeightedAverageScore)));

        /*if(MinAThresh<60){
            JOptionPane.showMessageDialog(null, " "Not ready review all dimensions" ");
            decision.setText(" "Not ready review all dimensions" ");
        }
        else if(MinAThresh>60 & tech > 20 & org >15 & env > 10){
            JOptionPane.showMessageDialog(null, " "Ready to adopt" ");
            decision.setText(" "Ready to adopt" ");
        }
        else if(MinAThresh>60 & tech < 20 ){
            JOptionPane.showMessageDialog(null, " "Ready to adopt, improve the Technology dimension and Implement" ");
            decision.setText(" "Ready to adopt, improve the Technology dimension and Implement" ");
        }
        else if(tech > 20 & org <15 ){
            JOptionPane.showMessageDialog(null, " ""Improve Organisation dimension, check environment" ");
            decision.setText(" "Improve Organisation dimension, check environment" ");
        }
        else if(tech > 20 & org >15 & env < 10){
            JOptionPane.showMessageDialog(null, " "Review Environment and Implement" ");
            decision.setText(" "Review Environment and Implement" ");
        }
        */

        if(totalWeightedAverageScore < MinAThresh){
            decision.setText(" "Not ready review all dimensions" ");
        }
        else if(totalWeightedAverageScore>0.6 & tech > 0.2 & org >0.15 & env > 0.1){
            decision.setText(" "Ready to adopt" ");
        }
    }
}

```


PP

```

jPanel1Layout.setVerticalGroup(
jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
.addGroup(jPanel1Layout.createSequentialGroup()
.addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
.addGap(34, 34, 34)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
.addComponent(jLabel7, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
.addComponent(jLabel2))
.addGap(18, 18, 18)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
.addComponent(jLabel3)
.addComponent(jLabel8, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGap(18, 18, 18)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
.addComponent(jLabel4)
.addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGap(18, 18, 18)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
.addComponent(jLabel5)
.addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGap(18, 18, 18)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
.addComponent(jLabel6)
.addComponent(jLabel11, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGap(20, 20, 20)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
.addComponent(jLabel12)
.addComponent(jLabel13, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE))
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
.addComponent(jButtonDone, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
.addGap(23, 23, 23)))
);

javax.swing.GroupLayout layout = new javax.swing.GroupLayout(getContentPane());
getContentPane().setLayout(layout);
layout.setHorizontalGroup(
    layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(layout.createSequentialGroup()
            .addComponent(jPanel1, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addGap(10, 10, 10)
            .addComponent(jButtonDone, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addContainerGap(10, true))
);

layout.setVerticalGroup(
    layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(layout.createSequentialGroup()
            .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
            .addContainerGap(10, true))
);

pack();
setLocationRelativeTo(null);
}

DecimalFormat dc = new DecimalFormat("0.00");
private void jButtonDoneActionPerformed(java.awt.event.ActionEvent evt) {

    double rel = Double.parseDouble(jLabel7.getText());
    double comp = Double.parseDouble(jLabel8.getText());
    double tech = Double.parseDouble(jLabel9.getText());
    double org = Double.parseDouble(jLabel10.getText());
    double env = Double.parseDouble(jLabel11.getText());

    double totalWeightedAverageScore = rel+comp+tech+org+env;
    jLabel13.setText(String.valueOf(dc.format(totalWeightedAverageScore)));

    setMinmumThreshold();

    Details Det = new Details();
    Details.CompName.setText(Decision.CompName.getText());
    Details.jLabel3.setText(Decision.jLabel13.getText());
    Details.jTextField1.setText(Decision.decision.getText());
    Det.setVisible(true);
    //setVisible(false);

}

/**
 * @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(Decision.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
} catch (InstantiationException ex) {
    java.util.logging.Logger.getLogger(Decision.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
} catch (IllegalAccessException ex) {
    java.util.logging.Logger.getLogger(Decision.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
} catch (javax.swing.UnsupportedLookAndFeelException ex) {
    java.util.logging.Logger.getLogger(Decision.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 Decision().setVisible(true);
    }
});
}

```

```

// Variables declaration - do not modify
public javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel decision;
public static javax.swing.JButton jButtonDone;
private javax.swing.JLabel jLabel1;
public static javax.swing.JLabel jLabel10;
public static javax.swing.JLabel jLabel11;
private javax.swing.JLabel jLabel12;
public static javax.swing.JLabel jLabel13;
private javax.swing.JLabel jLabel14;
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;
public static javax.swing.JLabel jLabel7;
public static javax.swing.JLabel jLabel8;
public static javax.swing.JLabel jLabel9;
private javax.swing.JPanel jPanel1;
private javax.swing.JPanel jPanel2;
// End of variables declaration
}

```

Total Score Calculation

```

/*
 * 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 Dimension;

/**
 *
 */

/**
 * public class Details extends javax.swing.JFrame {

    /**
     * Creates new form Details
     */

    public Details() {
        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() {

        jPanel1 = new javax.swing.JPanel();
        jPanel2 = new javax.swing.JPanel();
        jLabel1 = new javax.swing.JLabel();
        CompName = new javax.swing.JLabel();
        jLabel2 = new javax.swing.JLabel();
        jLabel3 = new javax.swing.JLabel();
        jLabel4 = new javax.swing.JLabel();
        jTextField1 = new javax.swing.JTextField();
        jButton2 = new javax.swing.JButton();
        jButton3 = new javax.swing.JButton();
        jButton1 = new javax.swing.JButton();

        setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

        jPanel2.setBackground(new java.awt.Color(214, 113, 45));

        jLabel1.setFont(new java.awt.Font("Tahoma", 1, 14)); // NOI18N

```

```

jLabel1.setText("Company Name:");

