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Strategic alignment of Information Technology and Business

by

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Dissertation Submitted in Fulfillment of the Requirements for the Degree of

Master of Science Engineering (Industrial Engineering)

University of the Witwatersrand

2016

Declaration

I declare that this dissertation is my own, unaided work, except where otherwise acknowledged. It is being submitted for the degree of Masters of Science to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

Signed this ___ day of _____ 2016

_____

Maarten Jacobus Petrus Coetzee

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Professor Ionel Botef for his supervision and Dr Ian Campbell for his support and supervision on this and previous study's.

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My wife, Elria, and my parents, Hennie and Wouda, for their unwavering support.

Abstract

The importance of information technology (IT) strategic alignment with organisational goals is considered and discussed. Internal and external factors that affect this alignment are identified. A method to strategically align business and IT is developed.

A case study methodology was used, which relied on both quantitative and qualitative methods. The focus of the case study is the School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand, Johannesburg, South Africa. The research identified current IT alignment barriers and the special requirements of this domain by conducting interviews, using questionnaires and focusing on relevant strategic documentation.

Data from the case-study environment was used to identify strengths, weaknesses, opportunities and threats.

The researcher identified a lack of commitment on the part of management both within the School and in the broader University to the University's strategic objectives as the main obstacle to IT and business strategic alignment. A revised IT strategic plan is developed for the School.

To Elria

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Nomenclature

Wits	The University of the Witwatersrand, Johannesburg
MIA	The School of Mechanical, Industrial and Aeronautical Engineering at The University of the Witwatersrand, Johannesburg
IT	Information Technology
SWOT	SWOT is a method of reviewing the current situation of your business or service. The idea is that you identify the strengths and weaknesses of your service, pinpoint opportunities and note threats. (Ojo et al. 2009)
BSC	Balanced scorecard
SPF	strategic Performance Factors
CIO	Chief Technology Officer
SOOCE	Student Ownership Of Computing Equipment
ICT	Information and communication technologies
PC	Personal Computer / Workstation

Chapter 1: INTRODUCTION

1.1 Background of the Research

Achieving a strategic advantage in today's competitive business world requires the optimal leverage and utilisation of all resources, including Information Technology (IT). IT can no longer be isolated as a separate department from others, and is used all over the modern business environment. Most departments rely on IT to function. Continuous developments and changes create a dynamic business environment (Silvius, 2007), an environment where both IT management and business management must constantly adapt and realign.

The School of Mechanical, Industrial and Aeronautical Engineering (MIA) brings together three engineering disciplines, these being mechanical engineering, industrial engineering and aeronautical engineering. The School is part of the University of the Witwatersrand (Wits), which sees itself as an internationally leading research-intensive university. It received its full university status in 1922, and is a unique institution due to its student demographics and research capacity (Director of Strategic Planning, 2011). The School of MIA relies on internal IT resources for a large part of its IT needs, the balance being supplied by Central Network Services (CNS), a department at Wits which offers and maintains physical network infrastructure and shared services such as hosting of the Wits website.

As early as 1968 Charles H. Kriebel argued that IT must be strategically aligned to business (Kriebel 1968). More than four decades later, the necessity of aligning business needs and IT is one of the key issues in IT management (Silvius, 2013). Regardless of all the focus this problem gets, in many cases it still remains unresolved (IT Governance Institute 2005) .

The strategic alignment of IT and business is not only to improve IT efficiency but also to improve business effectiveness. Alignment of IT and business will help organisations to achieve organisational goals (Al-hatmi 2012) .

The Balanced Scorecard (BS) methodology is a technique to guide business, providing objectives and key performance indicators (KPIs) to measure and for feedback and correction. The development of a BS for a business often includes strengths, weaknesses, opportunities and threats (SWOT) analysis and strategy

mapping. The first-generation balanced scorecard was developed by Robert S. Kaplan and management consultant David P. Norton (Khozein, 2012) and introduced the definitive four quadrants displaying the results of the selected KPI's (Lawrie & Cobbold, 2002, Kaplan, 2001). The BS links performance measures from the "four quadrants", which relate to the financial, customer, internal business and innovation and learning perspectives of a business. According to Lawrie and Cobbold (2002), the 3rd generation BS has distinct characteristics that makes it more suitable for strategic planning than previous versions.

This investigation will evaluate the strategic alignment of business and IT in the School of MIA. This will be done in three phases:

1) Identifying how the strategic alignment of business and IT can be achieved. The goal of this phase will be to investigate strategic methodology principles and practices.

2) Studying the environmental influences that affect the alignment between MIA at Wits and its internal IT by using a case study.

3) Formulating a strategic plan specifically for the case study environment using the balanced scorecard (BS) methodology.

This research was conducted in the form of a mixed methods case study, that is, a case study using both qualitative and quantitative data gathering methods.

1.2 Justification of the Research

The necessity of aligning business needs and IT is one of the key issues in IT management (Silvius, 2013). Management needs to know if their business and IT systems and strategy are aligned, and if not, what to do about it.

Research of this nature has never been done in the proposed environment.

1.3 Research Question and Objectives

The primary research question is:

Can a strategic plan be developed to align business and IT in the research environment using the 3rd generation balanced scorecard (BS) methodology?

The objectives are:

- Discover the factors that play a role.
- Create a holistic view of the environment to solve the research problem.
- Develop a model for business and IT alignment using the 3rd generation BS methodology.

1.4 Scope of Research

The purpose of this study is to determine how strategic planning is used in the chosen case study environment to align business and IT, and to provide a future IT strategic plan. The study includes a review of the factors influencing strategic alignment and strategic planning in a higher education institution.

1.5 Source of Data and Methodologies

The study attempts to develop a third generation BS based on cause and effect logic, specifically aimed at the long term strategic goal as stipulated in “The Wits 2030 top 100 goal”. This tailor-made balanced scorecard will provide MIA with a valuable management tool.

Mixed methods case studies comprise both quantitative data and qualitative data.

Quantitative data was gathered from questionnaires.

Qualitative data was gathered through interviews conducted with the staff of MIA. These interviews were transcribed from audio to written format. A thematic analysis was done on the interviews.

Chapter 2: LITERATURE REVIEW

This chapter synthesizes the relevant research on the topic. The flow of the research is emphasised by concentrating it in four primary themes, as shown in Figure 2. 1.

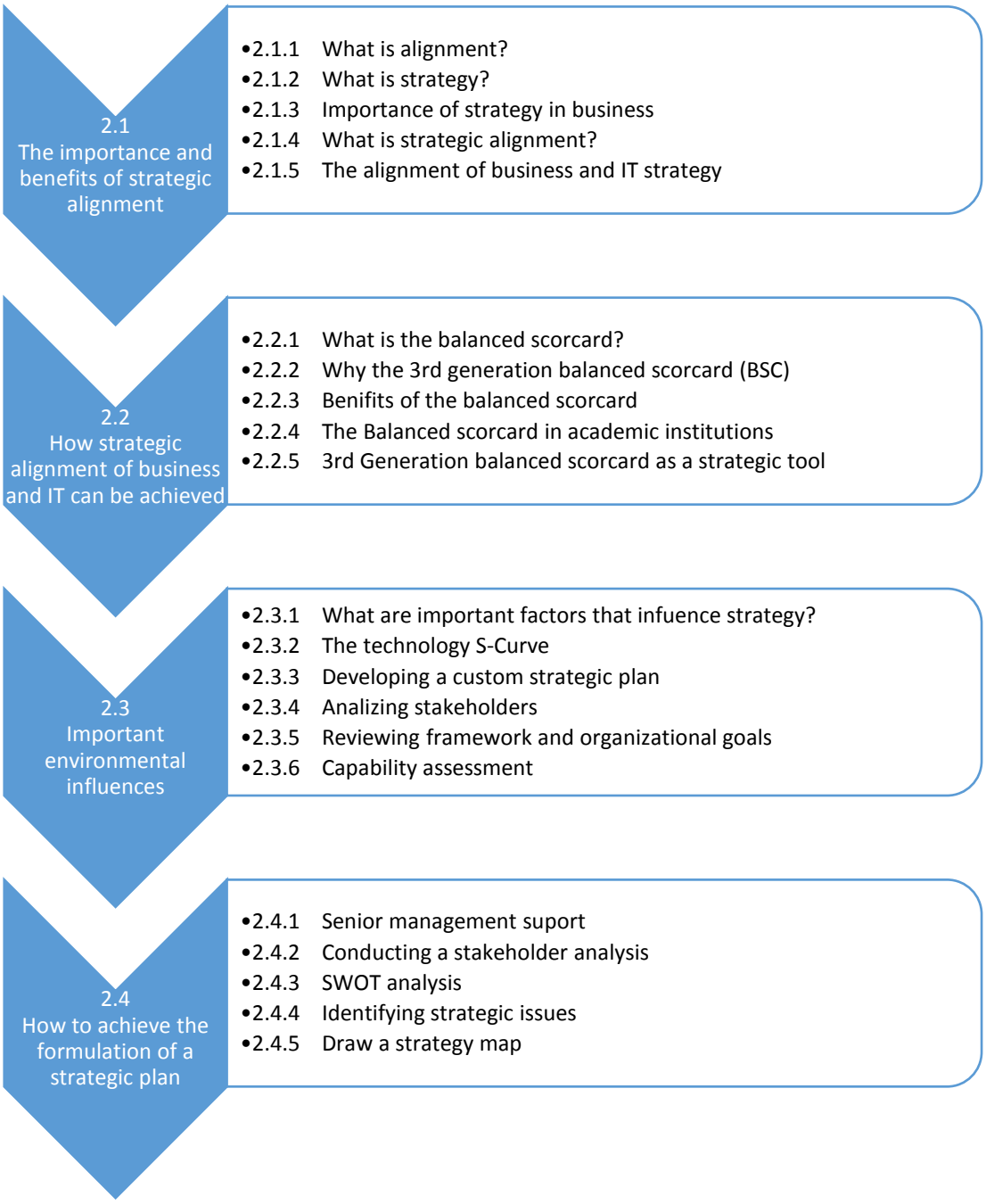
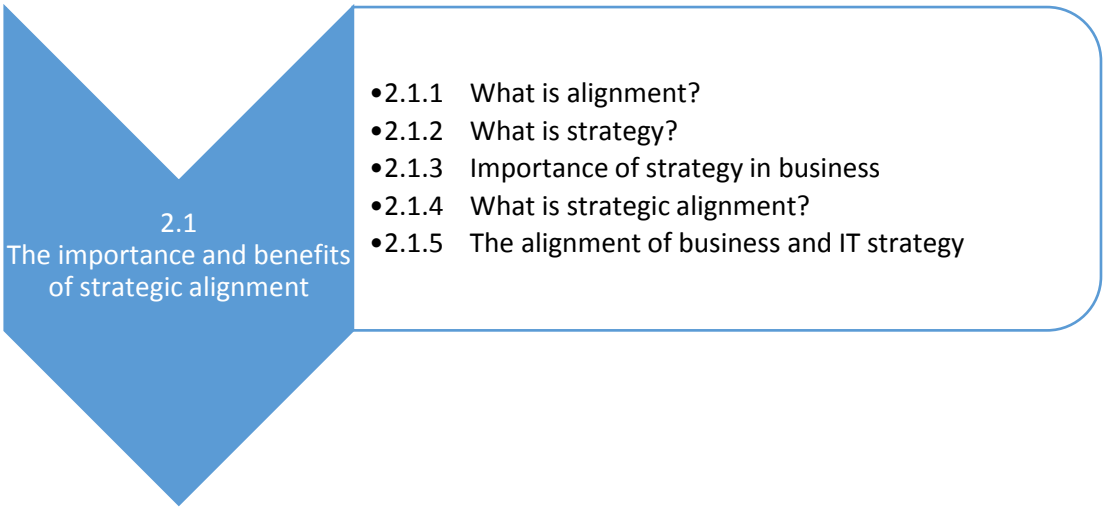


Figure 2.1 Chapter 2 breakdown



2.1 The Importance and Benefits of Strategic Alignment

This section defines alignment and strategy and contextualizes IT strategy, while focusing on its importance. It emphasises the positive influences strategic alignment will have on an organisation's performance.

2.1.1 What is strategic alignment?

The concept of strategic alignment is often used as a synonym or used interchangeably with "strategic fit" (Varghese & Kurien, 2004), "strategic integration" (Schlosser, et al., 2012), collaborative strategy (Ward, 2012) or a fit between functional domains (Henderson & Venkatraman, 1999), as well as the link between functional domains (Andolsen 2007).

A clear definition of alignment is elusive. The interpretations of the term get "flavoured" by the environment in which it is used. According to (Vargas, et al., 2007), there is little consensus on what business and IT alignment really is. A high-level definition of alignment, as described by Andolsen (Andolsen, 2007) , reads "it is the collaboration between the units that bring together an organization, by means of their individual contributions, as a result of integrating the organization's overall goals successfully".

The focus of this research will be on the well-defined strategic alignment between business and information technology. It does not focus on the general alignment of all departments, but only on the interaction between business and IT.

2.1.2 What is strategy?

The term can be traced back to ancient Greek civilization. The word strategy comes to us from the Greek word “strutegos”, meaning a general in command of an army. The word “**stratos”**, means army, and ending **-ug**, means to lead (Evered, 1983). All the functions of the ancient Greek military general add up to the composition of the term “strategy”.

Currently the term “strategy” is adopted by many schools of thought (Mintzberg, et al., 1998) and several different types of strategy are in use, such as marketing, (Anderson, 1982), sales, business (Chung, et al., 2012). Each has their specialised methodologies. A characteristic common to all strategies is that they have a goal (Kaplan & Norton, 2001).

A strategy, as explained by Shapiro (2007), entails an overall approach and plan that enables the management of a process. The focus on a high-level approach provides you with the big picture rather than only a plan of action for daily operations (Shapiro, 2007) .

2.1.3 Importance of Strategy in Business

In order for an organization to achieve its objectives, a set of decisions and actions are planned that are grounded in the current situation, aiming to achieve a possible future outcome (Abhijit, 2006). These actions are condensed into a strategic plan. Strategic management is what results in the formulation and implementation of these plans (Nuntamanop et al., 2013).

A typical strategic IT planning process aims to produce ingenuity to support organizational needs, and stimulate innovation. This process must deliver value to stakeholders (Ojo et al. 2009) in the form of a strategic plan for an organization to be effective (Yuwono et al., 2009) and lead to differentiation advantage (Pieterse, 2002).

A company without a strategic plan can be compared to a ship without a rudder, nothing to steer it in a specific direction on a planned course. A ship without a rudder will never reach its destination. Its fate will be the same as driftwood - washed ashore by currents, destined for failure (O’Regan et al., 2012).

The foundation for a successful strategy lies in the construction of the strategy to be uniquely designed to fit each organisation specifically (van Breda, 2000). Linking organizational learning with the characteristics of the continuous process of strategic

planning (Baltar, 2013) should result in a corporeal plan to outwit a competitor (Mintzberg et al., 1998).

Designing a successful strategy for the alignment between business and information technology starts by first looking at the specific mission and values representing the unique organization and most important of all, the vision generated by that company (Fattah and Arman, 2004). As illustrated by figure 2.*2*, the balanced scorecard translates the mission, values, and vision into strategy. The vision combines important qualities from its mission and values. Similar to a strategy, the vision must be feasible and agile to the changing business environment, and grounded solidly in reality (Niven 2003). A strategy must not only specify the desired outcomes as reflected in the vision, it is crucial that it describe how to achieve it (Kaplan & Norton, 2001).

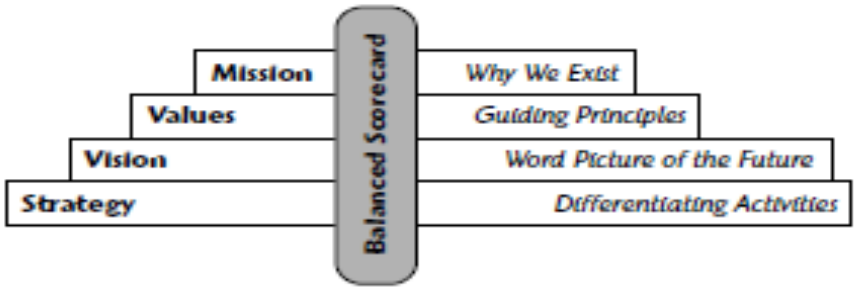


Figure 2.2 The balanced scorecard translates mission, values, vision and strategy (Niven 2003)

In the current electronic age, an efficient and strategically accurately aligned IT department is key to a properly functioning organisation. It is in an organisation's best interest that they remain ahead or at the very least, on par with competitors. This is possible with a detailed understanding of what alignment is and the benefits it provides (Scott, 2007).

2.1.4 What is strategic alignment?

A definition of strategic alignment between business and IT by De Haes and Van Grembergen (2009) is described as the process and goal to achieving competitive advantage by developing and sustaining a symbiotic relationship. It is clear that business has to align with IT to the same extent that IT has to align with business. Alignment can only be successful if it comes from both sides.

Two key factors are mutual leadership and accountability. Business leaders must influence IT, and CIOs must become business leaders (Growthwave, 2006). In a true symbiotic relationship (Van Grembergen et al., 2011), business must focus to obtain the benefits from IT. We can expect firms that manage to create a stronger IT-business alignment to outperform their competitors (Yaya and Hu, 2012).

The most limiting factor influencing alignment is a high level of communication between IT and business executives. Alignment is a two-way street that relies on communication (Hartung et al., 2000). It becomes even more critical in large organisations where the decentralised governance structures make coordination difficult and more mechanisms to promote strategic alignment are needed (Gutierrez et al., 2009).

2.1.5 The Alignment of business and IT strategy

Several suggestions were given on how alignment might be achieved and optimized. However, there will never be a standard, “one size fits all” strategic plan (Ahuja, 2012). Each organisation needs to design their own, according to their unique requirements and situation The IT Governance Institute (2005). Organisations might have functions that are outsourced, where all stakeholders need a clear understanding of an industry structure and dynamics to align (Bleistein et al., 2006).

The two-way process of alignment is demonstrated with red arrows in figure 2.3. Both parties have an equal responsibility to the other to strive to reach the primary objectives, vision and mission of the business together.

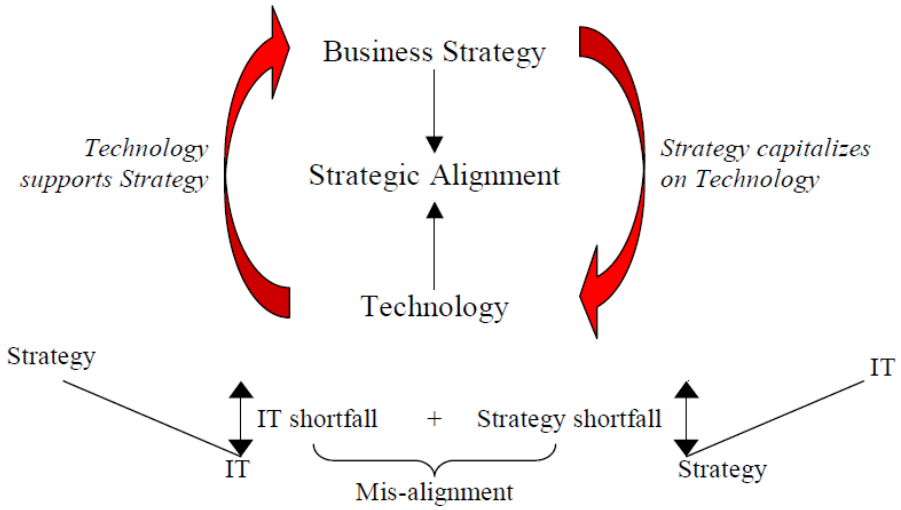
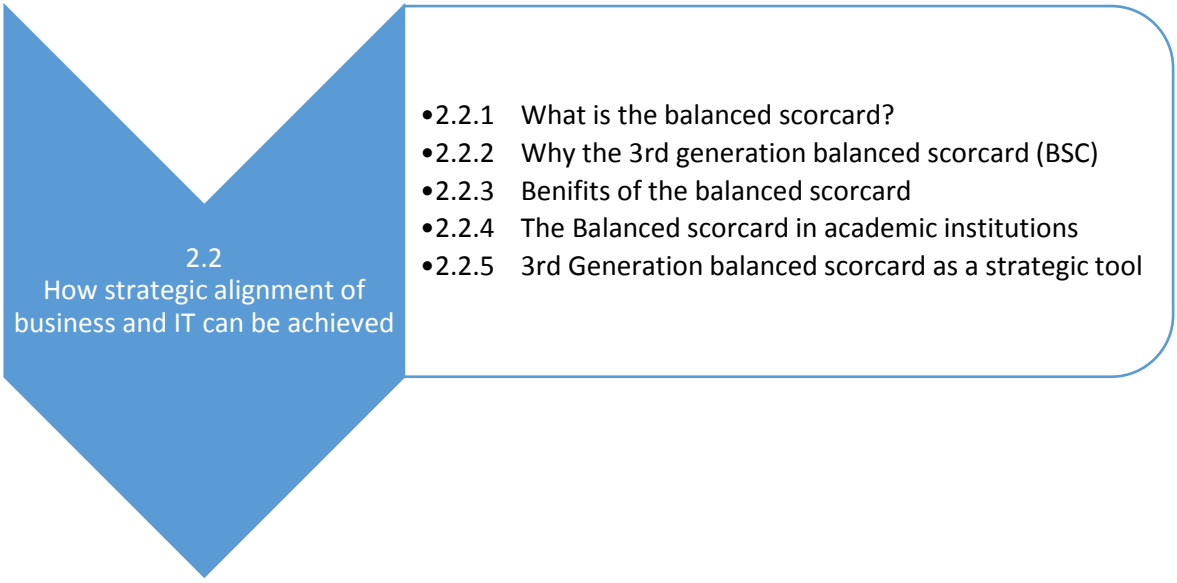


Figure 2.3 Exploring the dimensions of strategic alignment (Tallon & Kraemer, 1999)

The strategic alignment between business and IT has consistently been one of the top concerns of management (Hu & Huang, 2005, Yayla and Hu, 2012). A lack of alignment leads to the instability of business. The IT Governance Institute (2005) illustrates the far reaching implications of a lack of alignment. It is a fact that business and IT will be less productive, leading to potentially higher operating costs. Organizations that successfully align their business strategy with IT strategy are more successful compared to those that do not (Ullah & Lai, 2013).

The task of the industrial engineer typically includes the optimisation of resources. IT management focuses solely on the question: “do we do things right”? In a fast moving IT environment, it is possible to do things right and still fail. The question therefore must rather be “do we do the right things?” by aligning business and IT. The lack of strategic alignment in the economically strained South African environment will lead to an erosion of stakeholder value (Williams 2005, Badenhorst 2009).



2.2. How Strategic Alignment of Business and IT can be Achieved.

This section will identify how strategic alignment of business and IT can be achieved i.e. what needs to be done?

To achieve the strategic alignment of business and IT the main focus falls on strategic planning and its complexities. Alignment requires a shared understanding of organizational goals and objectives within various units of the organization (Kathuria et al., 2007). IT strategic planning supports the objectives of the organization in the long run, while being able to constantly adjust to the changing environment as needed. In the process of IT planning, the IT strategic balanced scorecard is identified as the best way to deploy IT strategies and achieve alignment (Marcos et al., 2012).

As an instrument that links operational targets to strategic goals, the balanced scorecard also integrates business activities to meet customer requirements. The 3rd generation balanced scorecard meets all of the criteria of a strategic alignment instrument (Atkinson, 2006).

