



Cape Peninsula
University of Technology

**FRAMEWORK TO ENHANCE ENGINEERING UNDERGRADUATES ENTREPRENEURIAL
EDUCATION TOWARDS SUSTAINABILITY OF EMPLOYMENT IN SOUTH AFRICA**

BY

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Construction: Construction Management**

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ABSTRACT

The study investigates the factors relevant to the enhancement of engineering undergraduates' entrepreneurial education aimed at sustainability of employment in South Africa. The research utilised a mixed methodological approach, as it involves the use of semi-structured qualitative interviews and closed-ended quantitative questionnaires, both of which were administered to engineering students (chemical engineering, civil engineering, construction management and quantity surveying, electrical, electronic and computer engineering, industrial and system engineering and mechanical engineering) in two selected universities in the Western Cape Province of South Africa. The quantitative data generated from the questionnaires was analysed using SPSS Version 25 software, while the 'content analysis' method was used to analyse the information generated through the qualitative interviews.

Based on the findings obtained in this study, various significant factors that can enhance entrepreneurial interest of undergraduate students are grouped: as perceptions, attitudes, knowledge, personality traits, education and training, entrepreneur's innovativeness, access to business information services, access to finance, technology, and government policy. However, lack of appropriate technical and life skills, among other factors, contributes to poor ability of graduates to establish their own businesses after graduation. Predictably, findings also indicate that innovativeness enhances entrepreneurship positively. There is a need for an emphasis on innovativeness in educational syllabi in HE schooling. Additionally, access to business information services is an area that requires more attention from the government, since higher education graduates in South Africa are often handicapped by a lack of adequate business support services and poor information technology infrastructure. Lack of access to credit is another common problem for graduates trying to start their own businesses.

In addition, findings revealed that the majority of students had significant entrepreneurial interest and attributes, wanting to start their own business within one year of graduation. The majority of respondents indicated that the course delivery should be practical and be learnt through business activities or application of practical cases instead of learning about business in a strictly theoretical fashion. Furthermore, to strengthen the delivery of the curriculum, it is recommended that the content, teaching approaches, assessment, etc., be better adjusted to the original interest of entrepreneurship education. A tracing system is recommended in order to follow students' progress over three successive years from their graduation.

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DEDICATION

This thesis is dedicated to Almighty God.

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ABBREVIATIONS

NGOs: Non-Governmental Organisations.

CPUT: Cape Peninsula University of Technology

UNESCO: United Nation Education, Scientific, Cultural and Organisations

HEI: Higher Education Institution

EE: Entrepreneurship Education

UES: Undergraduate Engineering Student

UoT: University of Technology

TU: Traditional University

GLOSSARY

- **Undergraduate Student:** An undergraduate student is a student engaged in study towards a graduate degree.
- **Entrepreneurship:** A way of creating value and opportunity, and the process of working on this opportunity. Innovation and risk-taking are common attributes of entrepreneurship (Schoof, 2006).
- **Unemployment:** A situation where a person of working age is willing to work but is unable to find a job but would like to be in full-time employment.
- **Engineering Education:** Engineering education is the activity of teaching and learning engineering and technology, at school, college and university levels. The goal of engineering education is to prepare people to practice engineering as a profession, to spread technological literacy, and to increase student interest in technical careers through science and math education and hands-on learning (SASEE, 2017).
- **Higher Education Institution:** Higher education is education, research guidance and training that takes place once at the postsecondary level.
- **Sustainable Employment:** For the purposes of this study, sustainable employment refers to the ability to create the means to meet your own financial needs without compromising the ability of future generations to meet their own needs.

ARTICLES FOR PUBLICATION

Ndukuba S., Simpeh E., and Fapohunda J., 2018. A conceptual framework for enhancing the adoption of e learning in engineering education

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1. INTRODUCTION TO CHAPTER ONE

Entrepreneurial education at all higher learning, including in the field of engineering and the built environment is paramount: to develop or enhance the students' interest, emotional cognitive and faculty on business. The benefit of this educational enhancement and learning stimuli is not limited to the students only, but added an extended value to the national economy through job creation that perpetuate the reduction of unemployment, (Tirronen & Nokkala, 2009). Categorically, entrepreneurial education fosters the pace of any growth of a country (Sukirno & Siengthai, 2011; Herrera *et al.*, 2018; Akhmetshin *et al.*, 2018; Zakaria *et al.*, 2011; Panshak *et al.*, 2019; Asheim 2019).

Entrepreneurship is considered as a planned mechanism or a motivating force for creativity, sustainable economic growth, innovation and job creation, as indicated by several authors, including João and Silva 2018; Reuber *et al.* 2018, Mahadi *et al.* 2018; Belz and Binder, 2017. Hansson (2010) affirms that entrepreneurial skills are vital to economic growth in all nations: both developed and developing countries. In addition, Dempsey (2009) notes that entrepreneurship promotes the growth of social development, economic competitiveness, and improvement, social welfare and reduction of crime (Mahadea and Kaseeram, 2018). Therefore, it is paramount to enhance a nation's manpower and wealth. There is also a cognitive need to encourage the interest in entrepreneurship at all levels of society, particularly among youth and young adults (Banerjee *et al.*, 2008; Gamede and Uleanya, 2018 and Shuaibu *et al.*, 2018). Thus, this research aims to assess the interest in entrepreneurship of undergraduate students, evaluate the required knowledge and skills that will provide drive to self-motivation for job creation and financial independence.