CompName.setFont(new java.awt.Font("Tahoma", 1, 14)); // NOI18N
CompName.setText("null");

javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
jPanel2.setLayout(jPanel2Layout);
jPanel2Layout.setHorizontalGroup(
    jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
            .addGap(205, 205, 205)
            .addComponent(jLabel1)
            .addGap(18, 18, 18)
            .addComponent(CompName, javax.swing.GroupLayout.PREFERRED_SIZE, 324, javax.swing.GroupLayout.PREFERRED_SIZE)
            .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
        );
jPanel2Layout.setVerticalGroup(
    jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel2Layout.createSequentialGroup()
            .addGroup(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING, false)
                .addContainerGap(27, Short.MAX_VALUE)
                .addGroup(jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
                    .addComponent(jLabel1)
                    .addComponent(CompName))
                .addGap(26, 26, 26))
            );

jLabel2.setFont(new java.awt.Font("Tahoma", 1, 14)); // NOI18N
jLabel2.setText("Score:");

jLabel3.setFont(new java.awt.Font("Tahoma", 1, 14)); // NOI18N
jLabel3.setText("0");

jLabel4.setFont(new java.awt.Font("Tahoma", 1, 14)); // NOI18N
jLabel4.setText("Decision:");

jTextField1.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
jTextField1.setBorder(new javax.swing.border.SoftBevelBorder(javax.swing.border.BevelBorder.RAISED));
jTextField1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jTextField1ActionPerformed(evt);
    }
});

jButton2.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
jButton2.setText("Login");
jButton2.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton2ActionPerformed(evt);
    }
});

jButton3.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
jButton3.setText("Exit");
jButton3.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton3ActionPerformed(evt);
    }
});

jButton1.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
jButton1.setText("Display Scores");
jButton1.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButton1ActionPerformed(evt);
    }
});

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel2, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING, false)
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addGap(61, 61, 61)
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.TRAILING)
                        .addComponent(jLabel2)
                        .addComponent(jLabel4))
                    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 113, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addComponent(jTextField1, javax.swing.GroupLayout.PREFERRED_SIZE, 540, javax.swing.GroupLayout.PREFERRED_SIZE)))
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addGap(87, 87, 87)
                    .addComponent(jButton1, javax.swing.GroupLayout.PREFERRED_SIZE, 126, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 113, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addComponent(jButton2, javax.swing.GroupLayout.PREFERRED_SIZE, 85, javax.swing.GroupLayout.PREFERRED_SIZE)
                    .addGap(55, 55, 55)
                    .addComponent(jButton3, javax.swing.GroupLayout.PREFERRED_SIZE, 80, javax.swing.GroupLayout.PREFERRED_SIZE))
                .addContainerGap(72, Short.MAX_VALUE))
            );
jPanel1Layout.setVerticalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup()
            .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 113, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addComponent(jTextField1, javax.swing.GroupLayout.PREFERRED_SIZE, 540, javax.swing.GroupLayout.PREFERRED_SIZE))
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 126, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 85, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 80, javax.swing.GroupLayout.PREFERRED_SIZE))
                    .addContainerGap(72, Short.MAX_VALUE))
                .addGroup(jPanel1Layout.createSequentialGroup()
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 113, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addComponent(jTextField1, javax.swing.GroupLayout.PREFERRED_SIZE, 540, javax.swing.GroupLayout.PREFERRED_SIZE))
                    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 126, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 85, javax.swing.GroupLayout.PREFERRED_SIZE)
                        .addPreferredGap(javax.swing.GroupLayout.PREFERRED_SIZE, 80, javax.swing.GroupLayout.PREFERRED_SIZE))
                    .addContainerGap(72, Short.MAX_VALUE))
            );

```

```

        .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addGap(86, 86, 86)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jLabel2)
            .addComponent(jLabel3))
        .addGap(97, 97, 97)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jLabel4)
            .addComponent(jTextField1, javax.swing.GroupLayout.PREFERRED_SIZE, 71, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, 120, Short.MAX_VALUE)
        .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
            .addComponent(jButton2)
            .addComponent(jButton3)
            .addComponent(jButton1))
        .addGap(38, 38, 38))
    );

    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, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    );
    layout.setVerticalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addComponent(jPanel1, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    );

    pack();
} // </editor-fold>

private void jButton3ActionPerformed(java.awt.event.ActionEvent evt) {
    System.exit(0);
}

private void jButton2ActionPerformed(java.awt.event.ActionEvent evt) {
    Login log = new Login();
    log.setVisible(true);
}

private void jTextField1ActionPerformed(java.awt.event.ActionEvent evt) {
    jTextField1.setEditable(false);
}

private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
    Decision dec = new Decision();
    dec.setVisible(true);
}

/**
 * @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(Details.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Details.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Details.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Details.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 Details().setVisible(true);
        }
    });
}

// Variables declaration - do not modify
public static javax.swing.JLabel CompName;
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;
public static javax.swing.JLabel jLabel3;
private javax.swing.JLabel jLabel4;
private javax.swing.JPanel jPanel1;

```