2.2.1 What is a balanced scorecard?

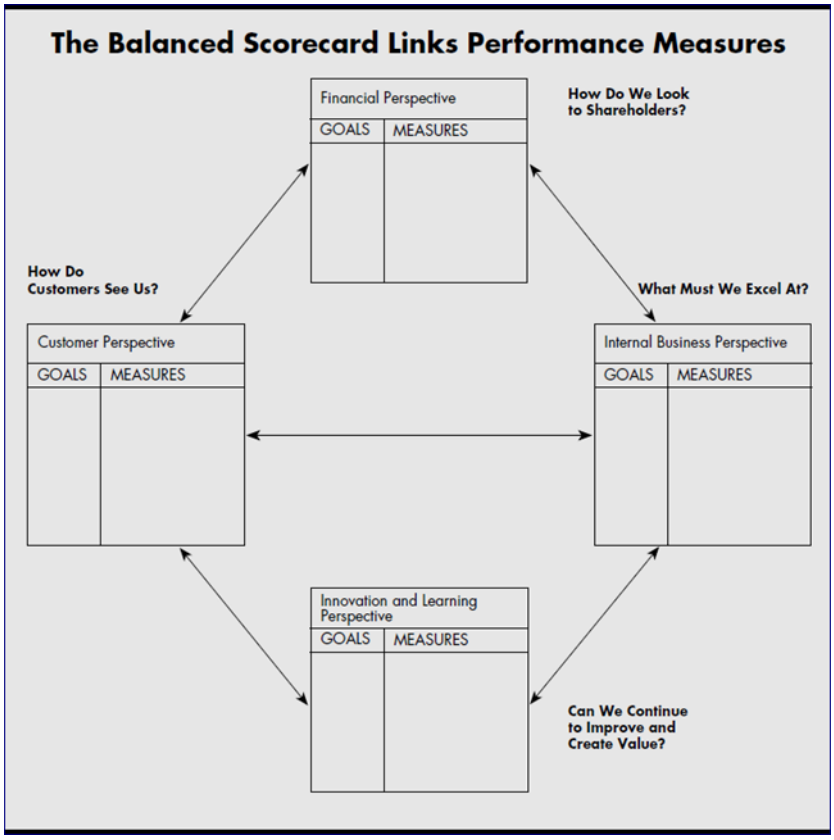


Figure 2. 4 The four perspectives (Tachiwona, 2011)

The BS definitive four quadrants are shown in Figure 2.4. The launch of the original first generation balanced scorecard in the early 1990's received a lot of media coverage and wide literature exposure (Cobbold & Lawrie, 2002, Khozein, 2012). The updated versions, version two and the current version three, tend to be more appreciated by subject matter experts. The difference between the first generation and the current version, the third generation balanced scorecard, is vast.

Because of the inflexible nature of the first balanced scorecard, current focus must be on the evolved version, the third generation balanced scorecard. A first generation balanced scorecard cannot be used for strategic alignment of business and IT (Andersen & Lawrie, 2002).

2.2.2 Why the 3rd generation balanced scorecard (BSC)?

The Advanced Performance Institute calls the balanced scorecard a "plan on a page" (Brunot, 2013). This is perhaps the most obvious difference between the 3rd

generation balanced scorecard and the earlier versions. The route to success as demonstrated using a strategy map, and successfully links cause and effect(Niven, 2002).

Applying the SWOT strategic tool to a primary analysis for the balanced scorecard increases the capability and efficiency of the model (Zohrabi & Manteghi, 2011).

As depicted in figure 2.5, the 3rd generation of the balanced scorecard is more suitable for a non-profit organisation. Figure 2.6 shows how the process addresses aspects of learning, customer satisfaction and the adoption of internal business processes.

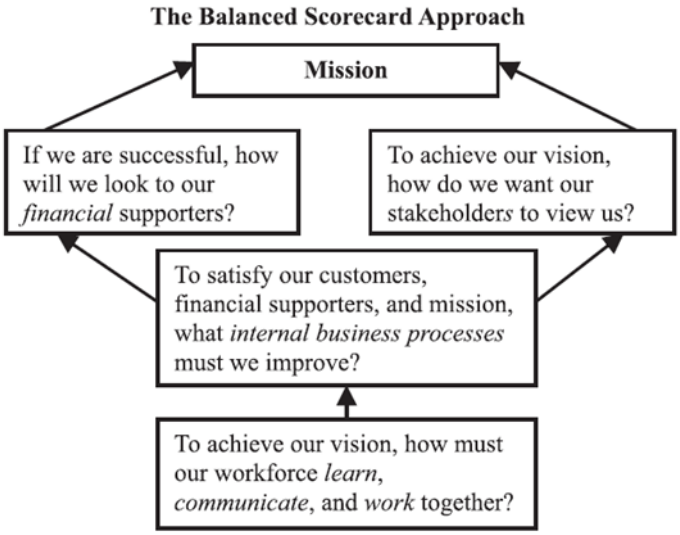


Figure 2.5 The balanced scorecard for a non-profit organisation (Papenhausen & Einstein, 2006) (Kaplan & Norton, 2001) (Nejati, et al., 2008)

2.2.3 Benefits of the balanced scorecard

The clear focus on cause and effect in the strategy map of a balanced scorecard (BSC) supports clarity of the role each employee must play in the achievement of targets. This has a positive influence on the achievement of organisational strategic goals (Greatbanks & Tapp, 2007).

Each BSC is constructed with the specifics from that organization and the strategic plans will be situation as well as goal dependent. Since each organization is unique, it should have its key elements based on its own vision and unique resources to reach

its goals. Nevertheless, the basic knowledge of BSC implementation can be generic (Wu 2012).

Research by Khozein (2012) lists the primary benefits of using a balanced scorecard as:

1. Better strategic planning – The BSC provides a structured framework to build and plan strategy.
2. Focused Communication – The strategy map visualises the business model which forces managers to think and communicate about cause-and-effect relationships they have.
3. Better management information and performance reporting – Key performance indicators for the various strategic objectives are monitored, resulting in up-to-date management information.
4. Better strategic alignment – envisioned synergy between internal and external role-players helps them to better align with the strategic objectives.
5. Better organizational alignment – organizational processes such as budgeting and risk management are better prioritized to align with the strategic objectives.

2.2.4 The balanced scorecard in academic institutions

Universities face increasing demands to be accountable to their stakeholders. Recent articles have shown that the BSC is widely used in several institutions to meet these demands and better themselves (Papenhausen & Einstein, 2006).

BSC's are used in academic institutions on various levels, pursuing operational excellence. They offer institutions the means to formulate and translate the mission into a framework (Umashankar & Dutta, 2007). The international acceptance and numerous implementations of the BSC, demonstrate its versatility to be adapted in various environments.

The adaptability of the BSC is evident in the diversity of its users. It is applied in many universities and countries for example:

- Indian universities can benefit through the application of balanced scorecards by focusing only on areas that urgently need attention (Umashankar & Dutta, 2007).

- Nejati et al (2008) focus their study on the application of BSC in Iranian universities. It was found that the BSC can be introduced widely throughout the environment (Nejati et al., 2008).
- The University of Southern California and Turku Polytechnic in Finland (Kettunen, 2005) (O'Neil et al., 1999) are universities that are pursuing customer intimacy, to provide solutions for unique customer's needs with the BSC technique.
- Polish universities, pursuing strategic alignment, identified the BSC as an adaptable tool. They used the BSC in pursuit of strategic alignment in both academic and non-academic departments (Pietrzak et al., 2015).
- In Finland there are 20 traditional universities and 29 polytechnics pursuing strategic alignment using the BSC technique to adapt their resources, activities and knowledge to the changing environment (Kettunen, 2006).
- In their study on the use of the BSC, Bailey et al. (2010) approached 500 business school deans, all members of the American Assembly of Collegiate Schools of Business (AACSB), individually, requesting data on their use of the BSC for continuous improvement. He concluded with the recommendation of the BSC as a strategic tool in both academic and for-profit environments (Bailey et al., 2010).
- Madah et al. (2013) built a BSC model for the Cihan University located in Iraq. A viable balanced scorecard was created as a tool to evaluate strategic performance and alignment to achieve strategic objectives. They explored the different methods that can be used by any organization to build and implement a balanced scorecard, based on the organization's vision, strategies and values.
- The University of Southern California Rossier School of Education, had strong reservations about the value of quantitative measures of performance. They adapted and implemented a BSC model (O'Neil et al., 1999). Charles F. Dolan School of Business, Fairfield University, Fairfield did the same thing, using the BSC to facilitate strategy development (McDevitt et al., 2008).
- The University of Edinburgh has been using a BSC to measure institutional performance since 2002. The University adopted a BSC containing 32 key performance indicators (Nelson, 2006).

2.2.5 3rd Generation balanced scorecard as a strategic tool

According to Lawrie and Cobbold (2002), the 3rd generation BSC has distinct characteristics that sets it apart from previous generations. For example, the incorporation of “Destination Statements” differentiates it and makes it more suitable for strategic planning than previous versions.

The strategic linkage models in the 3rd generation BSC enhance the strategic capabilities further. A single ‘outcome’ perspective simplifies the strategic model (Lawrie & Cobbold, 2002). The BSC has the ability to create awareness on all levels of the organisation (Kettunen & Kantola, 2005), translating the strategy into tangible objectives.

IT strategic planning translates “a complex” of implicit or explicit visions and goals by means of the 3rd generation BSC (Marcos et al., 2012).

The 3rd Generation balanced scorecard must meet three conditions to function effectively as a strategic control system. Atkinson (2006) identified these conditions as follows;

1.) The plan must link operational targets to strategic goals,
2.) It must integrate non-financial performance indicators, and
3.) It must focus on customer requirements**.**

The 3rd Generation balanced scorecard distinguishes itself as a strategic management tool that uses an evolutionary process, growing the organisation to reach its goal as demonstrated in figure 2.6. On the base level it focuses on learning and growth. The SWOT technique lends itself to discovering the environment, identifying focus points for learning and growth. This leads to better processes and increased customer value follows, both internal and external. This results in overall improved financial performance of the company and achievement of the vision.

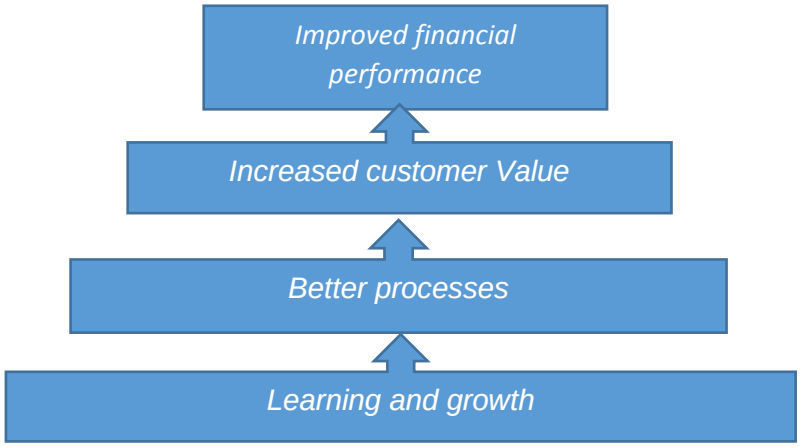
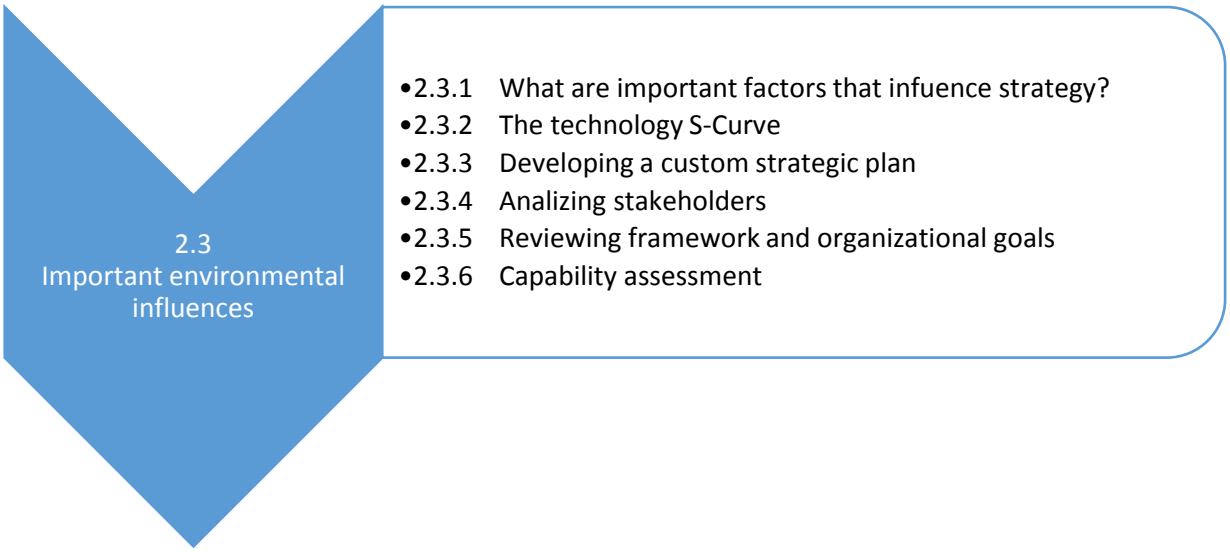


Figure 2.6 Cause and effect relationships (Abhijit, 2006)



2.3 Important Environmental Influences

Any strategic plan that is tailor-made for a specific environment and a specific purpose has a much better chance of succeeding. The environment plays a role in the strategic plan to the extent that it will dictate what exactly will be successful in that environment (Camillus & Datta, 1991, Igbaria, 1990) .

2.3.1 What are important factors that influence strategy?

The factors influencing strategy are slightly different in a non-profit organisation compared to a for-profit organisation, where the bottom-line is most important. In a non-profit organisation, the mission is at the top of the priority list (Niven, 2003).

The Vision 2022 Strategic Framework (Appendix A), sets out the vision for the University of the Witwatersrand. This high-level vision will serve as guideline to achieve strategic alignment. However, a long term plan does not guarantee the achievement of these goals in a changing environment. To be relevant to current and possible future technology usage, the strategy needs to be a living document with strategic frameworks to guide the organization. Whether the organization is able to move in that direction depends largely on the “organizational thrust” (Narchal et al., 1987).

A modern research university hosts a complex and challenging computing environment. The large scale of differentiation in services ranges from something as simple as word processing applications for large numbers of users on the one hand,

and complex engineering and mathematical facilities for research on the other (Slevin et al., 1991).

According to Slevin et al (1991), the IT function in a modern research university is one of the most complex and segregated. This environment is constantly subjected to increasingly complex demands. Organizational culture will influence the dimensions of a strategic alignment model (Fattah & Arman, 2014).

2.3.2 The technology S-curve

Another factor influencing strategy is the technology S-curve. The technology S-curve is a useful framework describing the substitution of old for new technologies at the industry level (Christensen, 1992).

If done accurately, the S-Curve analysis can be described as the "actual progress to-date curve". The S-Curve is constructed plotting the dates on the X-Axis and the calculated technology performance values on the Y-Axis and by plotting data extracted from baseline or production schedules for each technology. It tracks the progress of a base technology as a result of the research and development effort (Asthana, 1995).

The S-curve is used to anticipate technological progress, and for calculating technology factors influencing strategy. Figure 2.7 demonstrates how new technology starts off slow, then, as a critical mass of engineering expertise in the technology performance builds up, progress can be rapid. After some time, the technology matures and progress slows (Asthana, 1995).

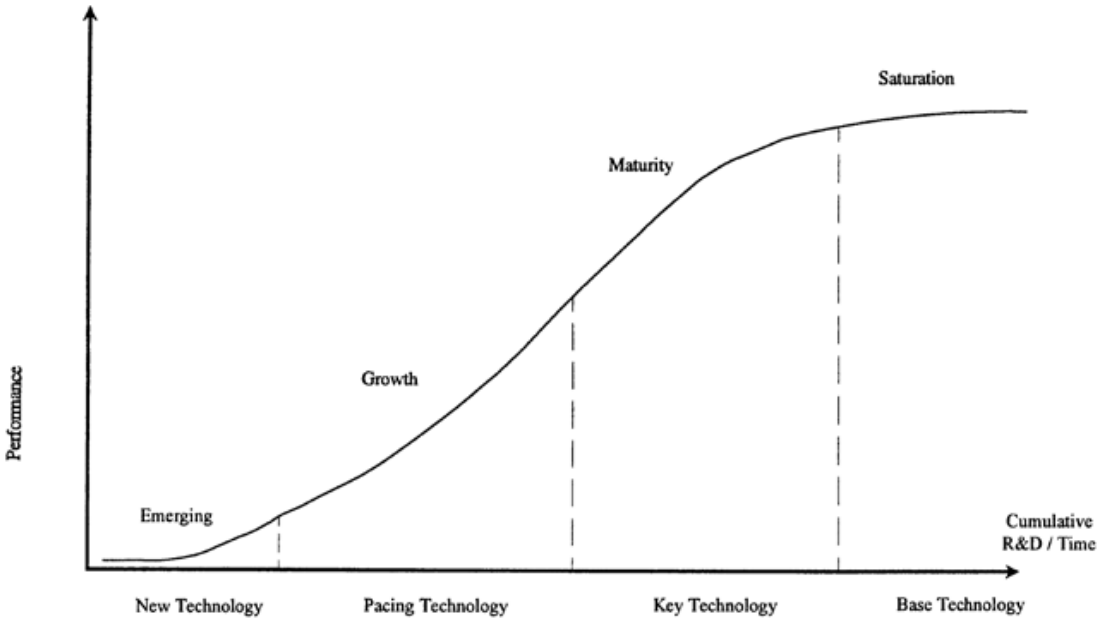


Figure 2.7 The S-curve concept of technology life cycle (Gao et al., 2011)

The technology s-curve is useful as a management tool when demonstrated over a longer term illustrating several generations of technologies succeeding each other (Christensen, 1992). As demonstrated in figure 2.8, hanging on to old technology for to long will lead to weak competitiveness, as new technology will give competitors the advantage.

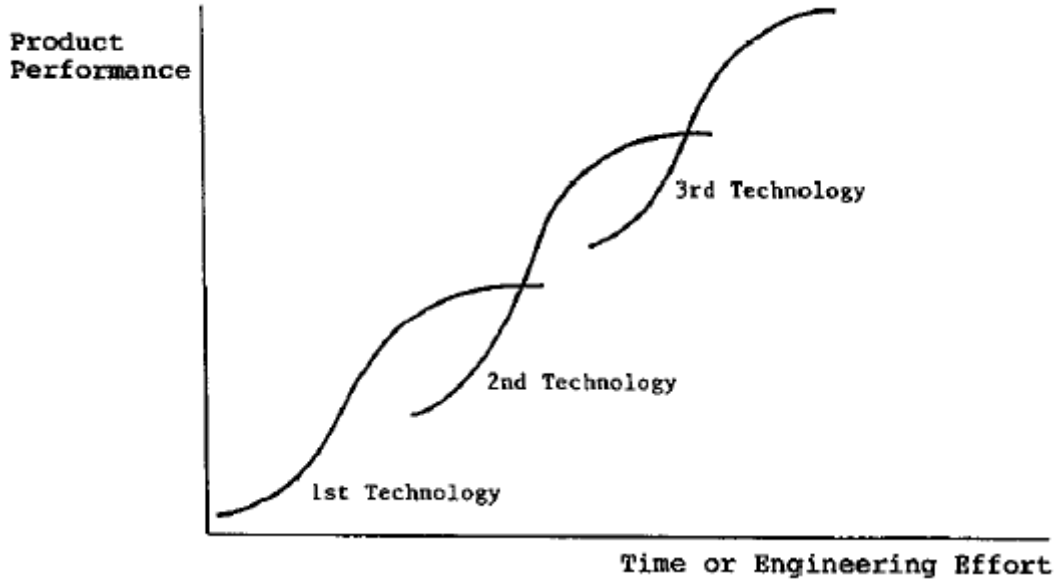


Figure 2. 8 Prescriptive S-curve strategy (Christensen, 1992)

2.3.3 Developing a custom strategic plan

The difference between strategy and long-term planning are often not explicit, but where it becomes distinct is with customisation. Long-term plans stay the same, where strategies are constantly updated to the changes in the specific environment.

Goals are a logical mechanism for identifying and organizing each organization's unique requirements (Anton, 1996) . The Strategic plan needs to be custom made to integrate technology in the specific work place with its specific vision, mission and goals. It is important to verify that goals are in alignment with the organizational background in which they occur (Bleistein et al., 2006).

Strategic alignment of IT exists when an organization's goals are synchronised with the IT systems that support them (Babar, et al., 2008). Their strategic plan needs to be custom-made to their environment to achieve this. The needs of what clients want and the recommendations of stakeholders are key elements in the planning and must be adhered to, to achieve alignment. Effective strategic alignment positively influences IT effectiveness and leads to superior business performance (Bleistein et al., 2006) (Babar et al., 2008).

Hinkelmann and Pasquini's (2014) definition of IT strategy states that an IT strategy is defined in terms of "the choices pertaining to the positioning in the marketplace" (Hinkelmann & Pasquini, 2014). This implies that the IT strategic plan needs to be custom made to the specific business, its positioning and components. Choices need to be relevant to the importance of IT.

2.3.4 Analysing stakeholders

A strategic plan starts with determining the needs of the major stakeholders. Stakeholder interviews or questionnaires are generally conducted to gather information required. This information includes specific to business requirements and the drivers of IT in the environment as well as the expectations regarding IT (Ojo et al., 2009).

Analysing stakeholders to determine their current and potential technology usage will lead to gaining a better understanding of the factors associated with the success and effectiveness of end-user computing (Babar et al., 2008).

Analysis of stakeholders is done by investigating current processes, procedures and standards in the focus environment. The integration of technology in the work place will determine the starting point in the strategic process. The identification of the right

combination of strategic performance factors (SPF) makes the conversion of the abstract vision into actionable strategic targets possible (Kumar & Sushil, 2013) .

Stakeholder inputs in the formulation of the strategic plan are normally the resources that drive the IS plan development (King, 1988). It is therefore important to analyse the different rates of technology adoption of stakeholders as shown in Figure 2.9 (Jacobsen, 2000).

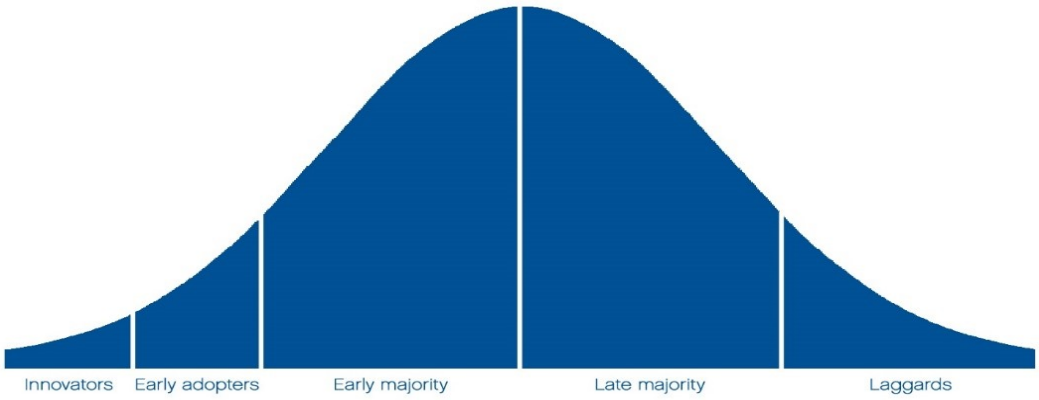


Figure 2.9 Technology adoption lifecycle (Moore, 2008)

The adoption of new technology can be divided in to five categories, starting with innovators (Figure 2.9). The second to adopt new technology will be early adopters, followed by early majority. The second half of the adoption lifecycle can be divided into late majority and, lastly, the laggards. Analysing stakeholders to determine their distribution will provide important information when drawing up strategic plans.