Adebola (2018) proposed the need for government and private institutions and the industries to collaborate and promote entrepreneurship education internships, funding, and encourage practical skills in all fields including engineering and the built environment. Noteworthy, entrepreneurship is the practice of beginning new organizations or revitalising mature organizations, particularly new businesses generally in response to identified opportunities (Parker, 2018; Russ 2015). Thus, entrepreneurship provides prospects for innovation and economic opportunity (Reynolds 2015). According to Gottschalk (2018) a vibrant entrepreneur is

a person who consistently creates and innovates to build something of value and increase opportunity. Hence, there is a need to ascertain the extent of entrepreneurship interest in undergraduate students and recommend the modalities that will boost the entrepreneurial curiosity of the engineering students towards becoming self-employed after graduation.

This section outlines the purpose of the study. It also highlights the background and the problem statement of the study. It discusses the aims and research objectives of the study, shows the key research questions, and outlines the significance and delimitations of the study. It also provides the outlines of other chapters and concludes with a brief summary.

1.2. BACKGROUND OF THE STUDY

Due to the growing pace of globalisation and inadequate role of governments in job creation and poverty alleviation in the present, promoting entrepreneurship has become the policy of nations hoping to sustain growth and create more jobs in the economy (Gabor, 2018; Naudé 2011). The 2014 G20 Leaders' Summit recognised *entrepreneurship* as a significant driver for job creation and economic growth. It proposed entrepreneurship-oriented policies in order to reduce youth unemployment (Bridge, 2017; Mason and Brown, 2014 and G20, 2014).

de Rhee and Joy (2012) point out that South Africa unemployment results from lack of experience, skills mismatch, lack of soft skills, discrimination by the employer and poor quality of education of graduates. Little research has been done in the area of undergraduates' interest in entrepreneurship in order to reduce unemployment. Unemployment is the main economic benchmark in every country in the world presently. An entrepreneurial interest on the part of undergraduate students could increase the employment rate and strengthen economy growths, South Africa.

Labour markets in various nations (including South Africa) are currently unable to accommodate the increasing number of skilled fresh graduates (ILO, 2007, as cited in Awogbenle and Iwuamadi, 2010). Studies reveal that one of the weaknesses in South Africa's education system is its failure to prepare undergraduates with adequate entrepreneurship skills for self-employment and innovative business practices, (Ndofirepi *et al.*, 2018; Ahmad *et al.*, 2018). In addition, lack of adequate entrepreneurship education for undergraduate engineering students (thereafter, UES) leads them to persist in the tradition of job seeking, rather than job creation (Agbimet *et al.*, 2013 and Bulama and Hime, 2008). Due to the inadequate curricula for entrepreneurship development in

higher institutions, UES are primarily engaged in looking for white-collar jobs. Nwambam *et al.* (2018) suggest that there is a need for collaboration from shareholders to provide resources to university graduates to encourage entrepreneurial skills.

In addition, entrepreneurship promotes entrepreneurial culture and self-employment, (Mejri, *et al.*, 2018; Crum and Chen, 2015). Sardesmukh and Smith-Nelson (2011) also add that there should be additional training on venture creation in different courses. Development of specific plans would enhance enterprise creation (Colette *et al.*, 2005), such as business incubators, competitions, business ideas, as well as encouragement and support for start-ups. Moreover, the engineering curriculum should focus on job creation. Entrepreneurship education should facilitate engineering graduates' ability to gain employment, and thrive in a job market characterised by instability and high retrenchment (Al Shobaki *et al.*, 2018). Hence, research is necessary to reveal the level of entrepreneurial interest among UES.

According to Israr and Saleem, (2018); Andersson and Formica (2018) and Shamsudin *et al.* (2018) many countries are currently facing an increase in unemployment, partly due to lack of an entrepreneurship mind-set on the part of students in university. Therefore, entrepreneurial skills and knowledge have the potential to reduce the unemployment rate (El Talla *et al.*, 2017; Mani, 2018). Abu Naser and Al Shobaki (2016) also mention that inadequate job opportunities cause a high rate of unemployment, mostly especially in competitive environments such as South Africa. Likewise, fresh graduates are unable to secure employment in either private or public sectors, due to the current unstable economic and competitive environment, and knowledge and entrepreneurial skills are seen as the major critical factor (Abu Naser and Al Shobaki 2016). Nurmaliza *et al.* (2018) assert that there is a high rate of unemployment locally and internationally. This illustrates the need for graduates to use entrepreneurial education acquired during university programmes to start their own businesses, rather than seeking for dwindling job opportunities. Additionally, there has been research conducted in South Africa on the role of entrepreneurship in sustainability of employment (Fatoki and Chindoga, 2011; Luiz and Mariotti, 2011; Du Toit and Muofhe, 2011) in which employment seems to be significantly low.