```

private javax.swing.JPanel jPanel2;
public static javax.swing.JTextField jTextField1;
// End of variables declaration
}

```

APPENDIX F- Testing and simulation results

A representative of an SSE may use the model to evaluate their organisation's readiness to adopt BIS by

1. The Login screen requires the use of assigned credentials and specifying the SSE's name

Default username is **admin**

Password **admin**

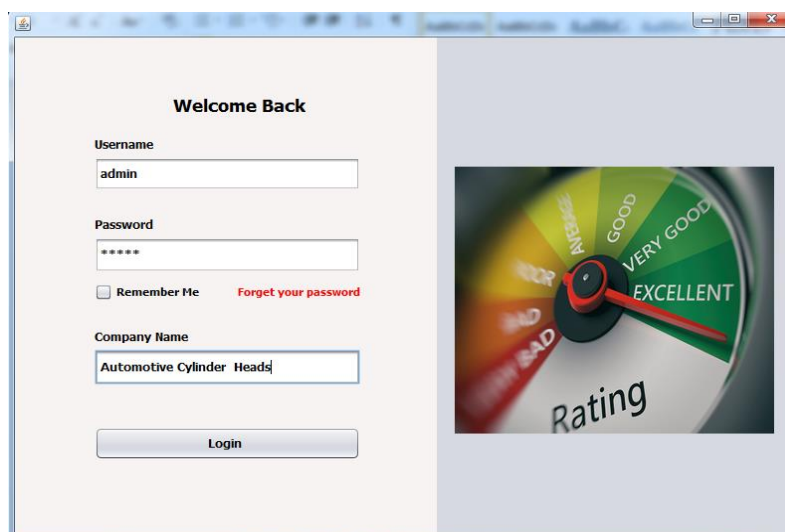


Figure F.1 Login screen

2. Upon successful login, a screen to evaluate the aspects defined under the Relative Advantage dimension is displayed.

Relative Advantage

Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AN 5 is STRONGLY AGREE

Improve operational efficiency	
Reduce operational costs	
Improve organisational performance	
Increase Competitive advantage	
Improve decision making	
Availability of data storage platforms	

Score : 0

Get Score Rest All Next

Figure F.2 Relative Advantage Dimension rating

- The representative is expected to rate their organisation against the given aspects on a scale of 1 to 5 as shown below

Compatibility

Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE

Availability of hardware and software resources for BIS use	4
Data storage and accessibility	4
Use of data in decision making process	3
Impact of new technologies on data management	
Change process in organisation	4
Prior BIS knowledge	2
BIS usage by competitors	2
Participate in BI related issues	4
BIS expertise in organisation	2
Data analysis expertise in organisation	2

Score : 0

Get Score Rest All Next

Figure F.3 Rate values for each aspect

In case of an aspect that has not been rated, the system prompts you to enter ratings for all aspects.

Compatibility

Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE

Availability of hardware and software resources for BIS use	4
Data storage and accessibility	4
Use of data in decision making process	
Impact of new technologies on data management	
Change process in organisation	
Prior BIS knowledge	
BIS usage by competitors	2
Participate in BI related issues	4
BIS expertise in organisation	2
Data analysis expertise in organisation	2

Score : 0

Message
Please answer all the question...!!!
OK

Figure F.4 Prompt to answer all questions

4. Upon completing entering the values, a click on the GET Score button displays the average score for that dimension.

Technology

Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE

Currently used systems and hardware	4
Ease of use of current software, security	4
Software license issues	2
Availability of data analysis software	2
Defined data handling procedures and adherence	2
Review of data handling procedures	4

Score : 3.00

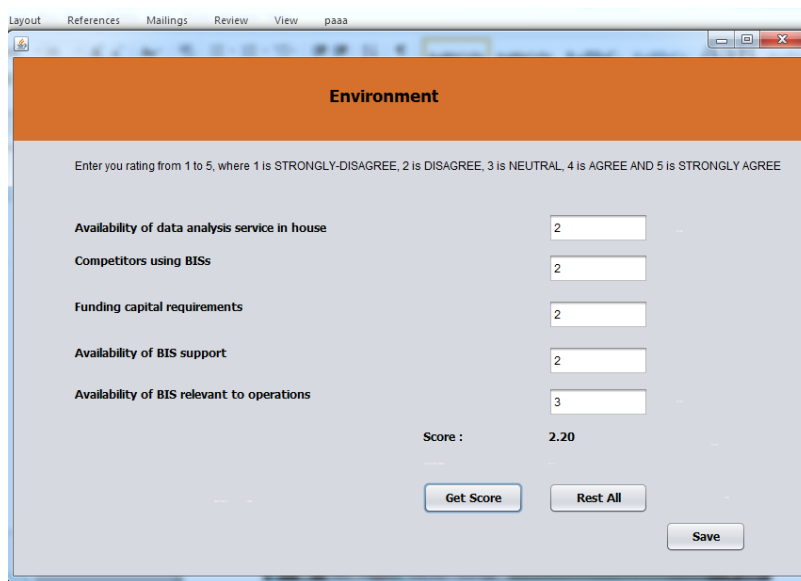
Get Score Rest All

Next

Figure F.5 Score for dimension displayed

5. Clicking Next displays the aspects of the next dimension to be rated.
6. The SSE representative/ user is expected to repeat steps 3,4 and 5 until they have rated all the defined Dimensions.

7. After all the Dimensions have been rated, click SAVE button to display the total score



Environment

Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AND 5 is STRONGLY AGREE

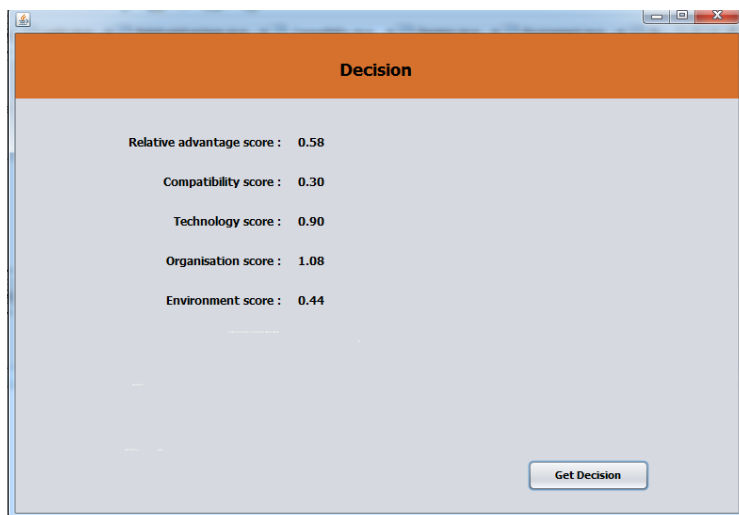
Availability of data analysis service in house	2
Competitors using BISs	2
Funding capital requirements	2
Availability of BIS support	2
Availability of BIS relevant to operations	3

Score : 2.20

Get Score Reset All Save

Figure F.6 Save the ratings

8. The scores per dimension are displayed



Decision

Relative advantage score : 0.58

Compatibility score : 0.30

Technology score : 0.90

Organisation score : 1.08

Environment score : 0.44

Get Decision

Figure F.7 Dimension Scores

9. Clicking on the Get Decision button displays the SSE's total score. An SSE that scores a total score greater than 0.6 is considered ready to adopt BIS

Company Name: ABC

Score: 0.66

Decision: "Ready to adopt"

Display Scores LogIn Exit

Figure F.8 Total Score and Decision

When the total score is below 0.6, the SSE is deemed to be not ready and must review the dimensions and aspects to address the areas they have been lowly rates and embrace those with a high rating.

Company Name: 0

Score: 0.00

Decision: "Not ready review all dimensions"

Display Scores LogIn Exit

Figure F.9 Score less than 60

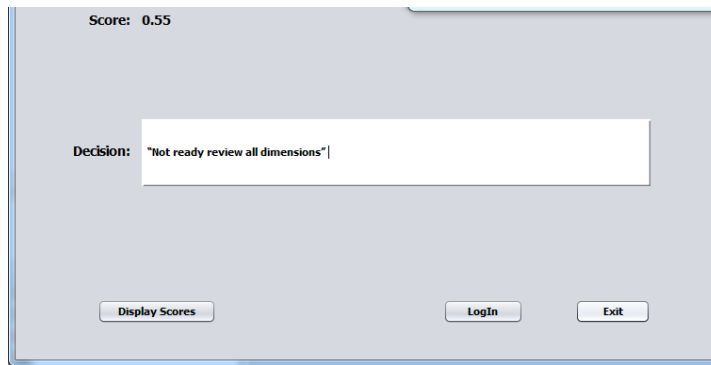


Figure 3.10 Score less than 60

10. Click Exit to end the evaluation process and return to the Log in screen shown in Step 1

APPENDIX G- Code snippets