If a large percentage falls in the “innovators” or “early adopters” categories the technology adoption will be led by a demand-pull as opposed to the technology-push that will happen if they were “laggards” (van den Ende & Dolfsma, 2005).

A majority of early adopters can make it easier to strategically align business and IT (Fattah & Arman, 2014). When analysing stakeholders to determine their device preference, non-IT requirements will have the same level of importance compared to IT requirements (Kamhawi, 2011).

It is important to realise that the most complex part of the environment is the people component. Steering a company in a new direction implies steering people in the new direction. Consumerization of information technology (IT) is one of the fastest trends influencing the competitiveness of academic institutions (Niehaves, et al., 2012).

2.3.5 ECAR study

EDUCAUSE is a non-profit association whose mission is to advance higher education by promoting the intelligent use of information technology (Smith & Caruso, 2010). EDUCAUSE conducts the ECAR study. This is an international study conducted worldwide. In 2014 it had 75 306 student respondents to its questionnaire in 15 countries on 213 campuses. It identifies critical challenges facing learning organizations (The New Media Consortium, 2008). The ECAR study questionnaire uses on average 39 questions. The ECAR Study of Undergraduate Students and Information Technology is conducted annually, investigating information technology in relation to undergraduate students, and thereby serving as a strategic management tool. It identifies critical challenges facing learning organizations, giving these educational environments the opportunity to plan according to their diversity and emerging technologies (The New Media Consortium, 2008).

2.3.6 IT and organizational goals

Achieving a strategic advantage in today's competitive business world requires the optimum utilisation of all resources to achieve organisational goals. IT as an "enabler" in support of business processes results in value which is not comparable to the financial benefits obtained (Fattah & Arman, 2014). A large portion of the value is non-financial performance incentives (Wier et al., 2007). Bleistein et al. (2006) recommend a requirements analysis approach for reviewing the framework and organizational goals and requirements in terms of alignment with and support for business strategy.

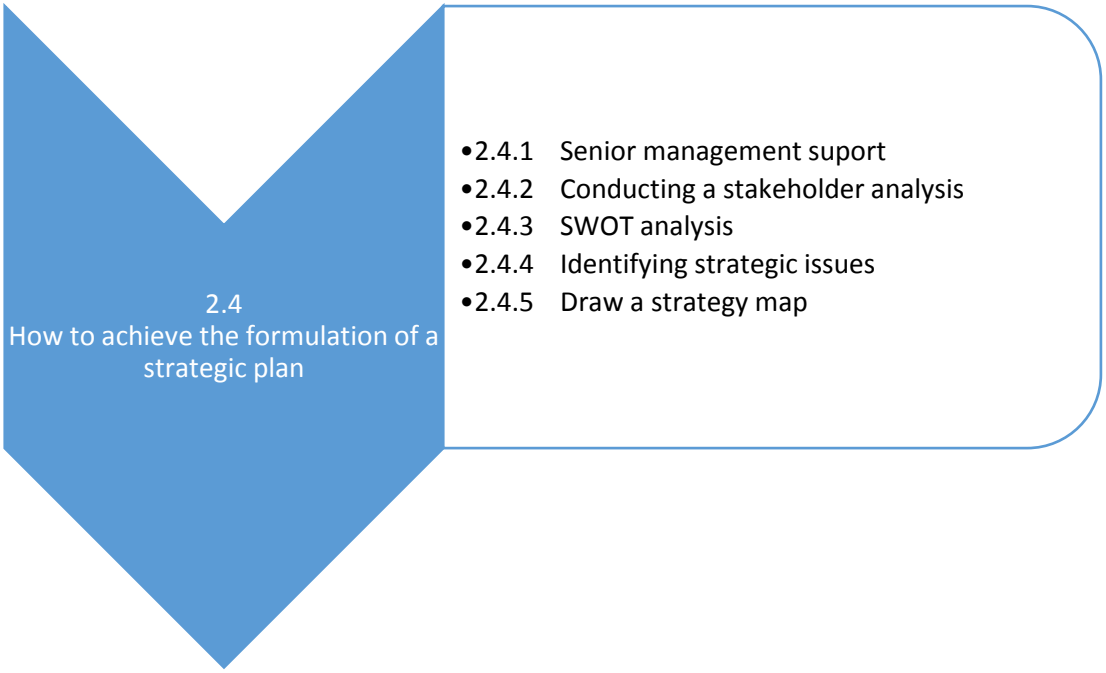
Important environmental influences in support of organizational goals include management factors such as a "clear strategic management" and "top management support" (Kamhawi, 2011).

2.3.7 Capability assessment

Capability assessment of technology usage will indicate the level of training or lack thereof in the organisation. The most certain way to succeed in global competition is the ability to identify and cultivate core competencies (Burgelman et al., 2009). Assessing capabilities as part of strategic planning is essential as the development of core competencies is only built over a long term through a process of continuous improvement (Burgelman et al., 2009).

The changes in environment, industry and the organization necessitate capability assessments that will indicate changing realities both within and outside the organization. These will be used to build important components - strategic performance factors" (SPF) (Kumar & Sushil, 2013). Capable information systems

and capable staff are means to increase business performance and provide organizations with a competitive advantage (Hinkelmann & Pasquini, 2014).



2.4 How to Formulate a Strategic Plan

2.4.1 Senior management support

The first step on the journey of the strategic planning process is to ensure that buy-in from senior management has been obtained and that the organization is ready to embark on the journey (Niven, 2003) (Babar et al., 2008). Buy-in from senior management is critical as it also offers them the instrument to identify opportunities for using information systems to create new business strategies (Lederer & Gardiner, 1992, Kaplan & Norton, 1996). This task gives information managers the opportunity to identify broad initiatives, specific applications, and critical technologies to help their organizations carry out their current business strategy more successfully.

2.4.2 Conducting a stakeholder analysis

A stakeholder analysis is done to determine the importance of IT in the environment. Research by Kyobe (2011) shows that capacity to “adopt and use” ICT has the most significant influence on ICT adoption. The Technology acceptance model (Figure 2. 4) demonstrates that analysing stakeholders to determine limiting factors to IT implementations require a more detailed investigation than only a SWOT analysis can reach. A more direct approach in a questionnaire is required, focusing on the “perceived usefulness” of the technology by the destined users. The technology acceptance model (Figure 2.10) focuses on the perceived ease of use by

stakeholders. Behavioural intentions play a key role in the strategic choices in, for example, IT hardware (Teo, 2011).

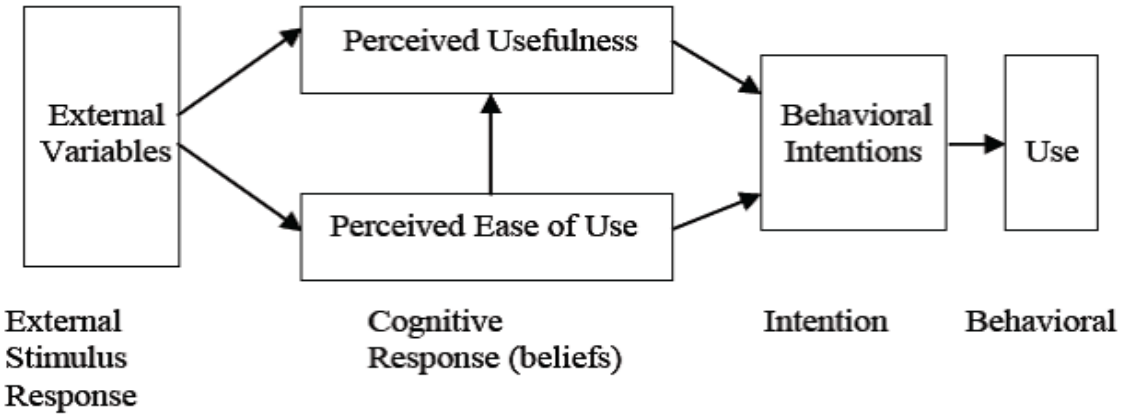


Figure 2.10 Technology acceptance model (Teo, 2011)

2.4.3 Swot analysis

The SWOT analysis is one of the simplest tools used during strategic planning. The SWOT analysis is suitable for compiling a high-level overview of the organization and the environment based on the internal strengths, weaknesses and external opportunities and threats (Lee et al., 2000, Abdolvand & Asadollahi, 2012). A SWOT analysis provides the foundation for the situation analysis needed in future design procedures (Manteghi & Zohrabi, 2011), which is necessary to achieve set goals in view of constraints and opportunities (Ojo et al., 2009). Figure 2.11 shows how SWOT can be analysed using the four quadrants of the SWOT Matrix.

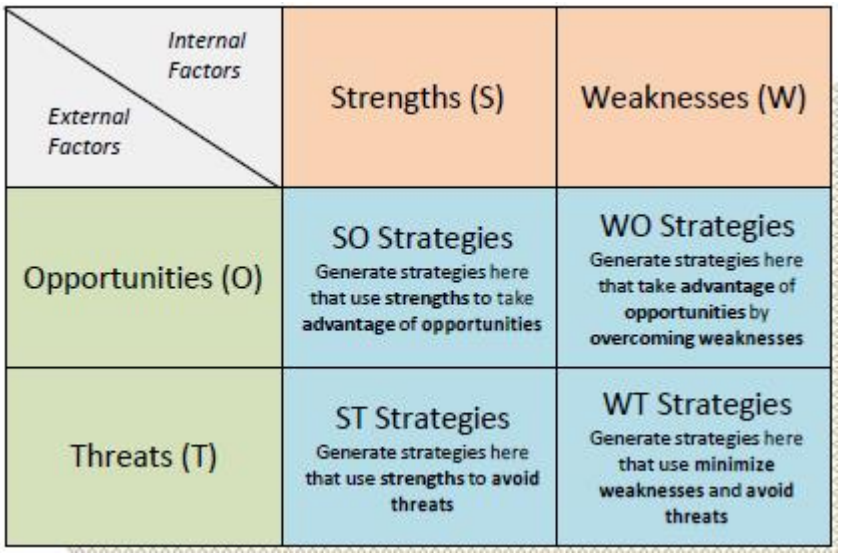


Figure 2.11 SWOT Matrix

One reason a SWOT analysis is useful is the fact that a firm's technology strategy is rooted in the evolution of its technical capabilities. However, the dynamics of these capabilities are not completely endogenous. A firm is affected by several internal and external factors. The evolution of technologies along the technology S-curve can be described in all four SWOT categories. The emergence of new technologies falls clearly in the "opportunity" quadrant (Burgelman et al., 2009).

2.4.4 Identifying Strategic issues

There is a positive correlation between strategic planning and organizational learning. This is illustrated in Figure 2.11, showing feedback and learning in a continuous process, leading to clarity and translating the vision into strategy.

When firms increase the level of formalisation of their routines, focusing on each of the four steps that form part of the BSC continuous process illustrated in Figure 2.11, the BSC will provide information enabling proactive decisions and identifying strategic issues that are most likely to improve KPIs (Baltar, 2013).

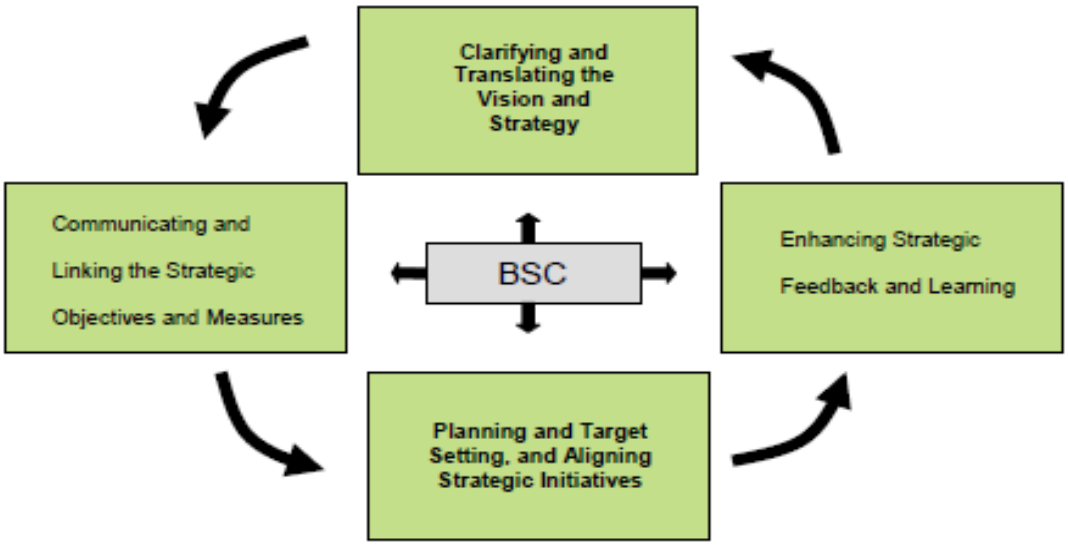


Figure 2.12 The balanced scorecard as a strategic framework for action (Marr, 2010, Kaplan & Norton, 1996)

The ability to identify strategic issues in the environment will determine if the plan is relevant to the organization. Internationally, the drive to cloud computing as a leading technology is a concern for many IT strategists and has been adopted cautiously (Lawler et al., 2012). Analysing stakeholders in the case study environment is considered essential to determine feasibility. The balanced scorecard as a strategic framework for action enables the 'tight fit' for the introduction of technology to be successful (Wills & Alexander, 2000).

IT managers, CIO's and business executives are constantly confronted by a changing environment. Identifying strategic issues early can change a potential risk into an opportunity. Involving end users when identifying strategic issues offers the opportunity to empower these users with enhanced processes, job duties and organizational alignments (Vaughan, 2001).

2.4.5 Strategy map

The final result is where all data and theory comes together, and is the production of the strategy map. The purpose of this stage will be to discover how to construct a strategic plan specifically for the environment.

Strategy maps are built using the strategic linkage model perspectives of the BSC, interfacing the strategic goal/target outcomes with their required activities /actions to

achieve the strategic goals. Each company can tailor the basic structure to fit its organization's needs by linking cause and effect (Wu, 2012).

Since the introduction of the BSC by (Kaplan & Norton, 2001), strategy mapping quickly became a popular approach for organizations to use as part of their strategy formulation process (Scholey, 2005).

The abstract and complex nature of the strategic alignment of business and IT strategy makes strategies difficult to describe and communicate. The visual nature of strategy mapping helps organizations overcome this difficulty by allowing the user to describe and depict the organizational strategy in a picture format (Scholey, 2005).

In the 3rd generation balanced scorecard the destination statement acts as a useful reference point for target setting processes (Lawrie & Cobbold, 2002), with the destination statement driving the selection of strategic objectives as indicated across the balanced scorecard categories. Managers simply choose 'activity' and 'outcome' objectives.

2.5 Conclusions

The literature review set out to investigate the research question presented in section 1.3, namely "Can a strategic plan be developed to align business and IT in the research environment using the 3rd generation balanced scorecard (BS) methodology?".

The findings of the literature review pertaining to the above can be divided into four parts namely:

2.5.1 The Importance and Benefits of Strategic Alignment

Of the literature found, 27 articles were selected for in depth review. Analysis of these articles divined what is alignment, strategy and the two-way process of alignment and strategy. They indicated what needs to be focused on, and the most important question is "do we do the rights things?".

2.5.2 How Strategic Alignment of Business and IT can be Achieved

Of the literature found, 33 articles were selected for in depth review. They revealed the complexity of the balanced scorecard.

SWOT was highlighted as tool suitable for performing the primary strategic analysis. Findings indicate that the 3rd generation BSC is used in academic institutions similar

to the case study environment and confirmed the feasibility of the study. The 3rd Generation balanced scorecard distinguishes itself as a strategic management tool that uses an evolutionary process to achieve the vision and diverse goals of an organisation.

2.5.3 Important Environmental Influences

Of the literature found, 30 articles were selected to conduct an in depth review of. These articles indicate that a strategic plan needs to be tailor-made for each scenario to succeed, as organisational culture will influence the dimensions of a strategic alignment model.

The technology S-curve was found to be an important management tool.

Analysing stakeholders to determine their current and potential technology usage will lead to gaining a better understanding of the factors associated with the success and effectiveness of a strategic alignment exercise.

2.5.4 How to Formulate a Strategic Plan?

Firstly, a stakeholder analysis must be done to determine the importance of IT in the environment. This is followed by a SWOT analysis, to provide the foundation for the situation analysis needed in design procedures. Finally, a strategy map must be built using the strategic linkage model perspectives of the BSC, interfacing the strategic goal/target outcomes with their required activities. It is essential for the strategic planning process to ensure buy-in from senior management

The foundation for a successful strategy lies in the construction of the strategy to be uniquely designed to fit each organisation specifically (van Breda, 2000). Each organisation and situation is unique, with numerous variables that change constantly.

Chapter 3: METHODOLOGY

A case study methodology relying on both quantitative and qualitative methods was used (mixed methods). The research methodology focused on ways and means to answer the research question. Two phases were carried out:

1.) Identify the main factors influencing the IT strategy. These will be distinguished between major and minor influences as statistically indicated.

2.) In accordance with the research objectives, these factors will be investigated to determine their influence on the strategic alignment of IT and business. This will enable the development of a model for business and IT alignment using the 3rd generation balanced scorecard methodology.

3.1 Case Study Methodology Design

This case study research can be defined as positivist in nature with regards to the testing of the theory of the balanced-scorecard methodology to align entities strategically (Noor 2008), and interpretive with regards to the environmental variable analysis impacting the final design of the architectural model for business and IT alignment (Gerring 2004).

The case study methodology is the most suitable method to achieve these objectives (Gibbert, Ruigrok et al. 2008, Al-Hatmi 2012). Case studies seek to study phenomena in their contexts **(**Gibbert**,** Ruigrok et al**.** 2008**).**

According to Johansson (2003), when conducting a case study, there should be a "well defined case" which is the objective of study (Johansson 2003). According to Johansson, the "case" (referring to the case environment) should meet the following requirements:

• be a complex functioning unit,

• be investigated in its natural context with a multitude of methods, and

• be contemporary.

All these research requirements of a case study are met in this research. The focus of the case study is the School of MIA at Wits, which is a complex, functioning unit. The case study consisted of the targeted stakeholders, namely the academic staff, administrative staff, service staff and students. The unit was investigated in 2014 by

conducting individual interviews with the staff, and issuing questionnaires to the students during their registration for the use of the IT facilities in the School.

Focusing on this environment provides a contemporary scenario, and the research is useful, as the strategic alignment of IT and business will assist in the achievement of Wit's strategic goals (see appendix H).

3.2 Research Method Rationale

The mixed methods case study research method chosen was tested with an initial pilot study. The questionnaires and interview questions were refined and adapted for maximum effectiveness.

The pilot study was done in the same environment as intended for the questionnaire. Technical glitches were addressed in a safe, controlled environment to ensure the integrity of the data collected.

Three types of data sources were considered: questionnaires and interviews for qualitative data, and document reviews. Documentation collected included mission statements, vision statements, strategic plans and management documents referring to the Wits 2022 goal.

The data can be divided into primary data and secondary data. Primary data includes interviews and questionnaires. The data collected by the researcher will be used in the School's internal strategic planning process. Secondary data included documentation, media releases, relevant email correspondence and university documentation available in the public domain.

3.3 Review of Strategic Documentation

Relevant Wits strategic documents were obtained and reviewed. It was found that the School did not have any documentation relating to business or IT strategy, so only documentation relating to Wits as a whole was reviewed.

The School IT strategy can be deduced to a certain extent by reviewing the current situation, in other words, examine the School IT services and facilities that are currently provided to students.

3.4 Samples Selection and Sizes

For the questionnaires, the aim was to achieve a 100% population sample. This was achieved in practise, since all 322 students completed the questionnaire at the same time they registered for the school IT facility at the start of the academic year.

Similarly, for the interviews, the aim was to achieve a 100% population sample. Therefore, all staff were invited for an individual interview. However, only 88% of the staff were interviewed.

3.5 Questionnaire Design

The final questionnaire used in this study is included in Appendix H.

3.5.1 ECAR questionnaire questions

Nine questions in the questionnaire are taken from the ECAR Study of Undergraduate Students and Information Technology questionnaire (The New Media Consortium, 2008), as follows:

- Question 1: 2011 ECAR questionnaire Section 2
- Question 2: 2004 and 2010 ECAR questionnaire
- Question 4: 2011 ECAR questionnaire
- Question 5: 2011 and 2014 ECAR questionnaire
- Question 6: 2011 ECAR questionnaire
- Question 7: 2012 ECAR questionnaire Q5
- Question 8: 2011 ECAR questionnaire Q14
- Question 9: 2013 ECAR questionnaire
- Question 10: 2014 ECAR questionnaire section 4: learning environments

The ECAR study results are published, but must be purchased, and therefore the results could be compared to the results from this work by other researchers.

Use of ECAR designed questions ensures the use of questions that have been designed, tried and tested in similar environments to this work.

3.5.2 Custom-designed questions

- **Binary scale Questions**: Binary scale questions are nominal scales consisting of binary items with only one of two possible answers e.g. yes or no, on or off, true or false (Bhattacherjee 2012). Question 3 is the only binary scale question with a yes or no answer. It was designed specifically for this research. This question will assess whether students have internet access off campus. The results will be illustrated using a Pi chart to show ratios.
- **Likert scale questions**: This scale includes simply worded statements to which respondents indicate positioning on a five point scale, indicating their agreement ranging from strongly agree on the one end and strongly disagree on the opposite end of the scale (Bhattacherjee 2012). This scale has a neutral point where respondents can neither agree nor disagree. On a scale of 1 to 5 this will be 3. Questions 1, 5, 6 and 9 are Likert scale questions. The results from these questions will be assessed using bar charts, sorting results according to the answers of the respondents, indicating tendencies and notions.
- **Scaling questions:** The unidimensional scale in Question 2 allows the respondents to answer on an increasing scale, starting with “no use” and building the scale gradually up to “exclusive use” as the fifth option. Question two was the only scaling question. This will be assessed using a bar chart.
- **Open ended questions:** Questions 7, 8 and 10, were open ended questions. In the case of question 7 the respondents were asked to explain why they answered what they did and elaborate, to get a more holistic view. In questions 8 and 10 the respondents were asked to give suggestions for improvements. The results from this question will be assessed in a SWOT analysis. The results from these questions will be coded and sorted to indicate tendencies and notions. The coded answers will be expressed in numeric format and demonstrated using line-diagrams, sorting results according to the answers of the respondents.

3.6 Interview Design

The final questionnaire used in this study is included in Appendix F.

3.6.1 Interview process

Individual interviews were conducted by contacting staff working in the case study environment. It was then arranged for the interview to be conducted at a time and place that suited them and which provided an appropriate level of privacy. All interviews were recorded by the researcher and anonymity was guaranteed. The anonymity of the interview provided the individuals an opportunity to open up and share criticism and in-depth answers. As a result, an extensive spectrum of data was collected.

3.6.2 Pilot study

A pilot study was done to test the interview questions. Seven members of staff volunteered to be part of the pilot study. The pilot study was done and all questions finalized before the ethics application. It was discovered during the pilot study that the staff have very little or no knowledge of the corporate strategy, or “the top 100 drive”. The interview questions were therefore adapted accordingly. The lack of knowledge and its impact will be further discussed in chapter 5.

.3.7 School IT Strategy Development

A strategy for IT at the School was developed. This was done by drawing up a strategy map.