Malebana and Swanepoel (2015) point out that South Africa needs more entrepreneurial interest and research aimed at monitoring the development of interventions that could increase entrepreneurial activity in order to reduce unemployment in the country. Meanwhile, the rapid increase of unemployment is challenging economic growth, as this hinders infrastructural development in South Africa. The unemployment rate is a critical factor that needs attention,

especially in South Africa and developing countries (Abu Naser and Al Shobaki 2016; Fatoki and Chindoga, 2011). The unemployment rate in South Africa is increasing due to the lack of adequate infrastructural development, economic recession and high rate of population growth in the country (Ahmad *et al.*, 2018; Mahadea *et al.*, 2018; Belz and Binder, 2017; Gast *et al.*, 2017) and university graduates are unable to find employment in the fields in which they studied. Entrepreneurship education has been recommended by UNESCO, Non-Governmental Organisations (NGOs) and the government to encourage the youth and, at the same time, contribute to economic growth and social welfare.

Though entrepreneurship is often studied in business faculties, there is an increasing call for teaching entrepreneurship in other areas. For example, engineering has been recognised globally (Wasley, 2008). Therefore, there is a need to assess the present level of entrepreneurial interest on the part of UES in South Africa and recommend ways forward to enhance it (Reynolds *et al.*, 2000). Expanding education in entrepreneurship skills to the engineers, technologists, and scientists in order to boost their interest in it is recommended. Entrepreneurial education for scientists and engineers is a crucial attribute of successful university graduates (Belitski and Heron, 2017). In support of this, a survey conducted in the USA in 2010 revealed that 4 in 10 young people (ages 8–21) start their own businesses and 60% of these young people had always wanted to start their own businesses, which signifies that education played a major role in their entrepreneurial interests (Kauffman Foundation, 2010).

This study aims to investigate the predominant factors involved in enhancing the engineering undergraduates' entrepreneurial education in South Africa. The following section discusses the details of the research problem.

1.3. RESEARCH PROBLEM STATEMENT

Unemployment is considered to be one of the serious problems facing a huge number of individuals living in Sub-Saharan Africa. Unemployment issues among graduates in South Africa have been a major concern among policymakers and academicians (Bruton and Ketchen, 2013). South Africa combines a high unemployment rate with severe income inequality and a shortage of skills, all three of which pose a severe threat to economic stability. Research shows that these problems lead to crimes such as prostitution, youth restiveness, and drug abuse that could hinder economic growth, employment, development and progress (OECD, 2010). Therefore, this suggests that undergraduate interest in entrepreneurship is necessary for the nation's growth, progress, workforce and economic development. Meanwhile, in order to reduce the problem of

unemployment, university graduates are required to become self-employed. Though some of the fresh graduates do possess the knowledge and skills that required for starting up their own company, only a few choose to be self-employed immediately after graduating from the university. This can be attributed to a lack of encouragement, self-confidence or support. In other words, some of the graduates could well be potential entrepreneurs, but are unaware of the career options open to them (Advising Entrepreneurial Students).

It is paramount to note that entrepreneurship education in higher institutions could enhance the chances of undergraduates becoming entrepreneurs and help reduce unemployment in the country. Undergraduate interest in becoming self-employed motivated this researcher to investigate the predominant factors responsible for improving engineering undergraduates' entrepreneurial education, with the goal being sustainability of employment in South Africa. Entrepreneurship education is crucial, but has not been well established in the curriculum. This shows that there is a paucity of research concerning entrepreneurial activities in the engineering discipline in South African universities, which might be as a result of factors such as attitudes and ambitions. Nevertheless, establishing successful entrepreneurship in a country like South Africa might require a better understanding of undergraduate students' knowledge, attitudes, perceptions, and skills regarding entrepreneurship, which is significant to the study.

Lennox (2013) indicates that the major role of youth entrepreneurship is to achieve development goals and arrest unemployment and poverty rates. He argues that the growing lack of interest in participating in entrepreneurial activity on the part of university graduates is rapidly becoming a major socio-economic problem for the country (Lennox, 2013). Drawing from the view above, the study aims to determine whether undergraduate interest in becoming an entrepreneur would serve as a viable tool in promoting the economic and social well-being of the country and in reducing unemployment. A body of research has shown that many engineering students are unable to start a business on their own due to the lack of good entrepreneurial confidence, ability, and quality, which might be because colleges and universities only pay attention to the acquisition of professional knowledge and skills, rather than paying attention to entrepreneurship education. Therefore, the popularity of higher education and employment situation of graduates in the country presently is critical, showing the significance of university undergraduates' students gaining entrepreneurial skills for employment purposes. It is also vital to encourage the students to acquire entrepreneurial skills and ability while still in the university as undergraduates. However, most studies that have been conducted have shown that there is a shortage of research

on the integration of entrepreneurship education into engineering training programmes. Most of the focus has been on management and social science-based programme fields of study.