```
public class RelativeAdvantage extends javax.swing.JFrame {

    /**
     * Creates new form Technology
     */
    public RelativeAdvantage() {
        initComponents();
    }

    DecimalFormat dc = new DecimalFormat("0.00");

    public void actionPerformed(){
        int one =Integer.parseInt(input1.getText());
        int two =Integer.parseInt(input2.getText());
        int three =Integer.parseInt(input3.getText());
        int four =Integer.parseInt(input4.getText());
        int five =Integer.parseInt(input5.getText());
        int six =Integer.parseInt(input6.getText());
        int sum = one+two+three+four+five+six;
        double average = sum/6f;
        averageOutput.setText(String.valueOf(dc.format(average)));

        double weightedScore = average*0.15f;
        Wsoutput.setText(String.valueOf(dc.format(weightedScore)));

    }
    FileWriter fileWriter;

    /**
     * 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() {

        jPanel1 = new javax.swing.JPanel();
        jLabel2 = new javax.swing.JLabel();
        jPanel2 = new javax.swing.JPanel();
        jLabel1 = new javax.swing.JLabel();
        input1 = new javax.swing.JTextField();
        jLabel3 = new javax.swing.JLabel();
        jLabel4 = new javax.swing.JLabel();
        jLabel5 = new javax.swing.JLabel();
        jLabel6 = new javax.swing.JLabel();
        jLabel7 = new javax.swing.JLabel();
        input4 = new javax.swing.JTextField();
        input5 = new javax.swing.JTextField();
        input2 = new javax.swing.JTextField();
        input6 = new javax.swing.JTextField();
        input3 = new javax.swing.JTextField();
        jLabel8 = new javax.swing.JLabel();
        jButtonNext = new javax.swing.JButton();
        jLabel9 = new javax.swing.JLabel();
        jButtonResetAll = new javax.swing.JButton();
        jButtonGetAverage = new javax.swing.JButton();
        jLabel10 = new javax.swing.JLabel();
        averageOutput = new javax.swing.JLabel();
        Wsoutput = new javax.swing.JLabel();
        CompName = new javax.swing.JLabel();
        CompNameText = new javax.swing.JLabel();

        setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

        jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
        jLabel2.setText("Improve operational efficiency");

        jPanel2.setBackground(new java.awt.Color(214, 113, 45));

        jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
        jLabel1.setText("Relative Advantage");

        javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
        jPanel2.setLayout(jPanel2Layout);
        jPanel2Layout.setHorizontalGroup(
            jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
                .addGroup(jPanel2Layout.createSequentialGroup()
                    .addGroup(jPanel2Layout.createSequentialGroup()
                        .addGap(307, 307, 307)
                        .addComponent(jLabel1)
                        .addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
                    .addGroup(jPanel2Layout.createSequentialGroup()
                        .addGap(30, 30, 30)
                        .addComponent(jLabel1)
                        .addContainerGap(36, Short.MAX_VALUE))
                );

        input1.addActionListener(new java.awt.event.ActionListener() {
            public void actionPerformed(java.awt.event.ActionEvent evt) {
                input1ActionPerformed(evt);
            }
        });
        input1.addKeyListener(new java.awt.event.KeyAdapter() {
            public void keyTyped(java.awt.event.KeyEvent evt) {
                input1KeyTyped(evt);
            }
        });
    }
}
```

```

    }
});

jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel3.setText("Reduce operational costs");

jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel4.setText("Improve organisational performance");

jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel5.setText("Increase Competitive advantage");

jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel6.setText("Improve decision making");

jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel7.setText("Availability of data storage platforms");

input4.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input4KeyTyped(evt);
    }
});

input5.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input5KeyTyped(evt);
    }
});

input2.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input2KeyTyped(evt);
    }
});

input6.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input6KeyTyped(evt);
    }
});

input3.addKeyListener(new java.awt.event.KeyAdapter() {
    public void keyTyped(java.awt.event.KeyEvent evt) {
        input3KeyTyped(evt);
    }
});

jLabel8.setText("Enter you rating from 1 to 5, where 1 is STRONGLY-DISAGREE, 2 is DISAGREE, 3 is NEUTRAL, 4 is AGREE AN 5 is STRONGLY DISAGREE");

jButtonNext.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonNext.setText("Next");
jButtonNext.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonNextActionPerformed(evt);
    }
});

jLabel9.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jLabel9.setText("Score :");

jButtonRestAll.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonRestAll.setText("Rest All");
jButtonRestAll.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonRestAllActionPerformed(evt);
    }
});

jButtonGetAverage.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
jButtonGetAverage.setText("Get Score");
jButtonGetAverage.addActionListener(new java.awt.event.ActionListener() {
    public void actionPerformed(java.awt.event.ActionEvent evt) {
        jButtonGetAverageActionPerformed(evt);
    }
});

jLabel10.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
jLabel10.setForeground(new java.awt.Color(240, 240, 240));
jLabel10.setText("Weighted score :");

averageOutput.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
averageOutput.setText("0");

WSoutput.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
WSoutput.setForeground(new java.awt.Color(240, 240, 240));
WSoutput.setText("0");

CompName.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompName.setForeground(new java.awt.Color(240, 240, 240));
CompName.setText("Campany:");

CompNameText.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
CompNameText.setForeground(new java.awt.Color(240, 240, 240));
CompNameText.setText("0");

javax.swing.GroupLayout jPanel1Layout = new javax.swing.GroupLayout(jPanel1);
jPanel1.setLayout(jPanel1Layout);
jPanel1Layout.setHorizontalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .add(jPanel2, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)

```

```

.addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
.addContainerGap(javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
    .addComponent(ButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(26, 26, 26)
    .addComponent(ButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(223, 223, 223))
.addGroup(javax.swing.GroupLayout.Alignment.TRAILING, jPanel1Layout.createSequentialGroup())
.addComponent(ButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 86, javax.swing.GroupLayout.PREFERRED_SIZE)
.addGap(46, 46, 46)))
.addGroup(jPanel1Layout.createSequentialGroup())
.addGap(86, 86, 86)
.addComponent(jLabel8)
.addContainerGap(99, Short.MAX_VALUE))
.addGroup(jPanel1Layout.createSequentialGroup())
.addGap(65, 65, 65)
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
    .addComponent(CompName)
    .addGap(18, 18, 18)
    .addComponent(CompNameText, javax.swing.GroupLayout.PREFERRED_SIZE, 69, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup())
        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
        .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 34, javax.swing.GroupLayout.PREFERRED_SIZE))
        .addGroup(jPanel1Layout.createSequentialGroup())
        .addComponent(jLabel9, javax.swing.GroupLayout.PREFERRED_SIZE, 106, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
        .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 47, javax.swing.GroupLayout.PREFERRED_SIZE)))
    .addGap(272, 272, 272))
.addGroup(jPanel1Layout.createSequentialGroup())
.addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addComponent(jLabel7)
    .addComponent(jLabel3)
    .addComponent(jLabel2)
    .addComponent(jLabel4)
    .addComponent(jLabel5)
    .addComponent(jLabel6))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING, false)
        .addComponent(input2, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
        .addComponent(input4, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
        .addComponent(input3, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
        .addComponent(input1, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
        .addComponent(input5, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE)
        .addComponent(input6, javax.swing.GroupLayout.DEFAULT_SIZE, 106, Short.MAX_VALUE))
    .addGap(217, 217, 217)))
);
jPanel1Layout.setVerticalGroup(
    jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
    .addGroup(jPanel1Layout.createSequentialGroup())
    .addComponent(jPanel2, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(18, 18, 18)
    .addComponent(jLabel8)
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED, 20, Short.MAX_VALUE)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(jLabel2)
        .addComponent(input1, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(jLabel3)
        .addComponent(input2, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jLabel4)
        .addComponent(input3, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addGroup(jPanel1Layout.createSequentialGroup())
        .addGap(14, 14, 14)
        .addComponent(jLabel5))
        .addGroup(jPanel1Layout.createSequentialGroup())
        .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
        .addComponent(input4, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input5, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel6))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(input6, javax.swing.GroupLayout.PREFERRED_SIZE, 31, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel7))
    .addGap(21, 21, 21)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(averageOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 19, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(jLabel9, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.UNRELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(jLabel10, javax.swing.GroupLayout.PREFERRED_SIZE, 24, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(WsOutput, javax.swing.GroupLayout.PREFERRED_SIZE, 27, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(CompName)
        .addComponent(CompNameText))
    .addPreferredGap(javax.swing.LayoutStyle.ComponentPlacement.RELATED)
    .addGroup(jPanel1Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.BASELINE)
        .addComponent(ButtonRestAll, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
        .addComponent(ButtonGetAverage, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE))
    .addGap(8, 8, 8)
    .addComponent(ButtonNext, javax.swing.GroupLayout.PREFERRED_SIZE, 33, javax.swing.GroupLayout.PREFERRED_SIZE)
    .addGap(50, 50, 50))
);

```