3.8 Development of the Balanced Scorecard

The results from primary data gathering and the strategy were used to develop a balanced scorecard. A SWOT analysis was included.

3.9 Ethics approval

The researcher requested the Head of School for permission to conduct the study and the standard Wits procedure for an ethics application was followed (see Appendix G: Ethics clearance certificate: H14/05/37).

Participation in this research was voluntary. The respondents signed an informed consent letter before the interview was conducted (Appendix C: Consent for Participation in Individual Research Interview). The researcher experienced one incident where the particular person from the case study environment agreed to be interviewed, but refused for the interview be recorded. As a result, this person was not interviewed.

Disclosure was given when the researcher discussed the study with each participant prior to their interview. This also provided the researcher the opportunity to answer all questions related to the research.

Each participant received information when he/ she was invited to the interview, as shown in Appendix B: Participant Information Sheet for Subject-Matter Experts.

Chapter 4: RESULTS

4.1 Strategic Documentation Compilation and Review

4.1.1 Wits strategic documents

The School of MIA does not have its own IT strategy and therefore no documentation relating thereto. The University has a strategy ("Wits 2013 Strategy") and a strategic framework ("The Vision 2022 Strategic Framework"). These two documents were obtained and reviewed, and are included in Appendix A.

Both the Wits 2013 Strategy and The Vision 2022 Strategic Framework cover a large number of topics. To answer the research question, only the IT related topics were considered.

The Wits 2013 Strategy forms part of the planning cycle of the Vision 2022 Strategic Framework. The Wits 2013 Strategy is directed at refining and aligning goals for research, teaching and learning, social engagement and knowledge transfer. The Wits 2013 Strategy should be read in conjunction with the Vision 2022 Strategic Framework which provides a detailed account of the University's vision. Wits has identified seven priorities as its strategic thrusts. These are:

1. Academic excellence and the Wits experience.
2. Research and knowledge Leadership.
3. Innovation and Social leadership.
4. An IT savvy university.
5. Extensive networks and partnerships.
6. Excellence in governance, management and support services.
7. Wealthy and well resourced.

Focus will be on number 4, "an IT savvy university", that contains 13 targets as stated in the Vision 2022 Strategic Framework. The Wits 2013 Strategy lists short-term targets and a number of long-term projects to achieve the Vision 2022. Strategic thrust number 4. could suggest that the organisation has a desire to be perceived as an "Innovator or Early Adopter" in their use of IT.

Wits aspires to be a leading research-intensive university, firmly embedded in the top 100 world universities by 2022. IT is considered an enabler of the business to succeed. The Vision 2022 Strategic Framework is the framework for all strategic plans to attain the Top 100 ranking. The Vision 2022 creates an image of what Wits will look like in 2022, as needed for a gap analysis.

The Vision 2022 Strategic Framework contains the following 13 objectives:

(a) Improve, develop and maintain the Wits IT infrastructure.

(b) That students possess computing devices and are connected to Wits irrespective of time or place.

(c) That academics are adept at using IT.

(d) That support staff has access to excellent administrative systems.

(e) That Wits alumni enjoy a sustained and valuable relationship with the University through the use of IT.

(f) Ensure that a strong element of innovation is used to create and apply IT to academic and support activities within the university.

(g) Actively collaborate with other institutions.

(h) Create, sustain and enhance a leading-edge IT infrastructure, including its network, telephony systems, back-office environment, and end-user systems.

(i) Strengthening IT infrastructure that enhances research and promotes the visibility of research output.

(j) Sustain and enhance a library that provides the latest electronic knowledge appropriate for a leading, research-intensive university.

(k) Continuous capacity-building, training and learning opportunities to improve student and staff capacity.

(l) Expand IT platforms to include open-access methods, licences and approaches.

(m) Data and the information needed for the administration and management of the institution will be available when and where needed (Director of Strategic Planning, 2011)

For each item a) to m), the document provides specific indicators and targets, target deadlines frequently being the end of 2011, 2012 or 2013.

Item b) has been implemented by means of a “one laptop / one student” initiative, or Student Ownership of Computing Equipment project (SOOCE). This is also in support of the Wits Vision 2022, where Wits commits itself to ensure that all students have mobile computing devices. In the Wits 2013 strategy document, the SOOCE aims to ensure that all students from second year onwards have their own mobile computing device by the end of 2012. The SOOCE provides mechanisms for acquiring computing devices for all students when they join the University (Appendix A). In the School of MIA, it can be assumed that mobile computing device refers to a laptop, since the cloud-based services currently provided need at least that level of computational ability. Item b) could be interpreted as a need to provide more cloud-based services.

Item I) lists research visibility enhancement, that is, marketing of research, as a strategic objective.

4.1.2 School of MIA IT facilities review

In 2012, the School installed Citrix servers, capable of delivering cloud-based services, and many applications were installed and tested. Physical infrastructure was installed and tested to ensure sufficient Wi-Fi services were available for lectures in existing lecture theatres. This infrastructure is underutilised due to the failure of the one-student, one laptop initiative.

The School has a PCPool with 51 desktop computers installed. A third of these are upgraded every 2nd year, and limited by budget restraints. Many powerful niche software applications are thereby available for student use. This PCPool is used generally by students doing work and projects, and also for lectures.

The School currently has a fixed budget for purchasing hardware and software. Staff are limited when purchasing new and additional software accordingly. The limited School IT budget is used up completely each year with no room for progression. Due to fluctuating exchange rates, in general adverse towards purchase of software from overseas, the number of software packages, or number of features, or number of concurrent usage licenses, or all three, gets reduced yearly.

Fortunately, many software providers have academic programs whereby they provide software free or at low cost to the University. However, the hard drives installed in the PCPool computers are of limited size, and this also limits staff in introducing software.

An additional problem in the School is that with the limited budget, no provision is made for differing IT requirements for different staff and different courses. All staff and courses are treated similarly. This prevents many staff from providing the full range of software they should provide for the students. It also demotivates staff and discourages them from staying up-to-date with software developments in their field.

Academic staff are a key driver for the provision of up-to-date and niche software. Therefore, encouragement of their investigating, funding, purchasing and using new software packages is vital.

The School uses an “e-learning” platform in the form of Sakai, a cloud-accessible system for staff and students, and accessible anywhere over the internet. Sakai is provided and maintained for every School at Wits centrally by CNS. Sakai can deliver course materials, tests, results, etc.

4.2 Questionnaire Results

4.2.1 Demographics

From the demographic data gathered, it can be deduced that 204 students study mechanical engineering. This forms the largest group with 63% of the total students. The second largest group is industrial engineering students with a total of 68 students, or 21% of the sample. The smallest number, 16% of the respondents, were the aeronautical engineering students who totalled 50 respondents.

Students studying in the school of MIA are allowed to use the IT services from the 3rd academic year onward. These facilities are specifically reserved and outfitted for 3rd and 4th year students. The group therefore excludes 1st and 2nd year students. Ages range from 21 to 29 year olds. The breakdown by academic group was as follows.

- 155 3rd year students making up 48% of the total.
- 149 4th year students making up 46% of the total.
- 18 postgraduate students making up 6% of the total.

4.2.2 Question 1 - Technology ownership and use

Question 1

Which of the following have you used for at least one course or academic activity to supplement your learning? Select all that apply.

	Never used	Seldom used	Average usage	Frequently used
Laptop	○	○	○	○
Smartphone	○	○	○	○
Netbook	○	○	○	○
iPad	○	○	○	○
Desktop Computer	○	○	○	○
PC-Pool PC	○	○	○	○
Other tablet (e.g. Galaxy Tab, Xoom, etc.)	○	○	○	○
Wi-Fi On Campus	○	○	○	○
USB Thumb drive/ Portable hard drive	○	○	○	○

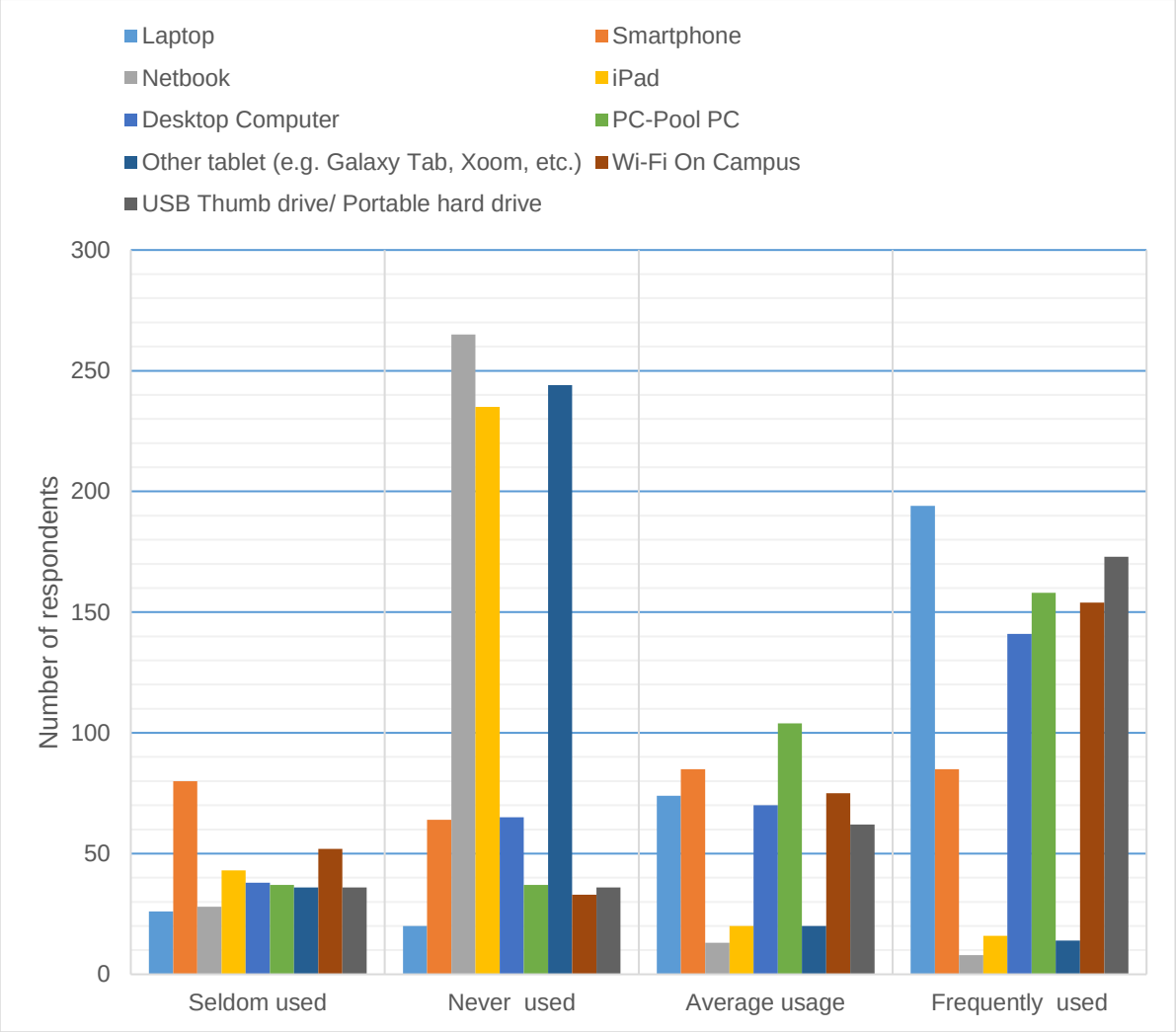


Figure 4.1 Question 1 - Technology usage

The majority of students use several electronic devices. Computing device usage was polarized into two groups, laptops and PC, as shown in Figure 4.1. Laptops were most popular, and frequently used by the majority of the respondents. iPad's, Netbook's and tablets, were rarely used, and smartphones were used more commonly. On campus Wi-Fi was not used by all students, corroborating the fact that many students rely on the desktop PCs in the PC-Pool.

4.2.3 Question 2 - Technology level

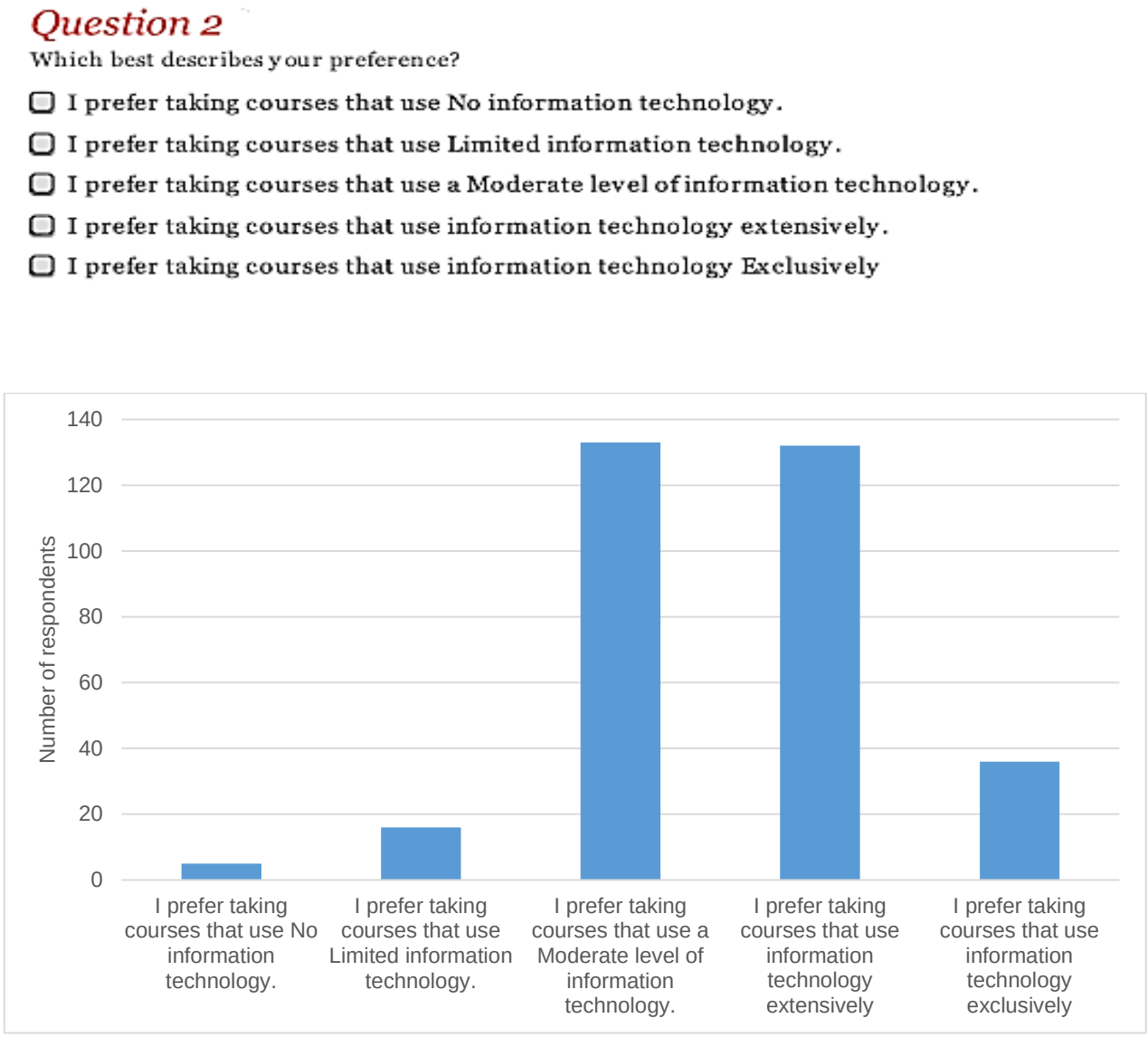


Figure 4.2 Question 2 – Technology level

The majority of the respondents (82%) prefer taking courses that use technology moderately or extensively. The least popular choice is no technology or little technology with a total of 8%. 11% of respondents prefer taking courses that use IT exclusively.

4.2.4 Question 3 – Off-campus internet

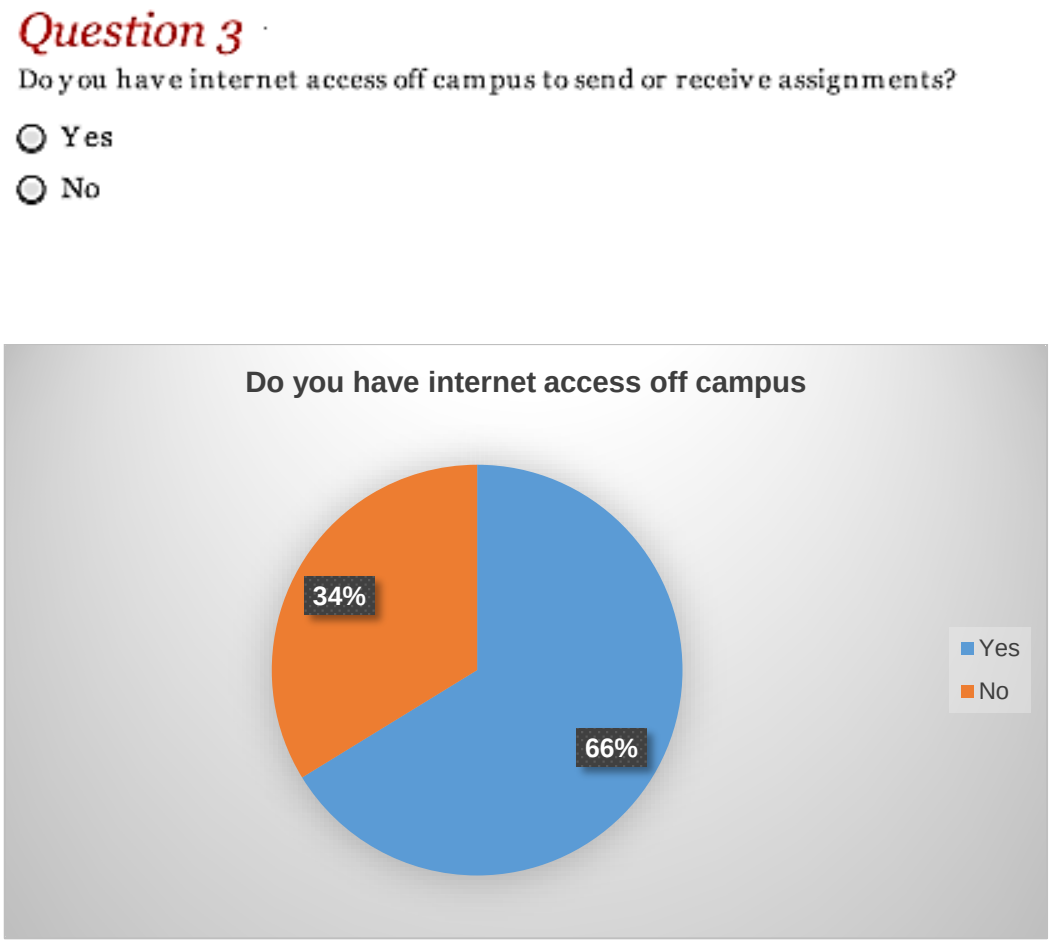


Figure 4.3 Question 3 – Off-campus internet

Figure 4.3 shows that 66% of respondents have Internet access off campus. 34% of the respondents rely solely on access on campus to access over the internet.

4.2.5 Question 4 – Cloud computing

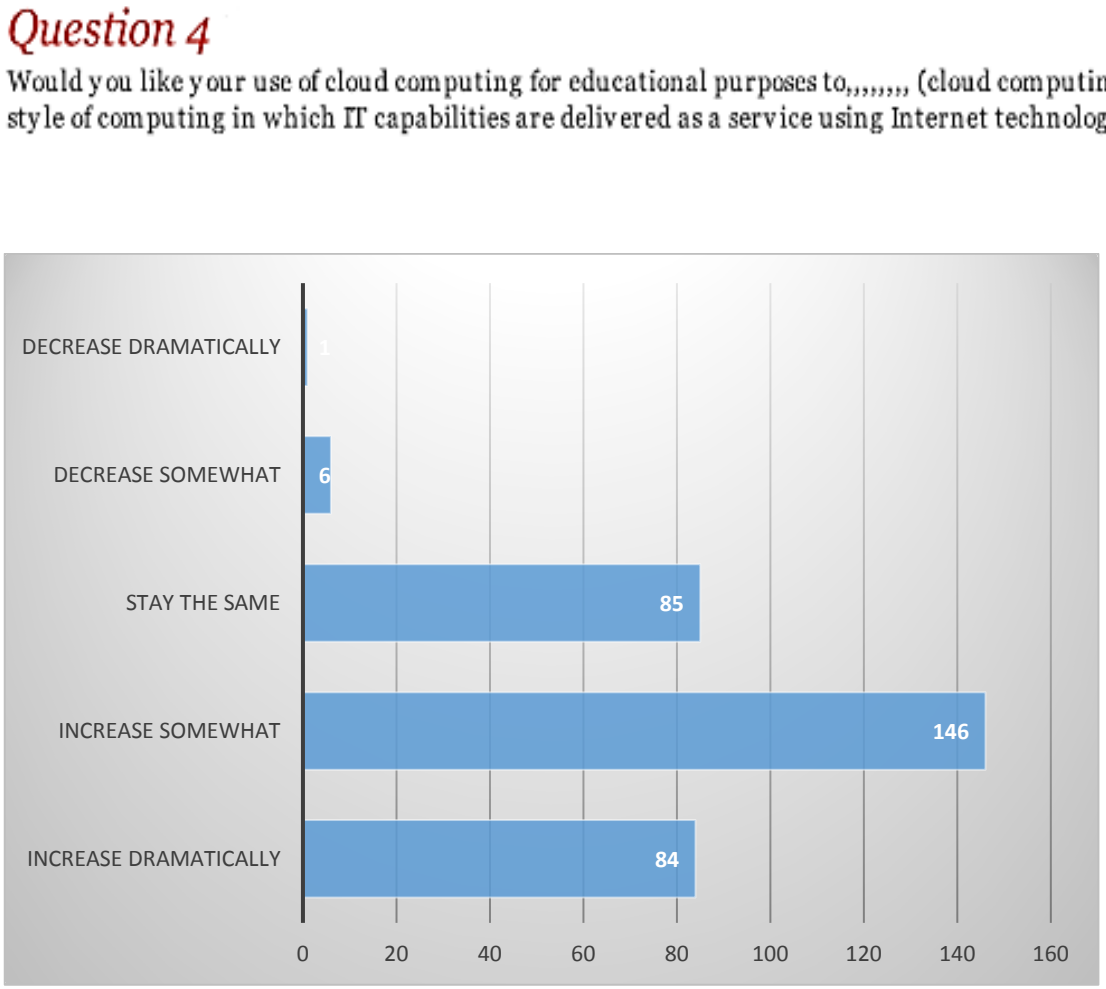


Figure 4.4 Question 4 – Cloud computing

There is a positive demand for cloud computing. Only 2% want it to decrease, and 26% are happy with the current status quo. Most (72%) of the respondents are desirous of more cloud-based services. The 72% are made up of 46% that chose "increase somewhat" and 26% that chose "increase dramatically". Certain cloud-based services are currently offered, and a substantial proportion of the students are happy with that status.

4.2.6 Question 5 – Technology adoption

Question 5

Please indicate how you agree or disagree with each of the following statements.