1.4. RESEARCH AIM AND OBJECTIVES

1.4.1. Aim

The aim of this study is to establish the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment in South Africa. To establish the research aims and obtain viable and reliable results, the following drawing for investigation as sub-objectives as:

1.4.2. Research objectives

1. To identify the extent of entrepreneurial interest of engineering students in South Africa
2. To identify the factors that could enhance the entrepreneurial interest of engineering students in South Africa
3. To ascertain the appropriate entrepreneurial teaching training methods that will enhance engineering student's knowledge concerning pursuing being self-employed in South Africa
4. To recommend the modalities that will facilitate the entrepreneurial interest of engineering students towards pursuing becoming self-employed after graduation.

1.5. RESEARCH QUESTIONS

What are the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment in South Africa? To solve the main question and obtain viable and reliable findings, the following were drawn for investigation as sub-questions.

1.6. SIGNIFICANCE OF THE STUDY

The findings of this study will contribute to future research in the area of entrepreneurship education. It will provide useful information for higher learning institutions in South Africa, to improve their entrepreneurship education curricula and practices. This study could help reduce unemployment in South Africa and globally by ensuring entrepreneurship is taught in all the disciplines in South Africa higher educational institutions. Similarly, the findings of this study will be useful for academia, researchers, non-governmental organisations, and policymakers to develop strategies that could be used to reduce unemployment in. Furthermore, the study will raise awareness in the general public about their roles in encouraging and supporting

undergraduate students' entrepreneurial interests' ad activities. Kolvereid (1996) states that family background affects an individual's interest in becoming an entrepreneur. Finally, this study will hopefully bring about reduction (if not eradication) of unemployment in South Africa and elsewhere, since it will proclaim the necessity of entrepreneurship education in H.E institutions.

1.6.1. Research sub-questions

1. What is the extent of the entrepreneurial interests of engineering students in South Africa?
2. What are the factors that enhance the entrepreneurial interest of engineering students in South Africa?
3. What are the appropriate teaching methods that will enhance engineering students' knowledge of being self-employed in South Africa?
4. What are the modalities that could motivate the entrepreneurial interest of engineering students in becoming self-employed?

Table1.1: Relationship between research questions, research objectives and research methods

Research objectives	Research questions	Research methods
To identify the extent of entrepreneurial interest of engineering undergraduate students in South Africa.	What is the extent of entrepreneurial interest of engineering undergraduate students in South Africa?	Review of relevant literature, interview and questionnaire underpinned by descriptive analysis.
To identify the factors that could facilitate the entrepreneurial interest of engineering students in South Africa.	What are the factors that facilitate the entrepreneurial interest of engineering students in South Africa?	Review of relevant literature, interview and questionnaire, underpinned by descriptive analysis.
To ascertain the appropriate teaching methods that will enhance engineering students' knowledge of being self-employed in South Africa	What are the appropriate teaching methods that will enhance engineering students' knowledge of being self-employed in South Africa?	Review of relevant literature, interview and questionnaire, underpinned by descriptive analysis.
To ascertain the modalities of enhancing the interest of engineering undergraduate	What are the modalities of motivating the entrepreneurial interest of engineering	Review of relevant literature, interview and questionnaire,

students in sustainable employment	undergraduate students concerning sustainable employment?	underpinned by descriptive analysis.
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Source: Researcher

1.7. RESEARCH METHODOLOGY

The research will adopt a mixed methods research approach for triangulation purposes, through the exploration of both qualitative and quantitative research surveys for data collection. Qualitative research uses an in-depth approach to investigate and understand the meaning of persons or groups relation to a social or human problem (Creswell, 2013). A quantitative method focuses on gathering numerical data and generalising it across groups of people (Sibanda, 2009). The semi-structured questionnaire will be developed and used to evaluate the status of undergraduate engineering students’ interest in entrepreneurship. A questionnaire survey with closed and open-ended questions will be developed to solicit participants’ opinions pertaining to the critical factors affecting engineering undergraduates’ interests in entrepreneurship and determine a possible way of sustaining self-employment after graduation from higher learning institutions.

1.7.1. Sampling techniques

According to Walliman (2015), a selected number of cases in a population are referred to as the sample. Fellows and Liu (2015) also state that, where the research study is concerned, it is crucial to obtain data from only a portion of the total population. Nevertheless, in the majority of research projects, a sample must be taken as a representation of the population (Opoku, *et al.*, 2016 and Fellows and Liu, 2013). The non-probability sampling technique was adopted for this research study. In non-probability sampling, there is no way of guaranteeing that each element of the population will be represented in the sample. Moreover, some groups of the population have little or no chance of being sampled (Leedy and Ormrod, 2010). However, Kothari (2001) argues that when using non-probability sampling, the specific units of the population that constitute the sample are purposively chosen, on the basis that the small sample selected will be representative of the whole population. In purposive sampling, people or other units are chosen, as the name implies for a particular purpose (Leedy and Ormrod, 2010). Therefore, a purposive sampling, which is a type of non-probability sampling, is a useful sampling approach consisting of receiving information from a sample of the population that one thinks knows most about the subject matter (Walliman, 2015). Respondents for the questionnaire and interview are representatives of the

population in the two universities offering Engineering programmes in South Africa, and the final year students' opinions were sampled for this study.