```

);

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, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
);
layout.setVerticalGroup(
    layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.PREFERRED_SIZE)
);
pack();
setLocationRelativeTo(null);
} // </editor-fold>

private void input1KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input2KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input3KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input4KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input5KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void input6KeyTyped(java.awt.event.KeyEvent evt) {
    char c = evt.getKeyChar();
    if(!Character.isDigit(c) || (c==KeyEvent.VK_BACK_SPACE) || c==KeyEvent.VK_DELETE){
        getToolkit().beep();
        evt.consume();
    }
}

private void jButtonResetActionPerformed(java.awt.event.ActionEvent evt) {
    input1.setText(null);
    input2.setText(null);
    input3.setText(null);
    input4.setText(null);
    input5.setText(null);
    input6.setText(null);
    averageOutput.setText(null);
    WSoutput.setText(null);
}

private void input1ActionPerformed(java.awt.event.ActionEvent evt) {
    //if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5){
    //JOptionPane.showMessageDialog(this, " Enter only numbers from 1 to 5 ");
    //JSpinner spinner = new JSpinner();
    //spinner.setModel(new SpinnerNumberModel(0, null, 10, 1));

    //}

private void jButtonGetAverageActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        if(input1.getText().length()<=0 ||
            input2.getText().length()<=0 ||
            input3.getText().length()<=0 ||
            input4.getText().length()<=0 ||
            input5.getText().length()<=0 ||
            input6.getText().length()<=0){
            JOptionPane.showMessageDialog(null, " Please answer all the question....!! ");
        }
        if(Integer.parseInt(input1.getText())<=0 || Integer.parseInt(input1.getText())>5 ||
            Integer.parseInt(input2.getText())<=0 || Integer.parseInt(input2.getText())>5 ||
            Integer.parseInt(input3.getText())<=0 || Integer.parseInt(input3.getText())>5 ||
            Integer.parseInt(input4.getText())<=0 || Integer.parseInt(input4.getText())>5 ||
            Integer.parseInt(input5.getText())<=0 || Integer.parseInt(input5.getText())>5 ||

```

```

        Integer.parseInt(input6.getText())<=0 || Integer.parseInt(input6.getText())>5){
JOptionPane.showMessageDialog(this, " Please only enter numbers from 1 to 5....!!! ");
}

        actionPerformed();

    }catch(Exception e){
    }

}

private void jButtonNextActionPerformed(java.awt.event.ActionEvent evt) {

    try {
        fileWriter = new FileWriter("Sheet.txt", true);
        //fileWriter.write(CompName.getText() + " : " + CompName.getText() + "\n");
        fileWriter.write("1: "+jLabel1.getText() + "\n" + "\n");
        fileWriter.write(jLabel2.getText() + " : " + input1.getText() + "\n");
        fileWriter.write(jLabel3.getText() + " : " + input2.getText() + "\n");
        fileWriter.write(jLabel4.getText() + " : " + input3.getText() + "\n");
        fileWriter.write(jLabel5.getText() + " : " + input4.getText() + "\n");
        fileWriter.write(jLabel6.getText() + " : " + input5.getText() + "\n");
        fileWriter.write(jLabel7.getText() + " : " + input6.getText() + "\n");
        fileWriter.write(jLabel9.getText() + averageOutput.getText() + "\n");
        fileWriter.write(jLabel10.getText() + WSoutput.getText() + "\n" + "\n" + "\n");

        fileWriter.close();
    } catch (IOException ex) {
        JOptionPane.showMessageDialog(this, " Database connection failed....!!! ");
    }

    Compatibility comp = new Compatibility();

    Compatibility.RAAS.setText(RelativeAdvantage.WSoutput.getText());
    Compatibility.CompNameText.setText(RelativeAdvantage.CompNameText.getText());
    comp.setVisible(true);
    setVisible(false);
}