	1 Strongly Disagree	2	3 Neutral	4	5 Strongly Agree
My friends would describe me as "into" the latest technology	○	○	○	○	○
My friends think of me as a knowledgeable source of information for technology	○	○	○	○	○
I am enthusiastic about consumer electronics and IT.	○	○	○	○	○
I think trying to keep up with the changes in technology is a hassle	○	○	○	○	○

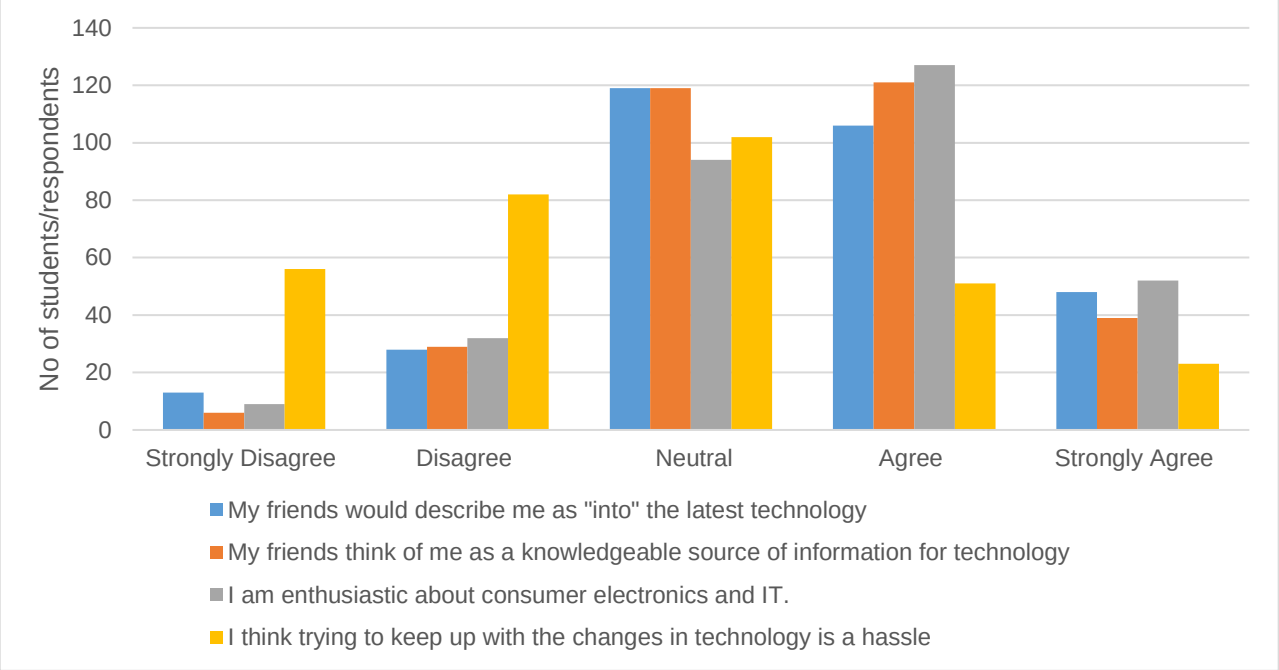


Figure 4.5 Question 5 – Technology adoption

The aim of question 5 is to determine the position of the students in the technology adoption cycle (the technology S curve), and the position on the technology adoption curve. As shown in Figure 4.9, the majority of the respondents see themselves as early adopters of technology. This is further emphasised by the indication that they are knowledgeable on IT. There is a strong inclination toward the progressive adoption of consumer electronic devices in general.

4.2.7 Question 6 - IT as part of the university experience

Question 6

Please indicate how you agree or disagree with each of the following statements about IT as it relates to your University Experience?

	1 Strongly Disagree	2	3 Neutral	4	5 Strongly Agree
Information Technology is an essential part of the University experience	○	○	○	○	○
Information for technology is instrumental in successful teaching	○	○	○	○	○
Cloud Computing could lower the cost of my university education	○	○	○	○	○
My university needs to use more Information Technology	○	○	○	○	○
My Instructors use Information Technology frequently enough	○	○	○	○	○

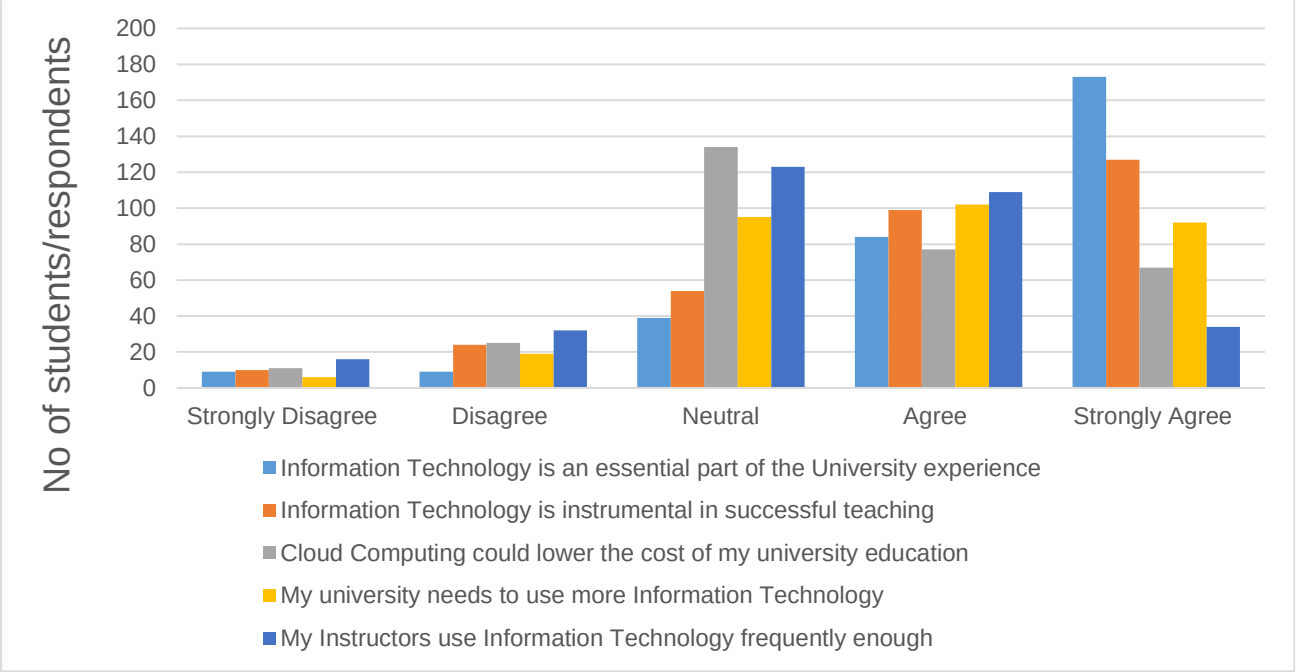


Figure 4.6 Question 6 – IT as part of the university experience

Question 6 is made up out of 5 sub-questions. Firstly, the respondents were asked if they think that IT an essential part of the university experience. As shown in Figure 4.11, the majority, a total of 257 of the respondents, think that IT is essential, as opposed to 18 that do not. 39 respondents were neutral.

Secondly, the respondents were asked if they think that IT is instrumental in successful teaching. This question focuses on teaching only, whereas the previous question included all IT. 34 respondents indicated that IT is not instrumental in successful teaching. 54 respondents were neutral. The majority, 226 respondents, indicated that IT is instrumental in successful teaching.

Thirdly, the respondents were asked if they think if cloud-computing could lower their education cost. The respondents currently experience cloud-computing on a small scale as part of the IT services that the school offers without any financial implication to the students. 36 respondents indicated that it will not lower their education cost. 134 respondents were neutral. The majority, 144 respondents, think that cloud-computing could lower their education cost.

Fourthly, the respondents were asked if they think that the university needs to use more IT. 25 respondents indicated that they disagree. 95 respondents were neutral. The majority (194 respondents), thought that the university needs to use more IT.

The fifth part of question 6 asked the respondents if they think that their instructors use IT frequent enough. 48 respondents disagree, 123 respondents stayed neutral, and 143 respondents agree.

4.2.8 Question 7 – Device preference

Question 7: Please describe in as much detail as you can which you prefer and why – laptop or desktop computer.

Question 7 had two parts to it. The first part as illustrated in Figure 4.12 gave an indication of the preference between using a laptop or a desktop, or both. The second part of the question was to motivate the answer. This provided a surprising picture about where these devices are used and why. It gave insight on problems that were not foreseen but provide motivation for the respondent's actions. These factors include a wide spectrum of motivators, for example, crime, electricity, a lack of study areas, space restrictions, transport problems to and from campus, limited seats in the PC-Pool and limited Wi-Fi on campus. This will be discussed in more detail in the next chapter.

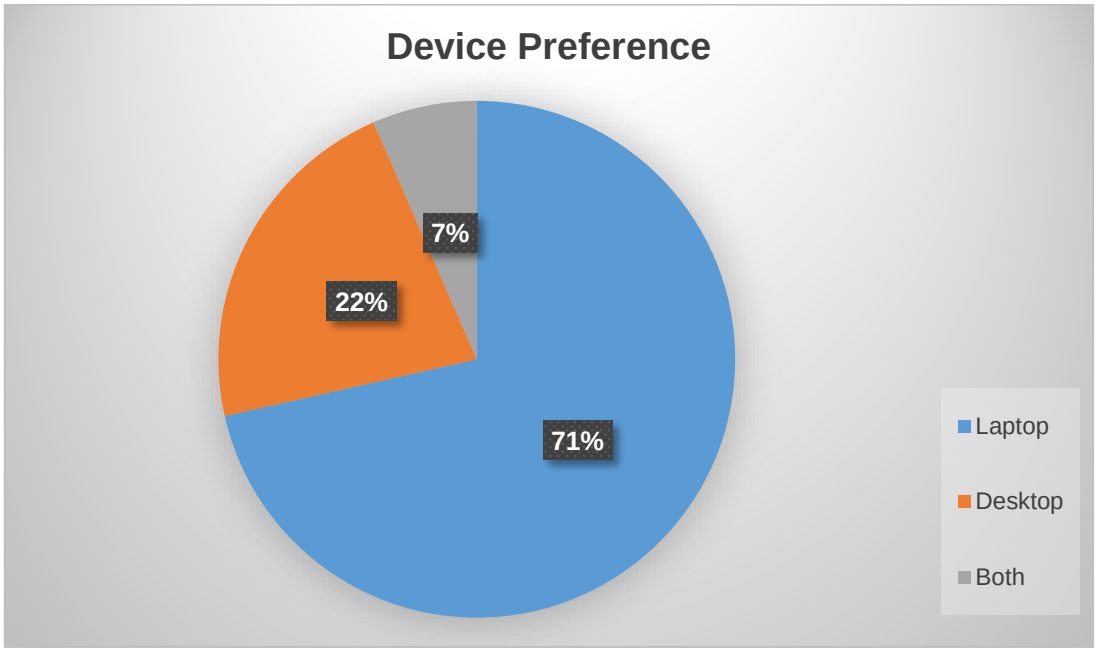


Figure 4.7 Question 7 Part 1- Device preference

Table 4. 1 Question 7 part 2 – Advantages and disadvantages of device types

Reasons for Laptop (advantages)	**Reasons for Desktop (advantages)**
• Work **anywhere**/ **mobility** – More (144*) productive • **No competition for resources** (PC's on campus) (65) • **Convenient** (35) • Access anywhere on campus with **Wi-Fi** (18) • Work short periods without electricity (22)	• Do not have the **security** risk that Laptops have. (46) • More **powerful** (32) • University supplied or lower **cost (29)** • More suitable for Engineering software (21)
Disadvantages	**Disadvantages**
• Less secure on campus/ to travel (10) • More expensive than PC (18) • Less **powerful** (7)	• Having to wait for other computer users in the PC-pool. (76) • PC-Pool too noisy (17)

**Numbers in brackets = number of respondents.*

4.2.9 Question 8 – Technology use

Question 8: Please describe in as much detail as you can how your university or lecturers could use technology better when it comes to providing you with the best possible learning experience. Please mention any additional technology that you think would be beneficial to your education, or ways to make current technology more effective.

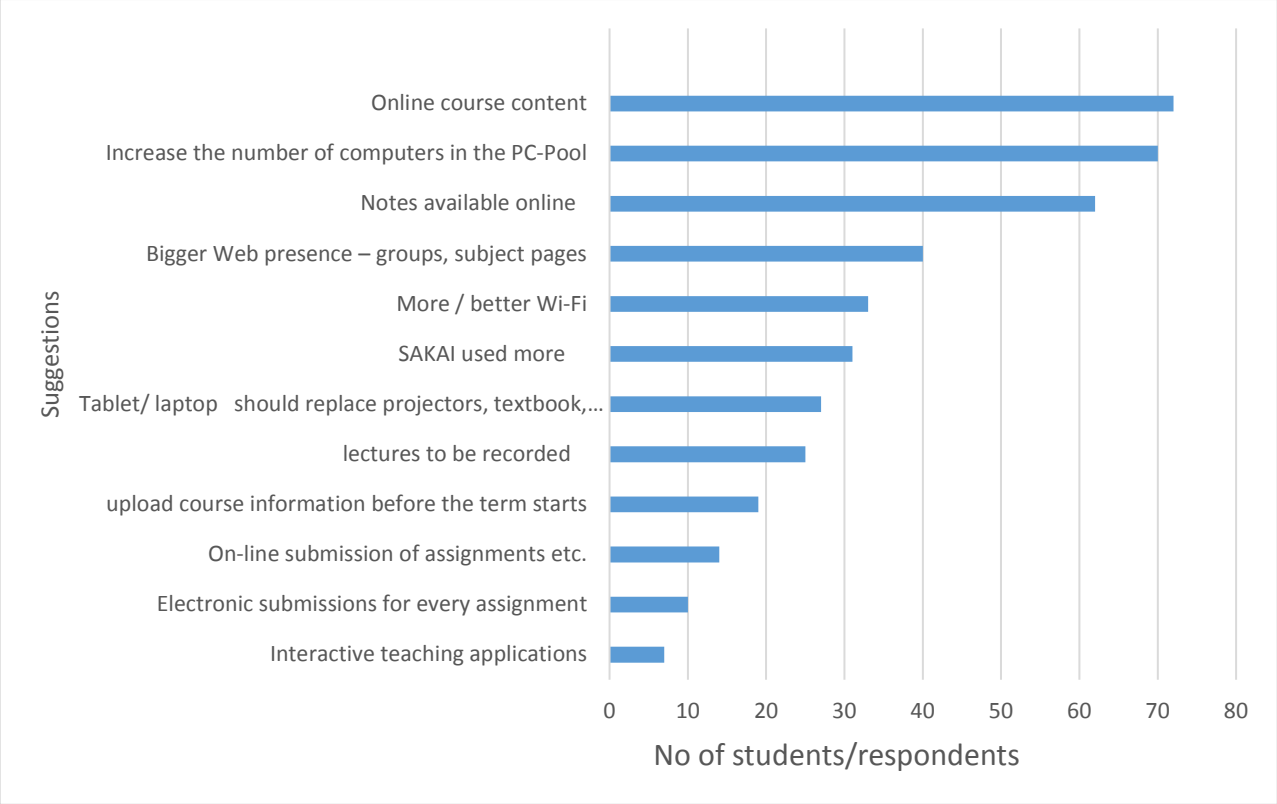


Figure 4.8 Question 8 – Suggestions for a better learning experience

Figure 4.8 shows the suggested improvements the respondents made, recommending how the university or lecturers could use technology better to enhance their possible learning experience. Only recommendations that were suggested by four or more respondents were included, since 3.2 respondents represent 1% of the data. Coding of the data was done to group them into 12 themes.

This open-ended question asked for suggestions on any additional technology that could be used or ways to make current technology more effective.

There is a slight overlap in the definition of some of these points. For example, the 19% recorded as suggesting that all notes must be available online, reinforces the previous findings that the respondents want more online course content. The coding of the data aimed to get as wide a range of answers as possible and therefore no merging of categories was done.

There is an interesting correlation between this question and question 6. In question 6, most respondents indicated that they thought IT was an important part of the university experience, and that more IT services are required. In this question, all the

respondents made suggestions on improvements. Not a single respondent indicated that no improvements are necessary.

4.2.10 Question 9 – One laptop-one student initiative

Question 9

How old is your :

	Don't own	Less than one year old	One year old	Two years old	Three or more years old
Personal Computer	○	○	○	○	○
Personal full-sized laptop	○	○	○	○	○
Personal Lightweight netbook or tablet computer	○	○	○	○	○
Personal dedicated e-book reader	○	○	○	○	○
Personal Handheld device that you use to access the internet	○	○	○	○	○

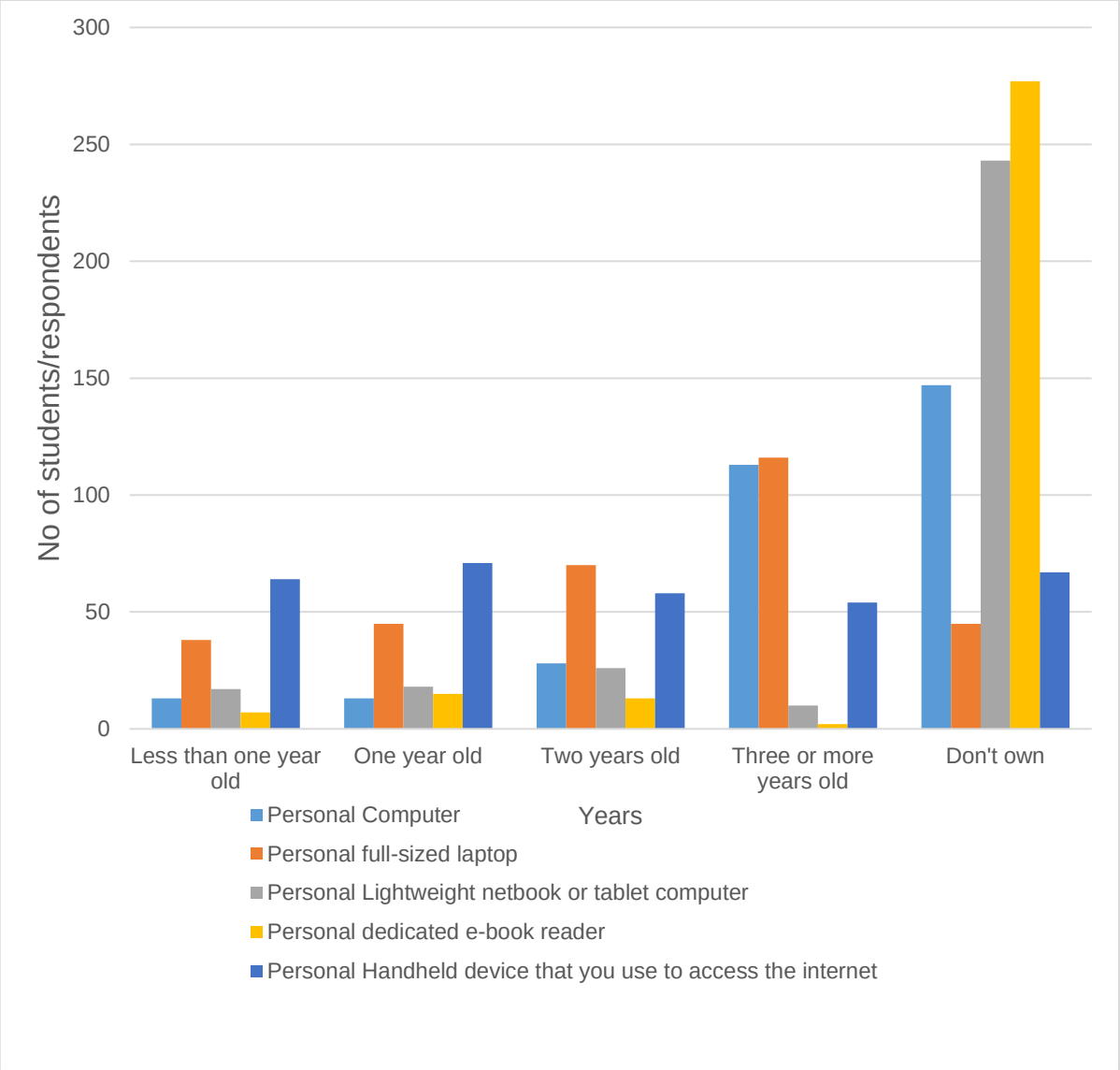


Figure 4. 9 Question 9 – Device ownership and age

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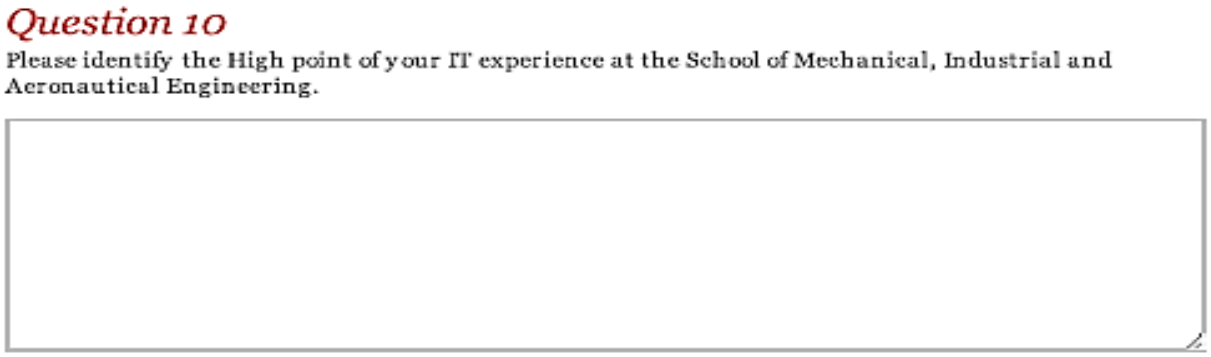
A large number of students indicated that they do not own computing devices. 147 students do not own a personal computer, 45 students do not own a laptop, and 243 students do not own tablet computers. This is important in the light of potential future application rollouts that might rely on remote access.

Question 9 tested the effect of the one laptop / one student initiative. However, as shown in Figure 4.2, there is no indication that the one laptop per student initiative has had an influence. A substantial number of students (45, or 14%) do not own a

laptop. Many students (110, or 34%) have laptops 3 or more years old, which makes sense since they will have got them in 1st year. The substantial number of students that purchased them since 1st year (167, or 52%) shows that they did not use the SOOCE project, but must have seen the need and used private resources for the purchase.