1.7.2. The source of data

The desktop review is used to generate secondary data from books, journals, conference proceedings, and publications. Kothari (2004) argues that secondary data is data which has already been collected by someone else and have passed through the statistical process. Naoum and Egbu, (2015) contends that the literature review involves reading and appraising what other people have written about your subject area. It can be both descriptive and analytical. It is descriptive when it illustrates the work of previous writers and it is analytical when it critically analyses the contribution of others, with a view to identifying similarities and contradictions from previous writers Naoum and Egbu, (2015).

1.7.3. Primary data

The primary data will be collected by means of a questionnaire survey and semi-structured interview, which will be directed to respondents including students, lectures in relation to entrepreneurship for sustainable employment to the youth in general. Primary data is new data generated for the research (Struwig and Stead, 2007). A questionnaire is an approach used in collecting data by administering questions to the respondents. This method of data collection requires researchers to ensure respondents properly understand the intention and relevance of the study, especially when using a quantitative approach (Kumar, 2011).

1.7.4. The treatment of the data

Data Analysis

Qualitative data, gathered by way of the semi-structured interview during the investigative research study, will be analysed using content analysis. Mouton (1996) refers to content analysis as studies which analyse the content of texts or documents such as letters, speeches, and annual reports. The analysis of the qualitative data will consist of transcribing and abstracting from the interview, (documentary reports) and open-ended questions all opinions that will be deemed to be relevant to the topic. Closed-ended questions constitute quantitative empirical data. Statistical Package for Social Scientists (SPSS) will be used to capture and compute relevant analyses of quantitative data. A quantitative analysis is the syntax of mathematical operations utilised to investigate the properties of the data (Walliman, 2015). Quantitative data will be analysed statistically, using both descriptive and inferential statistics. Descriptive statistics measure the central tendency (mode, median and mean) and the

dispersion (standard deviation). Inferential statistics will be used to validate the data collected through the t-test, the analysis of variance (ANOVA).

1.8. DELIMITATIONS OF THE STUDY

The delimitations of this study are as follows:

The study focuses on higher education undergraduates who are studying in South Africa. In addition, the research was conducted with some engineering undergraduate students and it looked at their interest concerning entrepreneurship in South Africa. Furthermore, the study was conducted in only two universities in the Western Cape Province of South Africa.

1.9. ETHICAL CONSIDERATIONS

All names of respondents (universities and students) remain anonymous on all research documents, with participant details protected. Each respondent was informed of the purpose of the study. Research respondents were not paid or compensated in any way whatsoever for participation. The research quality is assured by validating quantitative data with in-depth qualitative interviews.

1.10. CHAPTER OUTLINES

This study contains six chapters.

Chapter 1 – Introduction and background of the study

This is where the researcher presents an overview of the study and describes the research problem. It contains the introduction of the research; the background of the study, problem definition, objectives and significance of the research.

Chapter 2 – Literature Review

This chapter reviews relevant/significant literature consulted to guide this study. This includes a review of the literature, review of relevant theoretical models, proposed theoretical framework, and the development of hypotheses.

Chapter 3 – Research Methodology

This covers the general idea of the research: a research methodology. This chapter includes research design, data collection methods, sampling design, research instruments, as well as measurement construction, data processing, and data analysis.

Chapter 4 – Interpretation of Data analysis

This chapter presents the interpretation of analysis as well as revealing how the data was analysed using descriptive analysis, scale measurement, and inferential analyses.

Chapter 5 – Discussion of Findings

This chapter includes the discussion of the findings, discussions of major findings of the study

Chapter 6– Summary

This chapter includes the summary, conclusions, implications of the study, limitations of the study, and further research study

1.11. SUMMARY OF THE CHAPTER

This chapter presents a succinct background of the study and discusses the problem statement of the study. It also explains the aim and research objectives of the study, as well as the key research questions adopted to guide the study. Meanwhile, the overview of the research methodology employed to conduct the study is also presented, as well as the significance and delimitations of the study. In addition, the outlines of other chapters are presented.

CHAPTER TWO

LITERATURE REVIEW

2.1. CHAPTER TWO INTRODUCTION

This chapter presents the literature review and theoretical framework for the study. I start by reviewing literature related to the study by defining an entrepreneur, explaining the different arguments for and analyses of entrepreneurship education. I then review literature on an entrepreneurship education curriculum, discussing why it is important and its possible contents. The challenges of entrepreneur education were also discussed. This section ends with an analysis of the theoretical framework guiding the study.