/**
 * @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(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Technology.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Technology.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 Technology().setVisible(true);
        }
    });
}

// Variables declaration - do not modify
public javax.swing.JLabel CompName;
public static javax.swing.JLabel CompNameText;
public static javax.swing.JLabel WSoutput;
private javax.swing.JLabel averageOutput;
private javax.swing.JTextField input1;
private javax.swing.JTextField input2;
private javax.swing.JTextField input3;
private javax.swing.JTextField input4;
private javax.swing.JTextField input5;
private javax.swing.JTextField input6;
private javax.swing.JButton jButtonGetAverage;
private javax.swing.JButton jButtonNext;
private javax.swing.JButton jButtonResetAll;
private javax.swing.JLabel jLabel1;
private javax.swing.JLabel jLabel10;
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;

```

```
// End of variables declaration
}
```

The code defines an input form that displays the aspects of a dimension for them to be rated. The ratings are entered on the spaces provided. The GetScore button helps to display the score calculated out of the ratings. In case the rating for an aspect is to be changed, The Reset All button can be used to clear any entered ratings and allow a user to recapture new values for all the aspects. The same coding approach was adopted for all the input screens for the other four dimensions. The decision whether an SSE is ready to implement BIS or not is made from considering various functions like setting the minimum score that the SSE must attain at the rating, defining the criteria and compare the score to the criteria. The code snippet shows these key aspects.

```
public class Decision extends javax.swing.JFrame {
    /**
     * Creates new form Decision
     */
    FileWriter fileWriter;
    public Decision() {
        initComponents();
    }
    public void setMinnumThreshold(){
        double SRA = 0.10;
        double SCA = 0.05;
        double ST = 0.20;
        double SO = 0.15;
        double SE = 0.10;

        double MinAThresh = SRA+SCA+ST+SO+SE;

        double rel = Double.parseDouble(jLabel7.getText());
        double comp = Double.parseDouble(jLabel8.getText());
        double tech = Double.parseDouble(jLabel9.getText());
        double org = Double.parseDouble(jLabel10.getText());
        double env = Double.parseDouble(jLabel11.getText());

        double totalWeightedAverageScore = (rel+comp+tech+org+env)/5;
        jLabel13.setText(String.valueOf(dc.format(totalWeightedAverageScore)));

        /*if(MinAThresh<60){
            JOptionPane.showMessageDialog(null, " "Not ready review all dimensions" ");
            decision.setText(" "Not ready review all dimensions" ");
        }
        else if(MinAThresh>60 & tech > 20 & org >15 & env > 10){
            JOptionPane.showMessageDialog(null, " "Ready to adopt" ");
            decision.setText(" "Ready to adopt" ");
        }
        else if(MinAThresh>60 & tech < 20 ){
            JOptionPane.showMessageDialog(null, " "Ready to adopt, improve the Technology dimension and Implement" ");
            decision.setText(" "Ready to adopt, improve the Technology dimension and Implement" ");
        }
        else if(tech > 20 & org <15 ){
            JOptionPane.showMessageDialog(null, " ""Improve Organisation dimension, check environment" ");
            decision.setText(" "Improve Organisation dimension, check environment" ");
        }
        else if(tech > 20 & org >15 & env < 10){
            JOptionPane.showMessageDialog(null, " "Review Environment and Implement" ");
            decision.setText(" "Review Environment and Implement" ");
        }
        */

        if(totalWeightedAverageScore < MinAThresh){
            decision.setText(" "Not ready review all dimensions" ");
        }
        else if(totalWeightedAverageScore>0.6 & tech > 0.2 & org >0.15 & env > 0.1){
            decision.setText(" "Ready to adopt" ");
        }
        else if(totalWeightedAverageScore>.06 & tech < 0.2 ){
            decision.setText(" "Ready to adopt, improve the Technology dimension and Implement" ");
        }
        else if(tech > 0.2 & org <0.15 ){
            decision.setText(" "Improve Organisation dimension, check environment" ");
        }
        else if(tech > 0.2 & org >0.15 & env < 0.1){
            decision.setText(" "Review Environment and Implement" ");
        }
        }

        try {
            fileWriter = new FileWriter("Sheet.txt", true);
            fileWriter.write("6: "+jLabel11.getText()+"\n"+"");
            fileWriter.write(jLabel2.getText() + " " +jLabel7.getText() +"\n");
            fileWriter.write(jLabel3.getText() + " " +jLabel8.getText() +"\n");
            fileWriter.write(jLabel4.getText() + " " +jLabel9.getText() +"\n");
            fileWriter.write(jLabel5.getText() + " " +jLabel10.getText() +"\n");
            fileWriter.write(jLabel6.getText() + " " +jLabel11.getText() +"\n"+"");

            fileWriter.write(jLabel12.getText() + " : " +jLabel13.getText() +"\n"+"");
            fileWriter.write(jLabel14.getText() + " : " + decision.getText() +"\n"+"");
            fileWriter.write("#####"+"\n"+
                "                RATING COMPLETED                "+"\n"+
                "#####"+"\n"+"");

            fileWriter.close();
        } catch (IOException ex) {
            JOptionPane.showMessageDialog(this, " Database connection failed....!!! ");
        }
    }