4.2.11 Question 10 – IT Experience



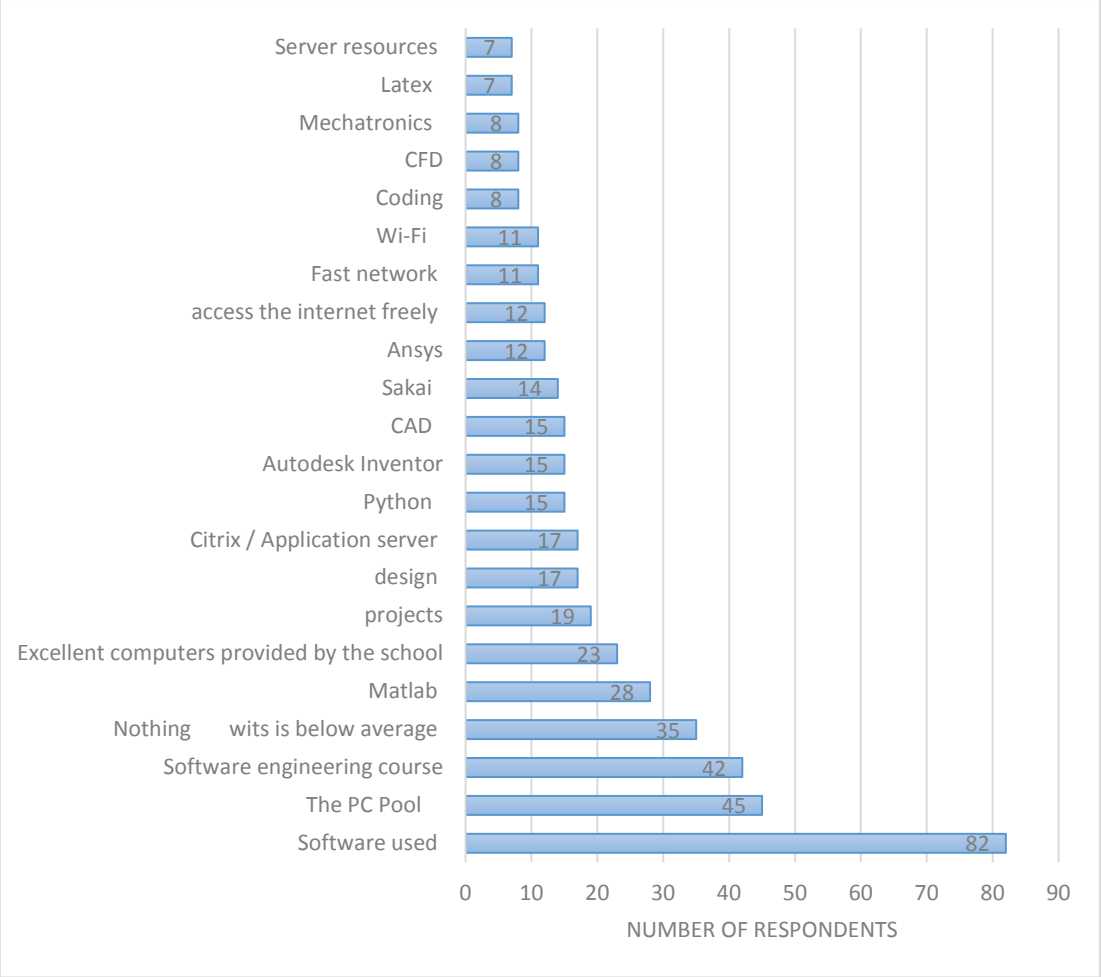


Figure 4. 10 Question 10 - Identify the high point of student IT experience

4.3 Staff Interviews

4.3.1 Sample sizes

36 interviews out of a total of 41 staff were carried out as follows (number of staff in School in brackets):

Lab and Technical staff (10): 6 interviews

Admin Staff (4): 4 interviews

Academic staff (27): 26 interviews

Sessional and part-time lecturers were excluded. Two Members of staff were on sabbatical and could not be interviewed. The sample size was 88% of the population.

4.3.2 Question 1: Does IT play a role in the case study environment?

All the participants, answered yes, IT does play an important role in the environment. The impact on their productivity varied from 100 % dependent on IT, to smaller percentages recorded by the workshop staff who only rely on IT for limited activities. One common denominator among the technical staff was the fact that they need more training on the applications they use. They complain that new software products get introduced to the environment without them being trained. All academic staff rely on IT for teaching, research and administrative duties.

4.3.3 Question 2: Describe the limiting factors for implementation of new technology.

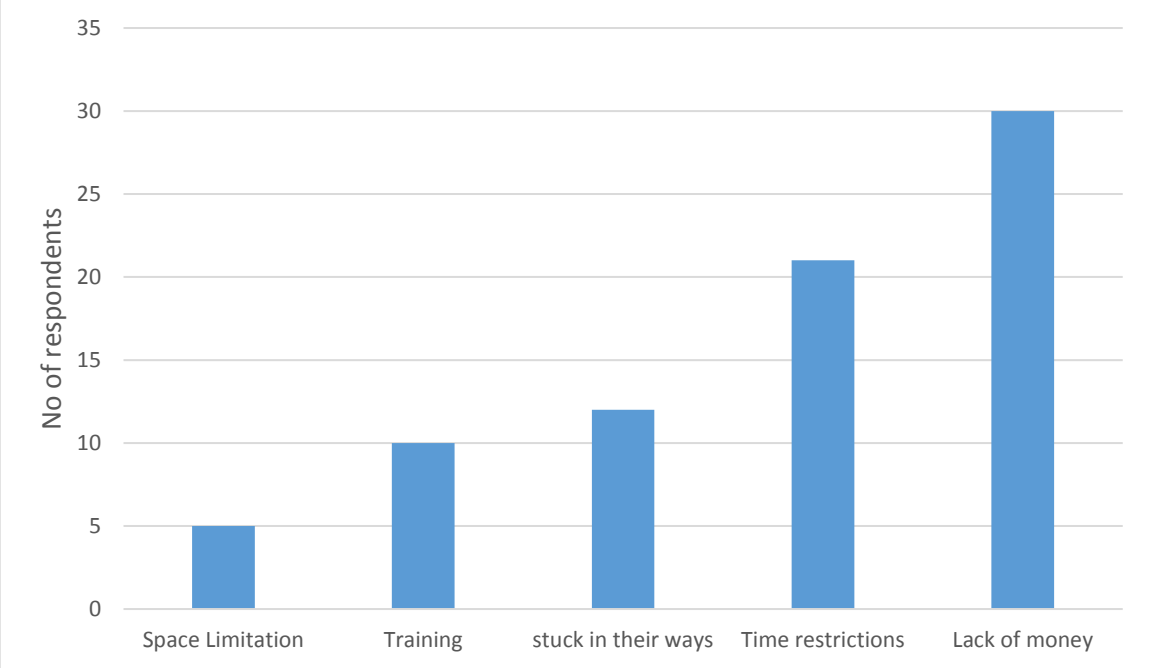


Figure 4. 11 Limiting factors for the implementation of new technology

22.3% of the staff, mainly the technical and support staff, indicated that the lack of training is a limiting factor. 69.9% of all staff were adamant that the current lack of

money and budgetary restrictions in general is a limiting factor. Limited time was the second most common limiting factor as listed by 51.2% of the staff.

11.6% of the staff described how the current limitations to and shortages of physical space limit the student access to virtual space. With the current space allocation in MIA there is no room to expand. 27.9% admitted that either they or their colleagues are stuck in their ways of doing things.

4.3.4 Question 3: Do you think The School of MIA has unique IT needs, compared to other faculties and Schools?

Figure 4.12 shows that 31 respondents believe that there is a difference between the school of MIA and the other faculties and schools at Wits in terms if IT needs. 7 respondents answered that they don't know what the situation is in the other schools and are unsure of the difference. No respondents answered that the school of MIA does not have unique IT needs, compared to other faculties and schools.

"Unique characteristics" refers to software for specific purposes, and some of these purposes are shown as finite element analysis (FEA), computer aided design (CAD), computational fluid dynamics (CFD), and modelling software in general.

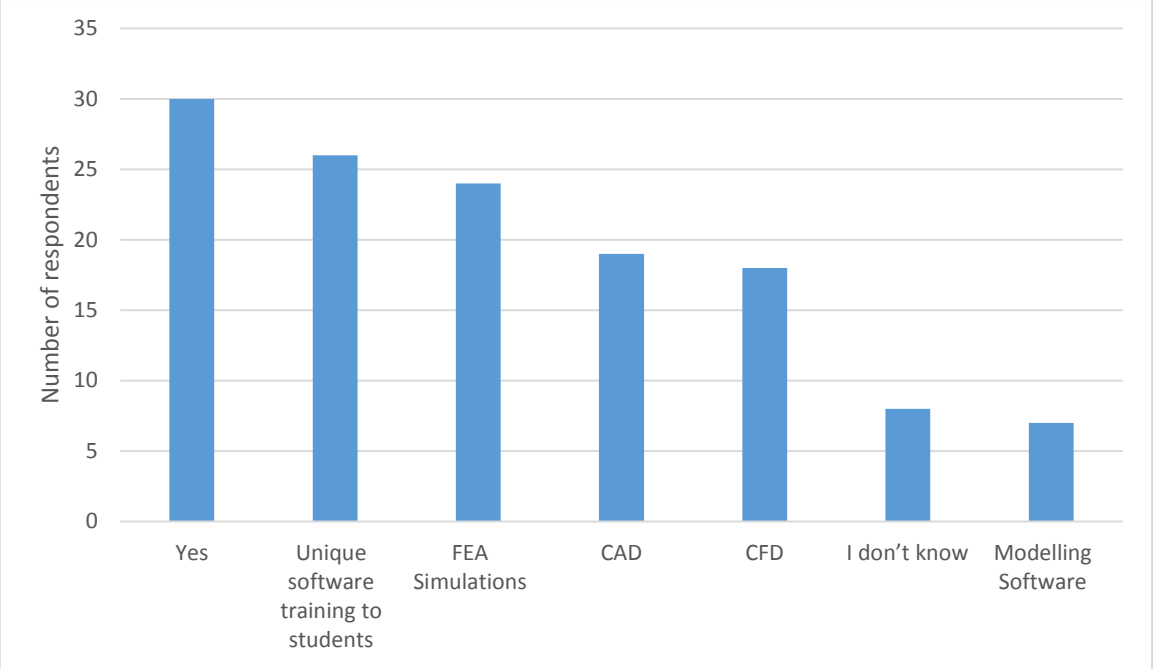


Figure 4. 12 Question 3 - Unique IT needs

4.3.5 Question 4: SWOT analysis

Each of the four SWOT segments will be individually discussed. In Figure 4.13, 4.14, 4.15 and 4.16, the strengths, weaknesses, opportunities and threats are listed, as given by respondents.

The most frequently listed strength (31 respondents) was the dedicated IT personnel. The fact that these positions exist in the school were seen as the biggest internal IT strength. The second biggest strength were modern software packages.

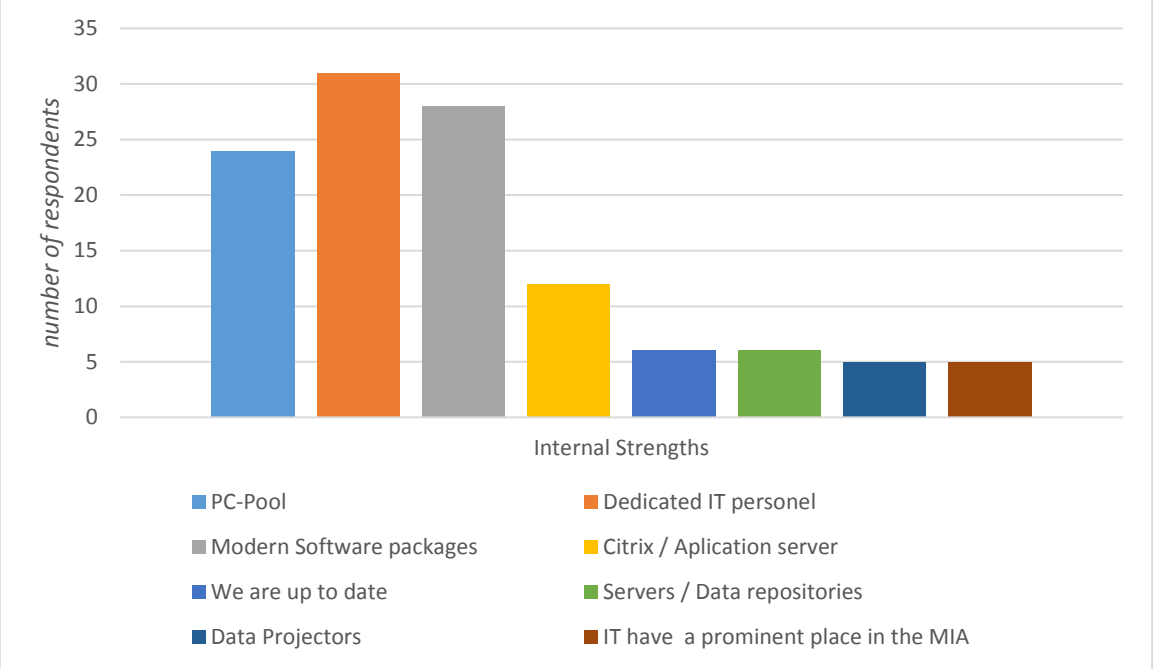


Figure 4. 13 Internal strengths

Figure 4.14 shows the eleven most commonly cited internal weaknesses, tabulated by number of respondents. The biggest weakness listed by almost all respondents is the lack of sufficient funding.

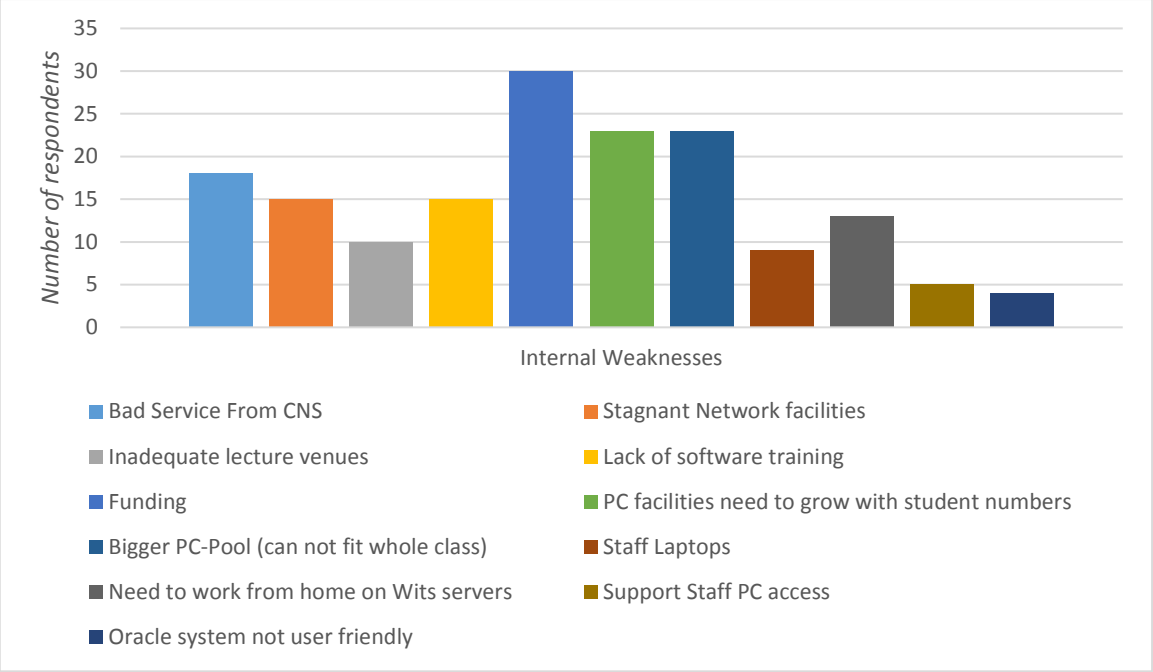


Figure 4. 14 Internal weaknesses

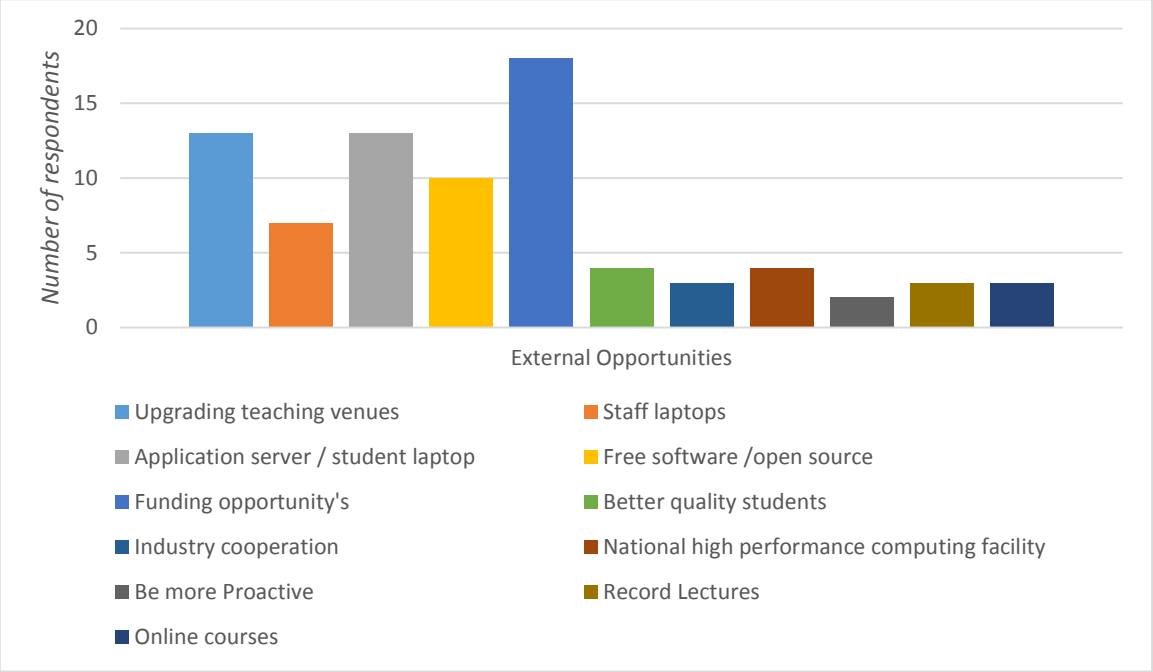


Figure 4. 15 External opportunities

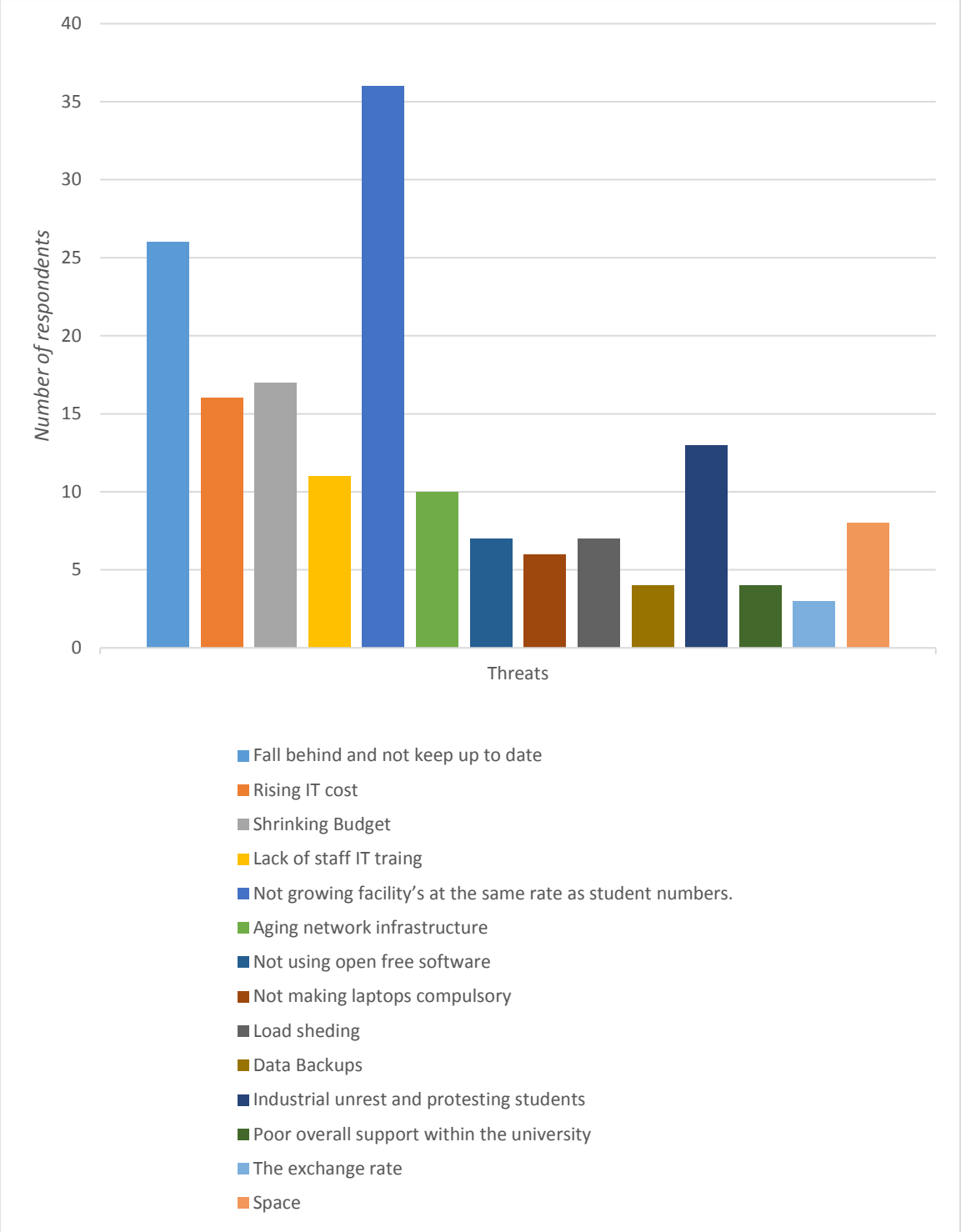


Figure 4. 16 Threats

4.3.6 Question 5: Describe a future vision to plan towards.

Each interview was finished by asking for a future vision of a world class institution. This question followed the SWOT analysis and as a result the respondents built their answers on SWOT. The data can be divided into 4 main categories and will be grouped accordingly.

IT infrastructure

- The use of personal laptops must be compulsory for all students.
- There should be more use of remote access to big servers or supercomputers.
- In their future vision 73% of staff prioritised network connections. Both Wi-Fi and wired connections must be top quality.

Web access and web presence

- All respondents are in agreement that a web enhanced environment is the future. This will give them the ability to access resources remotely.
- Digital teaching material that the students can access anytime, anywhere.
- Online courses, or adding a large online component to current teaching material.
- Growing a bigger web presence, enhancing communications and enhancing online marketing of the school.

Staff development and alignment

- Training must be maximised to optimise the investment made, because of current limited resources and the costs thereof.
- Time is currently a scarce commodity for staff. As a result, their future vision prioritizes more time.
- Be more proactive.
- Budget constraints must be addressed.

Open source software

- Open source software is seen as an opportunity to lighten the strain on the current limited budget while still staying relevant in the international arena.

4.4 Synthesis of Results

Use of Laptops

Questionnaire question 1 results shows that the students use several electronic devices, but have a preference for mobile devices. Question 7 ranks the laptop as the device of choice, with the lack of resources on campus as the main motivation to bringing their own. Here they are referring to the PCPool, the facility with desktop computers provided by the School, and which is considered by students and staff to be inadequate in terms of capacity. Therefore, laptops are considered by students as a replacement for use of desktops in the PCPool. Staff stated they would prefer students to have laptops.

The preference for one student, one laptop, was captured in the Wits 2013 vision. However, it appears as though the SOOCE project must have been abandoned, since the desired result of one laptop, one student was never achieved. Questionnaire question 9 confirms that many students still do not own a laptop. This failure of the SOOCE project may have been due to a change of management, or management objectives.

The Number of PC's in the PCPool is considered inadequate by staff for teaching purposes. Staff interviews supported the use of laptops and the Citrix application-server (cloud services). This would reduce the load on the PCPool. It should be noted that limitations to and shortages of physical space and funding prevent the PCPool from being expanded further, unless considerable further cost is incurred.

Many students that did report having laptops, also reported that these were 3 years old or older. This might restrict the software they are able to use, since much of the software currently used is up-to-date, and considered by students as a highlight. Therefore, every student would need to own a modern laptop capable of running all software required, or the small PCPool would need to be maintained for niche applications only.

Infrastructure

Internet access and access to electronic resources is only accessible on campus for many students. This leads to competition for resources in the PC-Pool. The Wi-Fi infrastructure in the School is currently underdeveloped and is unsuitable for expanded use for cloud-based services. Neither the staff or the students commented adversely about the services provided by CNS, which is effectively the network infrastructure connecting the School to the internet and all electronic resources.