2.2. CONCEPTUALISATION OF AN ENTREPRENEUR

2.2.1. What is an entrepreneur?

The term 'entrepreneur' is a French word that means self-employed. Studies have shown that there is no fixed definition for entrepreneurs; it's defined based on the field in which it's being applied. There is thus some controversy over who one could categorise as an entrepreneur (Tofan and Semizhon, 2017). For example: the economist describes an entrepreneur as the one who combines resources to make them valuable, while a psychologist refers an entrepreneur as someone who is being motivated by certain forces such as the need to obtain something, to try and to achieve the targeted goal. For the businessperson, an entrepreneur is seen as an aggressive competitor or a threat, a supporter, a customer, a source of supply, or someone who creates wealth for others as well as finds better ways to develop resources, reduce waste, and provide jobs to others (Hisrich, Peters & Shepherd, 2005). However, literature shows that entrepreneurs are born, not made. In contrast, the study undertaken by Barringer and Ireland (2010) reveal that entrepreneurs are made, rather than being the result of genes. This implies that everyone has the potential skills to become an entrepreneur, especially those who have gone through university (Gelard and Saleh, 2011; Ooi *et al.*, 2011). In addition, Gartner (1989) as well as Greene and Brush (2018) argue that becoming a successful entrepreneur will require systematic planning and business expertise in putting together a new venture team, developing a business model, raising money, managing finances, establishing partnerships, leading, and motivating employees. However, entrepreneurs have to be very careful to make the right decision in deciding on the right pathway for getting involved in a self-employed business.

2.2.2. Development of Entrepreneurial Interest through Entrepreneurship Education

Entrepreneurial interest is the willingness of a person to achieve an entrepreneurial behaviour, to be self-employed, or to establish the new business (Walter and Dhosa, 2010). A person can have the potential to become an entrepreneur, yet may not work toward becoming an entrepreneur unless they have such interest (Mohammad Ismail *et al.*, 2009). According to Datta (2018); Greene and Brush (2018) and Barringer and Ireland (2010) individuals who has a business mind-set that involves innovation and leadership could develop entrepreneurial interest. For instance, an entrepreneur takes an idea, assumes the risk for its success, develops business around it, and manages the business (Tipu, 2017; Giardino *et al.*, 2014). Therefore, Birds (1988) claims that *entrepreneurial interest* is an individual state of mind which aims at creating a new venture, creating new value within existing firms or developing a new business concept. This suggests that entrepreneurial interest is a significant factor in assisting the establishment of new ventures and has a crucial influence on business survival, growth and venture success. Birds (1988) further notes that intentional practice often begins based on an entrepreneur's personal needs, wants, values, beliefs, and habits. Bird points out that entrepreneurial interest is the best predictor of individual behaviours, particularly when the behaviour is uncommon, hard to detect or engage unpredictable time.

Entrepreneurship is a way of turning ideas into a business and making a living (Barringer and Ireland, 2010). Walter and Dhosa, (2010) define entrepreneurship education as the process through which individuals acquire a set of skills that brings social and economic benefits to individuals and the community at large. Entrepreneurship education can equip students with skills to maximise investment opportunities and maximise returns from those investments. According to Beeka and Rimmington (2011); Mwasalwiba (2010) and Wasley, (2008) entrepreneurship education should be included in the entrepreneurial interest model. The reason is that entrepreneurship education and training programmes bring about changes in the individual attitudes towards entrepreneurship, at the self-efficacy stage. In addition, entrepreneurship training will and positively change or reinforce their perceptions regarding entrepreneurship, thus enhance their entrepreneurial interest (Kolvereid and Isaksen, 2006; Dell, 2008; Tam, 2009).

Krueger (2007) highlights that people do not start a business as a reflex; they do it on purpose rather than engage in it unintentionally. Krueger (2007) further claims that the interest one has serves as a mediating factor between entrepreneurial action and potential exogenous influence (traits, demographics, skills, social, cultural and financial support). He suggests that entrepreneurial intention helps in describing why certain individuals tend to start their own

business before looking for opportunities or deciding on the type of business to engage in. Moreover, entrepreneurs should benefit from a better understanding of the factors that motivate individuals to pursue an entrepreneurial career and how the venture becomes a reality (Krueger, 2007).

2.2.3. Attitudes of engineering students towards becoming entrepreneurs

Ajzen (1991) defines attitude toward behaviour as the level to which an individual has a positive or negative appraisal of the behaviour. Li (2007) points out that attitudes towards entrepreneurialism are based on how attractive the prospect of self-employment seems. Tam (2009); Byabashaija and Katono (2011) mention that an entrepreneurship educational background has an influence on the degree of entrepreneurial attitude and entrepreneurial interest. This implies that entrepreneurial education in higher educational institutions could assist in boosting self-confidence and promoting the self-efficacy of students to become future entrepreneurs.

Dell (2008) posits that desire to be an entrepreneur is the measure of one's attitude toward entrepreneurship. He further argues that this attitude could be established and strengthened through information from prior experience and role models. Thus, external information (accessibility of resources) and internal (ones' perception of their capability and task-specific knowledge) could be efficacious in helping entrepreneurial self-efficacy and strengthening student attitudes toward entrepreneurship (Zhang, Wang, and Owen, 2015).