    /**
     * 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() {

    jPanel1 = new javax.swing.JPanel();
    jPanel2 = new javax.swing.JPanel();
    jLabel1 = new javax.swing.JLabel();
    jLabel2 = new javax.swing.JLabel();
    jLabel3 = new javax.swing.JLabel();
    jLabel4 = new javax.swing.JLabel();
    jLabel5 = new javax.swing.JLabel();
    jLabel6 = new javax.swing.JLabel();
    jLabel7 = new javax.swing.JLabel();
    jLabel8 = new javax.swing.JLabel();
    jLabel9 = new javax.swing.JLabel();
    jLabel10 = new javax.swing.JLabel();
    jLabel11 = new javax.swing.JLabel();
    jLabel12 = new javax.swing.JLabel();
    jLabel13 = new javax.swing.JLabel();
    jButtonDone = new javax.swing.JButton();
    jLabel14 = new javax.swing.JLabel();
    decision = new javax.swing.JLabel();
    CompNameText = new javax.swing.JLabel();
    CompName = new javax.swing.JLabel();

    setDefaultCloseOperation(javax.swing.WindowConstants.EXIT_ON_CLOSE);

    jPanel2.setBackground(new java.awt.Color(214, 113, 45));

    jLabel1.setFont(new java.awt.Font("Tahoma", 1, 18)); // NOI18N
    jLabel1.setText("Decision");

    javax.swing.GroupLayout jPanel2Layout = new javax.swing.GroupLayout(jPanel2);
    jPanel2.setLayout(jPanel2Layout);
    jPanel2Layout.setHorizontalGroup(
        jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel2Layout.createSequentialGroup()
                .createSequentialGroup()
                    .addGap(344, 344, 344)
                    .addComponent(jLabel1)
                    .addGap(Short.MAX_VALUE)
            )
    );
    jPanel2Layout.setVerticalGroup(
        jPanel2Layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
            .addGroup(jPanel2Layout.createSequentialGroup()
                .createSequentialGroup()
                    .addGap(27, 27, 27)
                    .addComponent(jLabel1)
                    .addGap(20, 20, 20)
            )
    );

    jLabel2.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel2.setText("Relative advantage score :");

    jLabel3.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel3.setText("Compatibility score :");

    jLabel4.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel4.setText("Technology score :");

    jLabel5.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel5.setText("Organisation score :");

    jLabel6.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel6.setText("Environment score :");

    jLabel7.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel7.setText("0");

    jLabel8.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel8.setText("0");

    jLabel9.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel9.setText("0");

    jLabel10.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel10.setText("0");

    jLabel11.setFont(new java.awt.Font("Tahoma", 1, 12)); // NOI18N
    jLabel11.setText("0");

    jLabel12.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
    jLabel12.setForeground(new java.awt.Color(240, 240, 240));
    jLabel12.setText("Total average Weighted score score :");

    jLabel13.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
    jLabel13.setForeground(new java.awt.Color(240, 240, 240));
    jLabel13.setText("0");

    jButtonDone.setFont(new java.awt.Font("Tahoma", 1, 11)); // NOI18N
    jButtonDone.setText("Get Decision");
    jButtonDone.addActionListener(new java.awt.event.ActionListener() {
        public void actionPerformed(java.awt.event.ActionEvent evt) {
            jButtonDoneActionPerformed(evt);
        }
    });

    jLabel14.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N
    jLabel14.setForeground(new java.awt.Color(240, 240, 240));
    jLabel14.setText("Decision:");

    decision.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N

    CompNameText.setFont(new java.awt.Font("Tahoma", 0, 3)); // NOI18N

```

```
CompNameText.setForeground(new java.awt.Color(240, 240, 240));
CompNameText.setText("0");
```

```

        .addComponent(jPanel1, javax.swing.GroupLayout.Alignment.TRAILING, javax.swing.GroupLayout.PREFERRED_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE,
javax.swing.GroupLayout.PREFERRED_SIZE)
    );
    layout.setVerticalGroup(
        layout.createParallelGroup(javax.swing.GroupLayout.Alignment.LEADING)
        .addComponent(jPanel1, javax.swing.GroupLayout.DEFAULT_SIZE, javax.swing.GroupLayout.DEFAULT_SIZE, Short.MAX_VALUE)
    );

    pack();
    setLocationRelativeTo(null);
} // </editor-fold>
DecimalFormat dc = new DecimalFormat("0.00");
private void jButtonDoneActionPerformed(java.awt.event.ActionEvent evt) {

    double rel = Double.parseDouble(jLabel7.getText());
    double comp = Double.parseDouble(jLabel8.getText());
    double tech = Double.parseDouble(jLabel9.getText());
    double org = Double.parseDouble(jLabel10.getText());
    double env = Double.parseDouble(jLabel11.getText());

    double totalWeightedAverageScore = rel+comp+tech+org+env;
    jLabel13.setText(String.valueOf(dc.format(totalWeightedAverageScore)));

    setMinumThreshold();

    Details Det = new Details();
    Details.CompName.setText(Decision.CompName.getText());
    Details.jLabel3.setText(Decision.jLabel13.getText());
    Details.jTextField1.setText(Decision.decision.getText());
    Det.setVisible(true);
    //setVisible(false);

}

/**
 * @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(Decision.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (InstantiationException ex) {
        java.util.logging.Logger.getLogger(Decision.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (IllegalAccessException ex) {
        java.util.logging.Logger.getLogger(Decision.class.getName()).log(java.util.logging.Level.SEVERE, null, ex);
    } catch (javax.swing.UnsupportedLookAndFeelException ex) {
        java.util.logging.Logger.getLogger(Decision.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 Decision().setVisible(true);
        }
    });
}

```