Both students and staff consider the current provision of cloud-base services, and future extension thereof, as positive.

IT and teaching

Results from questionnaire question 2 shows students are desirous that the more traditional teaching methods should be run in parallel with new technology. Students see themselves as early adopters of technology. This will aid the introduction and adoption of IT by the University. Typical of early adopters, their desire is to use more IT, indicating that IT forms an essential part of their university experience and is now instrumental in successful teaching. Students specifically want an increase in online course content. Indication are that staff are not as progressive ("stuck in their way of doing things"), and could prevent or slow the effective introduction of IT. Measures will need to be put in place to prevent this.

There is a strong notion among students that Information Technology is not used frequently enough in teaching. The students get frustrated by the lack of new technology in the environment, a factor that influences their morale and opinion of the institution. A number of students indicated that they think the school of MIA has fallen behind.

The provision of up-to-date and relevant software is important, as shown by student questionnaire question 10, and by staff interviews. Currently, the variety of modern software packages in the school, count as strength appreciated by staff and students. Unfortunately, this is a major cost driver, and cloud-based services are one way of containing costs. Staff fear that this may not be the case in the future due to budgetary constraints.

There is contradiction for the staff responses, in that they believe a strength is modern, up-to-date software, and a weakness is a lack of sufficient funding. It may be that there is only a perceived lack of funding by staff.

Staff consider lack of money and budgetary restrictions as limiting factors for the implementation of new technology. This is as a result of the lack of a School IT strategy, as well as the limited budget. However, it appears much of the budget could be re-allocated more effectively if there were an IT strategy, and if each student had a laptop. The staff fear that IT could fall behind in the future based on the low priority it has on the school budget. This may also be as a result of no school IT strategy.

IT strategy

The School of MIA has unique IT needs, compared to other faculties and Schools. However, this does not reflect in the Wits strategic plans. IT personnel in the School are considered a strength, indicating implementation of IT will be greatly aided in future. The focus on e-learning as a strategic objective is crucial to stay relevant in the educational arena.

Wits strategy documentation prescribe ease of geographic and time access to IT systems to be provided. This would be provided by a true cloud computing system.

MIA are required to keep abreast of changes in the global environment, arising from technological innovations. They appear to be meeting this strategic obligation admirably, apart from the PCPool capacity. The infrastructure and software provision has been found adequate by staff and student's restrictions to hardware and infrastructure exist though.

The failure of the SOOCE has been problematic, since various costs were incurred to align with it. It is essential that the school apply itself to ensuring every student has a laptop as cloud computing proved itself of the most cost effective way of delivering resources.

The staff fear of "falling behind and not keeping up to date" seems to originate from the inadequate budget. There is also a danger the staff themselves will fall behind due to being "stuck in their ways". MIA academic staff must be actively encouraged to introduce and use IT to enhance their teaching, student engagement, research, supervision and administration, and engagement with the broader community.

Certain strategic objectives relate to outside marketing. For example, IT systems to make research visible to the outside community are required. Also, a sustained relationship with the MIA alumni needs to be fostered. This is possible with a strong web presence that emphasises visibility.

Note that web presence falls outside the scope of this research, and such services are provided by CNS. Whether they are effective for the School is highly debateable.

4.5 Development of Strategy for IT

Wits aspires to be a leading research-intensive university firmly embedded in the top 100 world universities by 2022. The strategic objectives are as follows:

(a) Attract highly talented students from around the world and provide a unique student-centred and research-driven experience without compromising Wits' commitment to local imperatives.

(b) Re-invigorate Wits' reputation for supporting the participation of students and scholars from all diverse backgrounds who have the potential to benefit from our educational opportunities and arrangements.

(c) Attract, develop and retain high calibre and distinguished scholars and support staff by offering a welcoming and supportive environment noted for diversity and high level intellectual achievement.

(d) Cultivating a positive and lasting distinct experience for all who become associated with Wits, by promoting critical enquiry, debate, independence, accountability, and the public good

A strategy map was created for the School, and is shown in Figure 4.17 an IT strategic plan was provided for the university in the Wits 2013 strategy document. This can serve as an additional guide to strategy development. First, the gap between the current situation and the desired position as specified in the strategic plan must be defined. The most obvious gap is in the access to services by students. Other gaps identified are staff keeping up to date with current IT trends and software and the poor allocation of IT budget. Closing of these gaps will result in strategic alignment of the School IT with the University business.

No other strategy gaps are discernible. However, the strategy must be devised to ensure the School does not begin to fall out of alignment with the University in any other respect.

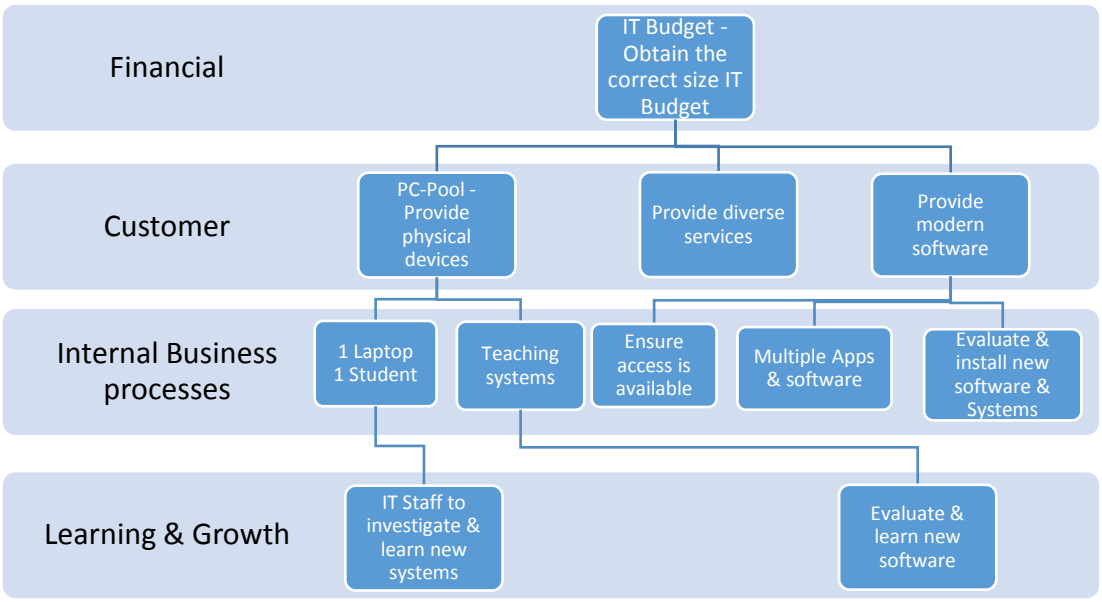


Figure 4. 17 *Strategy Map*

The following are the relevant items contained and extracted from the Wits IT 2013 strategy. This School strategy can be devised using the same items, as follows:

(a) Improve, develop and maintain the School IT infrastructure.

Required:

- Expand cloud-based services.
- Maintain and develop cloud servers.
- Expand W-Fi capacity.
- Maintain the PCPool.

(b) That students possess computing devices and are connected to the School irrespective of time or place.

Required:

- One student one laptop.
- Maintain and expand cloud-based services.
- Encourage staff to introduce and use online resources.

(b) That academics are adept at using IT.

Required:

Encourage staff to introduce and use online resources.

(c) That support staff have access to excellent administrative systems.

This is provided by CNS, therefore does not need to be included in the School strategy.

(d) That Wits alumni enjoy a sustained and valuable relationship with the University through the use of IT.

This is provided by CNS, therefore does not need to be included in the School strategy.

(e) Ensure that a strong element of innovation is used to create and apply IT to academic and support activities within the university.

Required:

Encourage staff to introduce and use online resources.

(f) Actively collaborate with other institutions.

Required:

Internet visibility is provided by CNS, therefore does not need to be included in the School strategy. However, the School will need to collaborate with CNS where relevant.

(h) Create, sustain and enhance a leading-edge IT infrastructure, including its network, telephony systems, back-office environment, and end-user systems.

Required:

Develop and maintain cloud servers, PCPool, Wi-Fi, Network infrastructure.

(i) Strengthening IT infrastructure that enhances research and promotes the visibility of research output.

Required:

- Provision of modern software.
- Networking services – provided by CNS.
- Fast, modern network and associated equipment.

(j) Sustain and enhance a library that provides the latest electronic knowledge appropriate for a leading, research-intensive university.

This is provided by the Wits library, therefore does not need to be included in the School strategy. A certain amount of collaboration may be necessary to ensure the unique needs of the School are met.

(k) Continuous capacity-building, training and learning opportunities to improve student and staff capacity.

Required:

Encourage staff to introduce and use online resources.

l) Expand IT platforms to include open-access methods, licences and approaches.

Required:

- Cloud provision
- Encourage use of open source software.

m) Data and the information needed for the administration and management of the institution will be available when and where needed (Director of Strategic Planning, 2011)

This is provided by CNS, therefore does not need to be included in the School strategy.

4.6 Balanced Scorecard Development

Using the strategy map, a balanced scorecard was devised to aid the alignment of the new IT strategy with business objectives, and to aid implementation. The BS consists of four quadrants as follows:

Quadrant 1: Financials

Objectives	Measures	Targets	Initiatives
Control budget	Unspent budget	All budget spent at year end	- Ensure budget is allocated - Encourage staff to seek alternative funding opportunities
	Money required vs budget	Sufficient money available	Motivate for budget adjustments as required

Quadrant 2: Customer

Objectives	Measures	Targets	Initiatives
PCPool maintained	Satisfied students	None – objective is currently achieved.	
	Computers sufficient to provide niche services	None – objective is currently achieved.	
Fast, geographically and time diverse accessibility	Satisfied students	Expand cloud services to all software by 2018.	All new updates and new software installed as a cloud service.
Provide a large range of modern, incl. niche, software	Satisfied students	None – objective is currently achieved.	
	Satisfied staff	None – objective is currently achieved	

Quadrant 3: Internal Business Process

Objectives	Measures	Targets	Initiatives
One laptop per student	All students have laptop	All students have laptop by 2018	Onsite security provision
			Financial arrangements
Ensure access availability	Satisfied students	None – objective is currently achieved.	
Maintain equipment and update software	Satisfied students and staff.	None – objective is currently achieved.	
Evaluate and install new software and IT systems.	More software packages obtained and installed.	Addition of software packages in under-serviced course fields.	
	Satisfied staff	None – objective is currently achieved.	
Best online teaching systems availability	Satisfied staff	None – objective is currently achieved	
	No new developments reported.	Current best available.	Continuous scanning and reporting by IT committee/staff

Quadrant 4: Learning and Growth

Objectives	Measures	Targets	Initiatives
Encourage staff to obtain, install and use new software	Staff suggestion count.	4 suggestions per staff member per year.	Encouragement of staff to scan industry.
IT staff to continuously investigate new, better systems.	No better systems reported.	Current best available.	Continuous scanning and reporting by IT committee/staff

Chapter 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter focuses on the final conclusions, substantiated by the collected evidence, in order to answer the research question, followed by recommendations, to form a holistic view.

5.2 A Brief Overview of Previous Chapters

To answer the primary research question: How and under what circumstances can Business and IT strategically align? The study was organised in 5 chapters.

The first chapter serves as an introduction, providing the background by giving an overview and justification of the research by explaining the research question. Chapter one, also gives a delimitation of scope, source of data and methodologies.

The crux of chapter 2 is emphasised by arranging it into four primary themes, fusing the relevant research on the topic. That is 2.1 - the importance and benefits of strategic alignment, 2.2 - How strategic alignment of business and IT can be achieved. 2.3 - Important environmental influences, 2.4 - How to achieve the formulation of a strategic plan.

Chapter three deals with the research methodology. This study was considered in light of the complexity of the research question aiming to achieve the research objectives.

Chapter four deals with the analysis of the data, studied from as many angles as possible to explore the different dimensions and trends, and to identify the main factors influencing this environment. The focus of this chapter is to condense and describe the large volume of data, producing information that is useful and meaningful for discussion and interpretations. Leading to findings and conclusions in chapter 5.

5.3 Translating evidence

Translating evidence as gathered in the case study environment by means and methods as explained in chapter three-research methodology. This study was aiming to achieve the research objectives. Chapter four deals with the analysis of the data,

studied from three main angles namely staff interviews, questionnaires to students and strategic documentation to explore the different dimensions. The data were percolated to the core and presented in chapter 4.4 as follows. The use of laptops infrastructure including network infrastructure and the PCPool, the relationship between IT and teaching in MIA, and IT strategy, based on the Wits Vision 2022.

5.4 Research Implications and recommendations

5.4.1 Implications for theory

This research proves that the use of the 3rd generation BSC methodology can be used as a strategic tool, to align business and IT in the research environment. It further proves that this technique is suitable for alignment planning in a systems environment with a large number of variables.

This study was the first of its kind in the MIA, South Africa context.

The assessment of IT alignment with business strategy represents an empirical contribution that has not been integrated before in industrial engineering. The basis for this integration was initially inspired by the approach used by (Avison, et al., 2004) to determine the degree of alignment between businesses strategies based on their completed projects. However, the aim was to assess strategic direction rather than a detailed roadmap to achieve alignment.

5.4.2 Implications for practice

The strategic plan illustrated in Chapter 4.6, were designed to bridge the gap between the current situation and the desired position as specified in Wits Vision 2022.

- The proposed balanced scorecard should be used to guide the implementation of the proposed new IT strategy within the School.
- Substantial parts of the strategy are based on each student having a laptop and the use of cloud technology. Therefore, this aspect of the scorecard should be given priority.
- Collaboration with CNS and library services has not been included. It is assumed these initiatives will be driven by the other party, but attention should

be given to ensure such collaboration is effective and achieves the required results.



Figure 5. 1 Strategy consolidation

5.5 Research Limitations

Even though the different steps for this thesis were planned and thought through before the execution of every phase, there are always areas for improving the study. The weaknesses in this dissertation can be used as examples for what could have been done differently.

- The fact that the researcher did not have access to confidential MIA budget information, limited the level of detail of the balance scorecard. The balanced scorecard as displayed in 4.6 can be used by the management staff in the case study environment as a valuable management tool with practical use. However, the aim of this study was to assess strategic direction rather than a detailed roadmap to achieve alignment.
- A limitation is that the research question focused on design only. Further study can focus on design as well as implementation as this can take several years.

5.6 Further Research

This research showed that it is both theoretically and practically possible to find solutions to the Primary research question: Can a strategic plan be developed to strategically align business and IT in the research environment, using the 3rd generation BSC methodology? The answer is yes. As demonstrated with the 3rd generation balanced scorecard 4.6. Consequently, this research contribution set a foundation for further research.

Future researchers should investigate how organisations can adapt and evolve their IT organisational structure in order to strategically align business and IT improve their current levels of alignment.

Future researchers should investigate the impact of centralised, decentralised and federated structures in organisations, in order to strategically align business and IT.

How strategic plans vary depending on other structural factors such as organisational size, industry, planning integration etc.

With the strong movement to “bring your own device strategy” in industry, future researchers should investigate the impact of socio- economic influences on strategic planning.

The influence of techno-literacy needs more attention – this research did not focus directly on the influence, but future research will be a helpful to interpret the findings in more detail.

Future researchers should focus on how management styles and corporate structures influence the alignment of IT and business.

5.7 Conclusions

- The factors that affect IT strategy and provision of IT services have been discovered and detailed.
- The School of MIA IT environment has been investigated and described. A new, proposed strategy for alignment of the School IT with the University business strategy has been developed and described.
- The BS methodology has been used to create a model for implementation of the new, proposed School IT strategy.

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Appendix A

Wits Top 100 strategy and Vision 2022 Strategic Framework

Wits - Knowledge at the leading edge





VISION 2022

Strategic Framework

Strategic Priorities



To be a Wits graduate is to be known as a top achiever.



An IT Savvy University

Wits will position itself as an IT-savvy university that uses technology to enhance all its core process, including providing new and innovative ways of engaging students and staff in academic activities.

This includes making the University accessible through mobile technologies irrespective of time and place. While remaining committed to the tutorial-based approach to learning, teaching and learning processes will be reinforced through the application of technology-enhanced pedagogy to address some of the key challenges that we face as a predominantly contact institution.

Wits researchers will be supported by technology to enable them to carry out cutting-edge research as befits a research-intensive university environment, including working in virtual interdisciplinary teams. Research, teaching and learning will benefit from open-access approaches, including institutional repositories, open educational resources and open



publication, all of which use creative commons licensing, together with traditional copyright-maintenance where appropriate.

Administrative support for our core academic activities will take advantage of the latest technology and approaches, and all IT implementations will consider people, process and technology to ensure success. Where appropriate, innovation will be encouraged and supported in our approach to technology.

To accomplish this, Wits will ensure that it sustains the people necessary, including:

- a core IT department with the necessary skills, attitudes
- an e-learning team that is responsible for the application of cutting-edge technology and pedagogy to teaching-and-learning
- a business intelligence capacity that is able to turn data into information that is available when and where it is needed
- a library system that makes available the latest resources appropriate for a leading research-intensive university
- an IT capacity within faculties that articulates with central IT system to ensure a coherent and responsive approach
- governance mechanisms that provide the right balance between agility and stability

Wits will position itself as an IT savvy university that uses technology to enhance all its core processes, including providing new and innovative ways of engaging students and staff in academic activities.



Strategic Objectives

(a) Improve, develop and maintain the Wits IT infrastructure to facilitate enhanced access to information, teaching and learning, research, and engagement opportunities in a manner that promotes academic excellence appropriate for a leading research-intensive university.

(b) Ensure that students possess computing devices and are connected to Wits irrespective of time or place, and are able to use their own and provided computing devices as knowledge access and creation tools in a connected way.

(c) Ensure that academics are adept at using IT to enhance their teaching, student engagement, research, supervision, administration, and engagement with a broader community.

(d) Ensure that support staff has access to excellent administrative systems that enhance their support role and help contribute to service excellence in all areas.

(e) Ensure that Wits alumni enjoy a sustained and valuable relationship with the University through the creative provision and use of IT.

(f) Ensure that a strong element of innovation underpins the way in which we choose, create and apply ICT to academic and support activities within the university.

(g) Remain cognizant of our position in Africa and actively collaborate in innovation and application areas with other institutions in Africa and the world.

(h) Create, sustain and enhance a leading-edge IT infrastructure, including its network, telephony systems, back-office environment and end-user systems.

(i) Place emphasis on strengthening IT infrastructure, technologies, and approaches that enhance research, promote the visibility of research output, and ensure that Wits researchers (both staff and students) are connected to a global network of researchers and research output.

(j) Ensure that we sustain and enhance a library that provides the latest electronic knowledge resources in support of teaching-and-learning and research appropriate for a leading, research-intensive university.

(k) Provide continuous capacity-building, training and just-in-time learning opportunities to improve student and staff capacity to exploit technology to achieve excellence in their work.

(l) Expand IT platforms to include open-access methods, licenses and approaches, along with more traditional full copyright where appropriate, to enhance our reputation as a global university participating actively in the knowledge commons.

(m) Ensure that the data and the information needed for the administration and management of the institution will be available when and where they are needed, and the underlying data will be accurate and well governed.

Wits - Knowledge at the leading edge





Wits **2013** Strategy

Towards Global Top-League Status

Our Strategic Priorities

For the next 12 years Wits has identified priorities as its strategic thrusts. These are:

Wits will position itself as an information technology (IT)-savvy university that uses technology to enhance all its core process, including providing new and innovative ways of engaging students and staff in academic activities. This includes making the University accessible through mobile technologies irrespective of time and place. While remaining committed to the tutorial-based approach to learning, teaching and learning processes will be reinforced through the application of technology-enhanced pedagogy to address some of the key challenges that we face as a predominantly contact institution.

Wits researchers will be supported by technology to enable them to carry out cutting-edge research as befits a research-intensive university environment, including working in virtual interdisciplinary teams. Research, teaching and learning will benefit from open-access approaches, including institutional repositories, open educational resources and open publication, all of which use creative commons licensing, together with traditional copyright maintenance where appropriate. Administrative support for our core academic activities will take advantage of the latest technology and approaches, and all IT implementations will consider people, process and technology to ensure success. Where appropriate, innovation will be encouraged and supported in our approach to technology.

Wits 2013 Strategy

4. An IT-Savvy University

Wits will position itself as an information technology (IT)-savvy university that uses technology to enhance all its core process, including providing new and innovative ways of engaging students and staff in academic activities. This includes making the University accessible through mobile technologies irrespective of time and place. While remaining committed to the tutorial-based approach to learning, teaching and learning processes will be reinforced through the application of technology-enhanced pedagogy to address some of the key challenges that we face as a predominantly contact institution.

Wits researchers will be supported by technology to enable them to carry out cutting-edge research as befits a research-intensive university environment, including working in virtual interdisciplinary teams. Research, teaching and learning will benefit from open-access approaches, including institutional repositories, open educational resources and open publication, all of which use creative commons licensing, together with traditional copyright maintenance where appropriate. Administrative support for our core academic activities will take advantage of the latest technology and approaches, and all IT implementations will consider people, process and technology to ensure success. Where appropriate, innovation will be encouraged and supported in our approach to technology.

IT-Savvy University	
Vision 2022 Strategic Objectives	**Indicators and Targets for Wits 2013 Strategy**
(a) Improve, develop and maintain the Wits IT infrastructure to facilitate enhanced access to information, teaching and learning, research and engagement opportunities in a manner that promotes academic excellence appropriate for a leading research-intensive university.	(a) By the end of 2012, we will have developed and implemented sustainable enterprise architecture. (b) Starting in 2011, we will sustain a project management practice that provides an implementation vehicle and is supported by a project office located in CNS. (c) During 2011, Wits will create a virtual learning environment as part of the student support system integrated into existing and new student information systems. (d) By the end of 2013, ubiquitous eLearning access will be provided from anywhere on any device.



Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
	(e) Starting in 2011, IT costs will be carefully managed and cost inefficiencies explicitly minimised. (f) Starting in 2011, synergies will be developed between the academic and support technology initiatives. (g) By the end of 2011, a private cloud infrastructure will be fully operational, allowing for the creation and billing of cloud-based services. (h) By the end of 2012, Wits will have a strategy and plan of action for making appropriate use of public compute and storage cloud resources, and by 2013, we will be able to provision an appropriate mix of private and public cloud resources. (i) By the end of 2013, CNS IT Service Management will be certified at level 2,5 Service Management Proficiency Index (SMPI), up from 1,7 in 2010. (j) By the end of 2012, faculties will have IT support units that are responsible for faculty IT, but that articulate with central IT in a federated manner. (k) By the end of 2011, a review of IT governance will be completed, and by 2012 its recommendations will have been implemented. (l) A business model for funding the provision of extra services by units, centres, faculties and schools will be in place and implemented. (m) The service desk will provide a reasonable degree of cross-platform support, and support for multiple devices. (n) All new classrooms and classroom upgrades will consider the implications of eLearning in their design, and eLSI will collaborate with PIMD in achieving this goal (eLearning GOAL 10). (o) By the end of 2011, an SLA will be established with the Legal Office to speed up IT procurement and projects. (p) By the end of 2011, a Knowledge and Information Management (KIM) communications plan will be in place and implemented on an ongoing basis. (q) By the end of 2011, enterprise printing for students will be available in CNS labs.
(b) Ensure that students possess computing devices and are connected to Wits irrespective of time or place and are able to use their own and provided computing devices as knowledge access and creation tools in a connected way.	(a) By the end of 2011, student-centric mobile applications will be identified; by 2012, relevant examples implemented or developed; and by 2013, mobile access to administrative systems provided (Student Management Information System [SIMS] programme). (b) By the end of 2012, the Student Ownership of Computing Equipment project (SOOCE) will ensure that all students from second year onwards will have their own mobile computing device.

Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
	(c) SOOCE will focus on a mechanism for acquiring computing devices for all first-year students as they join the University. (d) By the end of 2012, third-party financing and purchase arrangements will be in place and bursary support will available for needy students to acquire a mobile computing device. (e) By the end of 2012, a formalised student collaboration portal will be in place, and student use of this portal actively promoted. (f) By the end of 2012, eLearning pedagogy will be introduced to ensure that teaching and learning makes appropriate use of mobile computing devices. (g) By the end of 2011, student support guidelines will be published to inform students about wireless connectivity and how to set up their devices, when and where to ask for help, and setup fees, if any. A knowledge database for student computing devices will be available. (h) Digital academic literacies will be institutionalised at Wits and new students will have access to courses and 'just in time' (JIT) learning opportunities. (i) By the end of 2012, we will have differentiated learning strategies to ensure the development of multi-literacies. (j) By the end of 2011, eBook readers and mobile-device lending services will be introduced in the library. (k) By the end of 2011, the power and network points in the 24-hour reading rooms in the library will be expanded. (l) By the end of 2011, secure recharge facilities will be available in student open areas, including the provision of solar-powered chargers designed by the Faculty of Engineering and the Built Environment.
(c) Ensure that academics are adept at using IT to enhance their teaching, student engagement, research, supervision, administration, and engagement with a broader community.	(a) By the end of 2011, faculty eLearning champions will be in place, at least one per faculty. (b) By the end of 2011, school Teaching & Learning Committees will have eLearning as a standing item on their agenda, and will actively promote the implementation of the eLearning strategic plan (eLSI GOAL 4). (c) By the end of 2011, all courses currently in WebCT will be migrated to an open-source eLearning platform. (d) By the end of 2012, eLSI will - in co-operation with the Centre for Learning, Teaching and Development (CLTD) - supply JIT learning opportunities that supplement the courses and workshops offered by CLTD, especially those focusing on new lecturers (eLSI GOAL 6).





Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
	(e) By the end of 2012, eLSI will offer digital academic literacy training and support to academics according to their current stage in technology adoption and knowledge. (f) By the end of 2012, all courses will be supported in the creation and maintenance of an active eLearning presence which contains at least the essential information for the course and a facility which will allow all course participants to communicate electronically (eLSI GOAL 8). (g) By the end of 2012, existing electronic theses and dissertation procedures will be expanded to cover online supervision, examination and publication. (h) Starting in 2011, the library will provide training for bibliographic management (e.g. Zotero, Refworks) and research management tools (e.g. Incite, SCIVAL). (i) By 2012, academics will be able to publish their work on a Wits home page, including the use of integrated social networking technologies to enhance their connectedness.
(d) Ensure that support staff has access to excellent administrative systems that enhance their support role and help contribute to service excellence in all areas.	(a) By the end of 2011, the upgrade of HR and finance systems to Oracle Release 12 will be completed. (b) SIMS will be complete, and will provide for significant improvements in the area of student administration. (c) By the end of 2011, new developer skills will be acquired in CNS to cater for the requirements of SIMS. (d) By the end of 2011, digital asset management will be in place for the Legal Office and central records office, and by 2013 it will be available enterprise wide. (e) By the end of 2012, business intelligence information will be provided to mobile devices. (f) By the end of 2012, we will have systems that make use of business intelligence and other approaches to identify and mitigate factors that negatively influence success and throughput rates. (g) By the end of 2012, Wits will reach agreement on standardised service models, faculty processes, faculty job descriptions, faculty process training, and active data-governance measures. (h) Starting in 2011, Wits will agree upon and build strategic procurement reports and facilitate change to monitor and realise procurement savings. (i) By the end of 2011, Wits will begin to provide high-quality training materials as part of a library or JIT learning resources to support our administrative technologies. (j) Starting in 2011, Wits will develop a faculty process and reporting handbook for academics and administrators.

Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
(e) Ensure that Wits alumni enjoy a sustained and valuable relationship with the University through the creative provision and use of IT.	(a) By the end of 2012, Wits alumni will have access to an interactive website that allows for blogging and integration of social media, and is integrated into the Wits website. (b) By the end of 2012, electronic services will be made available to alumni for life. This includes access to library resources, email and similar tools that link them to the University. (c) By the end of 2013, a directory of Wits researchers (staff and students) will provide opportunities for alumni who are industry leaders to connect with research happening at Wits. (d) We will sustain our investment in the Wits CRM and ensure that it is used effectively to remain connected with our alumni. (e) Students will be able to create electronic portfolios which they will retain for life.
(f) Ensure that a strong element of innovation underpins the way in which we choose, create and apply ICT to academic and support activities within the University.	(a) Starting in 2011, Wits will sustain a software development capability within the KIM portfolio. (b) Create and sustain a free and open-source software (FOSS) ecosystem consisting of knowledgeable people, companies who support and implement FOSS technologies, and global networks of FOSS developers and end-users. (c) By the end of 2012, the eLearning unit will be able to conduct usability research to ensure that user interfaces for eLearning are well designed and implemented to work effectively across devices. (d) By the end of 2012, grant funds for research and development in eLearning will be available. (e) By the end of 2012, KIM will offer annual awards for technology innovation, targeting four areas: eLearning, eResearch, eAdministration and KIM internal innovations. (f) Starting in 2011, we will develop and sustain a case-study, analysis, presentation and writing capability within the KIM portfolio, and use this to improve practice, leave an experience legacy, and enhance marketing our achievements.
(g) Remain cognizant of our position in Africa and actively collaborate in innovation and application areas with other institutions in Africa and the world.	(a) By the end of 2012, Wits will have conducted a benchmarking exercise to gauge technological innovations against selected top-100, research-intensive universities. (b) By the end of 2011, KIM will have developed a framework for collaboration with the Centre for Software Engineering and one internationally acclaimed technology centre (WDL) for the development of innovative software. (c) In 2011, Wits will conduct a LibQual survey to benchmark library services against other institutions.





Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
	(d) By the end of 2012, Business Intelligence Services will build and maintain relationships with Berkeley and MIT to build competencies in data quality. (e) By the end of 2011, the CNS business solutions team will create a working group to support a University CMS in the AVOIR community.
(h) Create, sustain and enhance a leading-edge IT infrastructure, including its network, telephony systems, back-office environment and end-user systems, using a variety of technologies and approaches.	(a) By the end of 2011, an above-average bandwidth will be available to the University ensuring high-speed network links for researchers and students. (b) By 2013, Wits will have developed an IP-telephony infrastructure that is substantially open-source based to allow for innovative integration with our systems and enable new services to be provided. (c) By the end of 2012, we will provide between 1 and 10Gb connectivity, with redundancy, among all campuses. (d) Wits will have a campus-wide 10Gb backbone network connecting 60% of all buildings within all campuses. (e) The University will improve connectivity to remote sites such as Wits Rural to ensure equity of the Wits experience in all our sites. (f) By the end of 2011, Wits will have access to a national network of wireless hotspots using Wits login credentials. (g) By the end of 2012, an enterprise desktop backup solution that is cross platform and easy to use will be implemented. (h) By the end of 2012, Wits will provide a file synchronising system that is ubiquitous, accessible and easy to use (similar to Dropbox and UbuntuOne). (i) We will implement enterprise collaboration that includes instant messaging (XMPP-based), document sharing, voice and video.
(i) Place emphasis on strengthening IT infrastructure, technologies, and approaches that enhance research, promote the visibility of research output, and ensure that Wits researchers (both staff and students) are connected to a global network of researchers and research output.	(a) A detailed plan of action on further improvements to the manner in which research is supported and enhanced by IT will be implemented. (b) Starting in 2011, IT will be used to enhance postgraduate student supervision and improve throughput, with all postgraduate research projects registered on the system, and the process of producing and submitting theses enhanced by technology. (c) By the end of 2012, postgraduate supervision functionality and processes will be added to the eLearning system or made available via a postgraduate-focused system that includes social and semantic technologies. (d) By 2013, researchers will deposit their papers in the Wits institutional repository research output will be placed in the institutional repository with 75% compliance.

Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
	(e) By the end of 2013, all theses will be available in the ETD component of the Wits institutional repository, with 100% compliance. (f) By the end of 2013, effective and efficient IT systems will be in place to provide for the management of grants and other research funds, with 100% of grants managed and an annual grant-holder satisfaction survey in place. (g) By the end of 2013, all research students will be able to participate in relevant international collaborative initiatives that require high bandwidth. (h) By the end of 2013, where bandwidth limits the transfer of research data, provision will be made for such transfer during off-peak periods - the process will be functioning with an analysis of logs of use. (i) By the end of 2012 Wits will have established an interactive research portal for the submission of research papers, blogging and discussions by scholars around the globe on the content of the papers. (j) By 2011 Wits will have a dedicated team to make continued improvements to the Wits website, and lead to improved status in the Webometrics rankings.
(j) Ensure that we sustain and enhance a library that provides the latest electronic knowledge resources in support of teaching-and-learning and research appropriate for a leading, research-intensive university.	(a) By the end of 2013, knowledge commons facilities will be available in other libraries, and the existing ones will be expanded. (b) By the end of 2012, libraries will provide access to a broad spectrum of e-resources via mobile devices and multiple platforms. (c) By the end of 2012, the latest electronic knowledge resources in support of teaching-and-learning and research available from the library will be integrated into the eLearning platform and accessible in a relevant way as part of course content (eLSI GOAL 9). (d) By the beginning of 2012, a resource-list management system will be in place. (e) By end of 2011, the library will complete the exercise of identifying the core resources for research across all disciplines. (f) During 2011, the library will make available subject-specific information resources and services on the LibGuides system. (g) On an ongoing basis, the library will continue to increase electronic access to key information resources for research, teaching and learning. (h) By the end of 2011, the library will establish the Wits digitisation centre and continue to grow the digital library and archives and engage with the Digital Asset Management project. (i) By the end of 2011, the library will develop data services in support of research. (j) By end of 2011, interactive online information-literacy courses will be in place (for selected subjects).

Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
	(k) By the end of 2012, library services and facilities will be expanded to support disabled users. (l) By the end of 2011, the library will improve Internet access for visitors and part-time students in the library. (m) By the end of 2011, Wits will make the library catalogue available for access via mobile devices (patrons to search, identify, and renew via mobile devices).
(k) Expand IT platforms to include open-access methods, licences and approaches, along with more traditional full copyright where appropriate, to enhance our reputation as a global university participating actively in the knowledge commons.	(a) By the end of 2013, knowledge of Free and Open Educational Resources will be widespread in the University, and their creation, use and enhancement in courses will be facilitated (eLSI GOAL 12). (b) By the end of 2011, Wits will have established an on-line 'real-time' tutoring facility. (c) By the end of 2012, Wits will have established a Free and Open Educational Resources portal. (d) By the end of 2013, Wits will have appropriate licensing of some of the University's research and technology outputs. (e) By the end of 2013, the number of Wits-based contributions to the common body of knowledge and software on the different portals, sites and forges will increase significantly, and the global visibility of Wits will be enhanced through many "made at Wits" contributions. (f) By the end of 2011, we will create an internship training program for web developers. (g) By the end of 2012, the library will implement an Open Journal System (OJS) to enable open access to Wits journal full-text articles. (h) By the end of 2012, we will have defined standards for devices (mobile or otherwise) and promote usage of these standard devices to improve interoperability and support. (i) By the end of 2013, we will implement publishing of business intelligence output in open standards document formats.
(l) Provide continuous capacity building, training and just-in-time learning opportunities to improve student and staff capacity to exploit technology to achieve excellence in their work.	(a) Wits will have established an interactive web portal for each discipline that allows for inter- and intra-disciplinary research and web-based engagement. (b) Wits will have expanded information management and IT skills training to students and staff by exploiting virtual learning platforms and innovative pedagogies. (c) Traditional IT and information-management training opportunities for staff will be provided through eLSI and CLTD.

Vision 2022 Strategic Objectives	Indicators and Targets for Wits 2013 Strategy
(m) Ensure that the data and the information needed for the administration and management of the institution will be available when and where they are needed, and the underlying data will be accurate and well governed.	(a) Starting in 2011, information integrity will be kept at a high level and availability will be managed with business continuity planning and disaster recovery systems. (b) Starting in 2011, Wits will provide customer-centred service delivery to ensure alignment of IT-based systems, business processes and data integrity. (c) Starting in 2011, Wits will adopt information governance arrangements that allow greater coherence between central and decentralised information services. (d) Business Information Services (BIS) will implement a well-designed, agile, BI infrastructure informed by the Oracle Fusion daily business intelligence method and populated by efficient quality-controlled processes. (e) BIS will implement a world-class, rationalised, integrated BI toolset. (f) By 2011, BIS will implement a rationalised, complete set of operational, management and strategic reports for faculties and schools. (g) By 2012, BIS will implement world-class corporate performance infrastructure comprising scorecards, KPIs, portals, models and analytics to support the 2013 strategic plan. (h) BIS will implement an optimised statutory reporting infrastructure, training and process that allows subsidy to be well managed. (i) By 2012, BIS will facilitate appropriate data governance structures, processes and metrics to assure data quality.



Appendix B

Participant Information Sheet for Subject-matter Experts

Participant Information Sheet for Subject-matter Experts

Good day,

My name is Maarten Coetzee and I am currently completing my Masters in Industrial Engineering at the University of the Witwatersrand, Johannesburg.

My research is entitled *Strategic alignment of Information Technology & Business.*

The objective of the study is to develop a method to strategically align business and IT.

I hereby invite you to be a participant in this study. Your selection was based on the fact that you are a subject-matter expert.

By being a participant an interview session is required.

With your permission, the interview will be recorded through the use of an audio-recorder. This will allow for accurate results and analysis to be done. This interview will be approximately 1 hour in length.

Your participation in this research is voluntary and I can guarantee that your personal details will remain anonymous throughout this research study as well as in the final research dissertation. You as the participant may refuse to answer any questions which you feel uncomfortable with and may also feel free to withdraw from this study at any time. By being a participant in this research you will not receive payment of any form and the information you disclose will be used in the research report.

This research will be presented as a Masters Dissertation and will be available through the University's website. Should you require a summary of the research, I can make this available to you.

Should you have any further questions or queries you are welcome to contact myself or my Supervisor, Dr I Botef & Dr I Campbell at any time at contact details provided below.

Researcher

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Supervisor

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Tel: 011 717 7303

Appendix C

Consent for Participation in Individual Research Interview

Consent for Participation in Individual Research Interview

I volunteer to participate in a research project conducted by Mr. Maarten Coetzee from the University of the Witwatersrand.

I understand that the project is designed to gather information to identify the factors that influence the alignment of business and IT.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, I will
2. not be penalized in any way.

3. If I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

4. Participation involves being interviewed by researcher from the University of the Witwatersrand. The interview will last approximately 30-45 minutes. Notes will be written during the interview. An audio recording of the interview and subsequent dialogue will be make. If I don't want to be recorded, I will not be able to participate in the study.

5. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals.

6. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

7. I have been given a copy of this consent form.

_____ _____

My Signature Date

_____ _____

My Printed Name Signature of the Investigator

For further information, please contact:

Mr. M Coetzee

Tel: 011 717 7318

Maarten.Coetzee@wits.ac.za

Appendix D

Ethics letter to school

To the head, School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand.

I would request permission to use the School of Mechanical, Industrial and Aeronautical Engineering, as Case study environment.
I am currently registered as MSc Student in Industrial Engineering, Student number: 0616643P

The topic of my research is, the Strategic alignment of Information Technology & Business.

My aim is to develop a method to strategically align business and IT

Secondary objectives:

a) Identify the internal and external factors that may align business and IT.

b) Investigate the internal and external factors influencing the strategic alignment of IT and business.

c) Develop an architectural model for business and IT alignment.

Gathering thick data, typical of a Case study research, will require from me to:

For Qualitative research

- Do Individual interviews
- Do Focus group discussions

For Quantitative research

- Gathered secondary data in the School of Mechanical, Industrial and Aeronautical Engineering

Mapping the strategic planning with a *Cause-and-Effect Logic, the researcher will use the Wits 2022 Vision – to position this school in the top 100 in the world - as a strategic goal*

I trust that you will see the benefits to the School of Mechanical, Industrial and Aeronautical Engineering in allowing this.

Regards

Maarten Coetzee

Student number: 0616643P

I FULLY SUPPORT THIS REQUEST ON CONDITION THAT ALL APPROPRIATE ETHICAL CONSIDERATIONS & PROCEDURES ARE FOLLOWED.

R. REID
ACTING HoS (MIA)
24 APRIL 2014

Appendix E

Consent for Participation in Focus Group Research Interview

Consent for Participation in Focus Group Research Interview

I volunteer to participate in a research project conducted by Mr. Maarten Coetzee from the University of the Witwatersrand. I understand that the project is designed to gather information to identify the factors that influence the alignment of business and IT.

My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.

If I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

Participation involves being interviewed in a focus group discussion with 4-8 other people. by researchers from the University of the Witwatersrand. The focus group discussion will last approximately 1.5 hours. Notes will be written during the focus group discussion. An audio recording of the focus group discussion and subsequent dialogue will be make. If I don't want to be recorded, I will not be able to participate in the study.

I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals.

I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

I have been given a copy of this consent form.

_____ _____

My Signature Date

_____ _____

My Printed Name Signature of the Investigator

For further information, please contact:

Mr. M Coetzee

Tel: 011 717 7318

Maarten.Coetzee@wits.ac.za

Appendix F

Interview Questions

The following will be verbally explained by the interviewer to the volunteering staff that will be interviewed prior to the interview.:

My name is Maarten Coetzee, I conduct this study as part of my MSc research on the strategic alignment of IT and business.

It is important to respond to get a representative sample of the study area to enable true results

It will take + /- 20 min to complete the interview

The contact details of the researcher = Maarten.coetzee@wits.ac.za

Your responses will be treated confidentially and you will be completely anonymous.

Do you agree for this interview to be recoded – audio only?

Questions:

With reference to the Wits 2022 Vision

Question 1 Does Information Technology play a role in *The School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand?* Explain

Question 2 What would you describe as limiting factors for the Implementation of new technology in this environment?

Question 3 Do you think *The School of Mechanical, Industrial and Aeronautical Engineering* have unique IT needs, compared to other faculties? Explain

Question 4 SWOT analysis

- What are we good at? (Strengths)
- What can we improve on? (Weaknesses)
- Can you think of External Opportunities that can be turned in to assets/ advantages?
- What do we do wrong? (Threats)

Question 5 How do you see *The School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand* as a top 100 in the world?

Appendix G

ETHICS CLEARANCE CERTIFICATE: H14/05/37

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Coetzee

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER H14/05/37**
PROJECT TITLE	Strategic alignment of Information Technology and Business
INVESTIGATOR(S)	Mr MJ Coetzee
SCHOOL/DEPARTMENT	Mechanical, Industrial & Aeronautical Engineering
DATE CONSIDERED	23 May 2014
DECISION OF THE COMMITTEE	Approved Unconditionally
EXPIRY DATE	19/06/2016

DATE 20/06/2014 **CHAIRPERSON** _____ (Professor T Milani)

cc: Supervisor : Drs I Botef & I Campbell

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10000, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ **Signature**

_____/_____/_____ **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Appendix H

QUESTIONNAIRE

Edit this form

School of Mechanical, Industrial and Aeronautical Engineering PC-Pool Application

*Required

Please note If you received this form via email fill it out online
No printed copies will be accepted

yyyy/mm/dd

Fist name(s) *

Surname: *

ID Number: *

Student Number *

Contact phone number *

Stream *

- Mechanical
- Aeronautical

○ Industrial

Acceptance of Liability *

The Code of conduct can be viewed on the School web page:
http://www.wits.ac.za/academic/ebe/mecheng/undergraduate/5182/rules_amp;_syllabuses.html

☐ I hereby undertake to abide by the conditions of use and code of conduct prescribed by the School of Mechanical, Industrial & Aeronautical Engineering of the University of the Witwatersrand. I have read and understand the conditions of use and agree to abide by the University of the Witwatersrand Code of Conduct for usage of Computer and Laboratory Facilities. I am aware that my usage of the facilities can be monitored and that I will be refused access to the facilities if I breach any item in the code of conduct or conditions of use. I am aware that the School of Mechanical, Industrial & Aeronautical Engineering has delegated to the IT manager, the authority to monitor and block my use of all computer facilities maintained by the school.

Level *

○ 3rd Year
○ 4th Year
○ Post Grad

Icam number *

(The number at the bottom of your student card)

Question 1 *

Which of the following have you used for at least one course or academic activity to supplement your learning? Select all that apply.

	Never used	Seldom used	Average usage	Frequently used
Laptop	○	○	○	○
Smartphone	○	○	○	○
Netbook	○	○	○	○
iPad	○	○	○	○
Desktop Computer	○	○	○	○
PC-Pool PC	○	○	○	○
Other tablet (e.g. Galaxy Tab, Xoom, etc.)	○	○	○	○
Wi-Fi On Campus	○	○	○	○
USB Thumb drive/ Portable hard drive	○	○	○	○

Question 2 *

Which best describes your preference?

- ☐ I prefer taking courses that use No information technology.
- ☐ I prefer taking courses that use Limited information technology.
- ☐ I prefer taking courses that use a Moderate level of information technology.
- ☐ I prefer taking courses that use information technology extensively.
- ☐ I prefer taking courses that use information technology Exclusively

Question 3 *

Do you have internet access off campus to send or receive assignments?

- ○ Yes
- ○ No

Question 4 *

Would you like your use of cloud computing for educational purposes to,,,,,,,, (cloud computing: a style of computing in which IT capabilities are delivered as a service using Internet technologies).

▼

Question 5 *

Please indicate how you agree or disagree with each of the following statements.

	1 Strongly Disagree	2	3 Neutral	4	5 Strongly Agree
My friends would describe me as "into" the latest technology	○	○	○	○	○
My friends think of me as a knowledgeable source of information for technology	○	○	○	○	○
I am enthusiastic about consumer electronics and IT.	○	○	○	○	○
I think trying to keep up with the changes in technology is a hassle	○	○	○	○	○

Question 6 *

Please indicate how you agree or disagree with each of the following statements about IT as it relates to your University Experience?

	1 Strongly Disagree	2	3 Neutral	4	5 Strongly Agree
Information Technology is an essential part of the University experience	○	○	○	○	○
Information for technology is instrumental in successful teaching	○	○	○	○	○
Cloud Computing could lower the cost of my university education	○	○	○	○	○
My university needs to use more Information Technology	○	○	○	○	○
My Instructors use Information Technology frequently enough	○	○	○	○	○

Question 7 *

Please describe in as much detail as you can which do you prefer and why - Laptop or Desktop Computer

Question 8 *

* Please describe in as much detail as you can how your University or Lecturers could use technology

better when it comes to providing you with the best possible learning experience. Please mention any additional technology that you think would be beneficial to your education, or ways to make current technology more effective.

Question 9 *

How old is your :

	Don't own	Less than one year old	One year old	Two years old	Three or more years old
Personal Computer	○	○	○	○	○
Personal full-sized laptop	○	○	○	○	○
Personal Lightweight netbook or tablet computer	○	○	○	○	○
Personal dedicated e-book reader	○	○	○	○	○
Personal Handheld device that you use to access the internet	○	○	○	○	○

Question 10 *

Please identify the High point of your IT experience at the School of Mechanical, Industrial and Aeronautical Engineering.