Walter and Dohse (2009) with Paço *et al.* (2015) explained that attitudes to entrepreneurialism have a direct and positive effect on entrepreneurial interest. Hence, education and training should centre on changing personal attitudes, rather than providing technical knowledge regarding business, because the effects could be more important to the process of business creation and overcoming the perceived barriers to entrepreneurship (Paco *et al.*, 2015; Walter and Dohse, 2009). A study conducted by Scholten *et al.* (2004), which examined attitudes towards entrepreneurial behaviour, found a very strong impact of attitude on interest. Hence attitude is a deterministic variable for interest; with every variation in attitude directly leading to a variation to the same extent for entrepreneurial interest. A study by Leong (2008), found that it was evident that the more students value the entrepreneurial profession course, the stronger their interest in becoming an entrepreneur. This implies that training and skills development programmes are significant in fostering personal capabilities and intention among students.

2.3. KNOWLEDGE OF ENGINEERING STUDENTS REGARDING THEIR INTEREST IN BECOMING ENTREPRENEURS

Entrepreneurship Knowledge (thereafter, EK) is considered an aspect of human capital required for entrepreneurial success, initiatives, and economic sustainability (Widding, 2005). EK is seen as an analytic understanding of the multi-functional and multi-faceted process of entrepreneurship. It broadly refers to 'know what' content-level of knowledge about entrepreneurship (thereafter, UES) (Johannisson, 1991). This knowledge signifies a UES's potential capability to recognise opportunities and pursue them. Similarly, this knowledge helps UESs potential to able to comprehend, interpret, extrapolate, and apply new information in new ways – activities which are at the core of entrepreneurship.

Similarly, entrepreneurial knowledge is considered as an individual's appreciation of the concepts, mentality, and skills of an entrepreneur (Jack and Anderson, 1999). Massad and Tucker (2009) point out that this knowledge can be developed and acquired by constant exposure to entrepreneurship activities, and that entrepreneurial knowledge is connected with the development of entrepreneurial understanding. Moreover, Turker (2009) ascertains two distinct kinds of entrepreneurial knowledge that complement each other when formulating new venture creation processes. On the one hand, the knowledge required to identify entrepreneurial opportunities during and after graduating, which includes the discovery and evaluation of new venture prospects (Turker, 2009). On the other hand, the second kind of knowledge involves effectively exploiting the recognised opportunity (Turker, 2009). Therefore, the entrepreneur develops a practical business model, which comprises of the formation and development of a lucrative business around the new venture opportunity. An effective entrepreneur is expected to possess both these kinds of knowledge.

2.3.1. Perceived behavioural control of engineering students regarding their interest in becoming entrepreneurs

Perceived behavioural control is considered as the attribute indicating how people perceive the ease or difficulty of carrying out a particular action (Naong, 2019; Ford and Gross 2019; Kgagara, 2011). A related concept is intention, which, according to Liñán *et al.* (2005) is a function of perceived self-efficacy. One's perceived ability to do something obviously affects one's attitude towards it. Thus, self-efficacy and perceived behavioural control are interchangeable, given that the concept of perceived behavioural control is closely related to self-efficacy (Pihie and Bagheri, 2013).

Zaidatol *et al.* (2009) point out that undergraduate students who receive entrepreneurial experience achieve higher scores in examinations and have a higher degree of perceived behavioural control. Therefore, the more the undergraduate students are exposed to entrepreneurial skills, the greater their perceived behavioural control. Zaidatol *et al.* further argue that those who pursue entrepreneurship training in universities or colleges will perform better in entrepreneurship courses. Wood and Bandura (1989) also suggest that university training motivates students' self-efficacy, because entrepreneurship education could increase the knowledge and skills; and the students' self-efficacy will increase as a result of increasing their entrepreneurial interest. In a similar vein, Basu and Virick (2008) argue that entrepreneurship education has a positive effect on perceived behavioural control. Thus, students who have prior experience in entrepreneurship education while studying in higher education institutions (hereafter HEI) possess the confidence and this leads to increased entrepreneurial interest.

Several authors (Basu and Virick, 2008); Pihie and Bagheri, 2013); Ruhle *et al.* 2010; Paco *et al.* 2011) claim that perceived behavioural control has a positive influence on students' entrepreneurial intentions. For instance, Basu and Virick (2008) with Ruhle *et al.* (2010) argue that perceived behavioural control has an important relationship with intention. Ruhle *et al.* (2010) further reveal that self-assessment of perceived behavioural control has a great influence on a student's interest, as there is an encouraging range of perceived feasibility that can enhance entrepreneurial interests. In addition, Basu and Virick (2008) affirm that prior experience of starting a business is significantly connected to the level of self-efficacy and positive attitude towards entrepreneurship. An individual with experience of being successful will have higher self-efficacy and more confidence in their capability to repeat that behaviour, as compared to those who do not have previous experience. On the other hand, Elfving *et al.* (2009) and Paco, *et al.* (2011) point out that self-efficacy has an insignificant direct effect on entrepreneurial interest. Elfving *et al.* (2009) add that when people have high self-efficacy, this would accelerate their commitment to entrepreneurship and lead to greater motivation to start their own business. Therefore, the more the individual believes that it is good to be a successful entrepreneur with a high possibility of succeeding; the stronger the entrepreneurial interest.

2.4. PERSONALITY TRAITS

Personality traits are indicated as predictors of many aspects of entrepreneurship (Schneider and Albornoz, 2018; Obschonka and Fisch, 2018; Porcar and Soriano, 2018; Mei *et al.*, 2017 Shaver and Scott, 1991). According to the school of thought known as trait theory, personality traits refer to the enduring psychological characteristics of successful entrepreneurs, and consist of five

identified variables, namely: extraversion, agreeableness, neuroticism, openness, and conscientiousness. These five groups are presented in the diagram below.

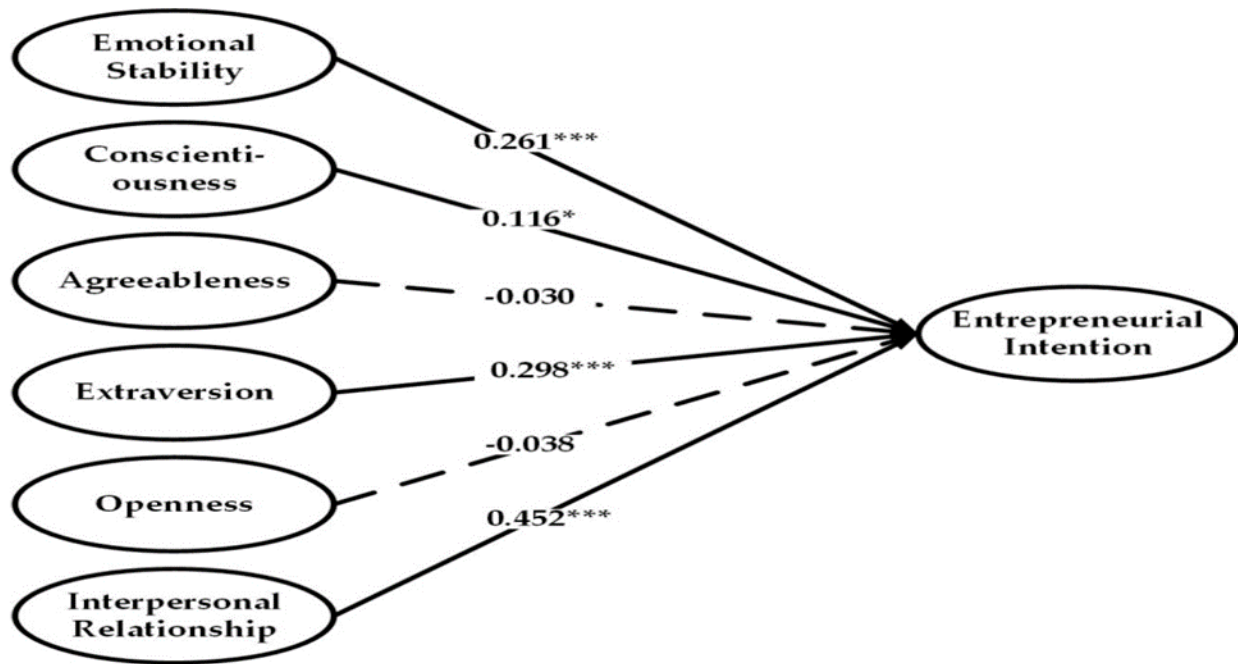


Figure 2: 1 Entrepreneurial Intentions (Source: Mei *et al.*, 2017)

2.4.1. Extraversion

Extraversion is the degree to which some individual exhibits tendencies to be sociable, lively, talkative, and active, open to experience, adventurous, imaginative, creative, and excitable (Peetsma and Van 2011; Ciavarella *et al.*, 2004; Llewellyn and Wilson, 2003; Moon *et al.*, 2008; Yong, 2007). Extraversion enhances the proactive personality required in fuelling the instinct and driving the charismatic vision of the social entrepreneur (Crant, 1996). However, extraversion reveals a tendency to like people, to desire being in large groups, and desire excitement and encouragement (Digman, 1990). Social entrepreneurs predictably possess extraversion characteristics, as they have to be eager and able to communicate well with countless stakeholders. Extraversion creates a positively perceived locus of control as they are determined to accomplish their risk-taking propensity and need for achievement (McCarthy, 2003). In addition, an empirical study revealed that extraversion characteristics which comprises of reward sensitivity, sociability, and positive emotions were found to offset one another (Ciavarella *et al.*,

2004; Moon *et al.*, 2008; Zhao and Seibert, 2006). Therefore, this study will examine the overall effect of extraversion on citizenship behaviour and entrepreneurship.

2.4.2. Agreeableness

The term 'agreeable' refers to people who are cooperative, altruistic, and trustworthy (Digman, 1990). Agreeableness could also be seen as the extent to which an individual is good-natured, trusting, helpful, and cooperative (Llewellyn and Wilson, 2003; Yong, 2007). Individuals with this characteristic are considerate, empathetic, friendly, and generous, as well as have a positive view of human nature (Caliendo and Kritikos, 2008). The trusting and co-operative environments typically promoted by agreeable individuals lead to strong alliances, good rapport, and freer exchange of technology and capital necessary for growth (Ciavarella *et al.*, 2004). Nevertheless, Ciavarella *et al.* (2004) note that individuals who are more likely to compromise in the name of gaining the acceptance of others, and are also less likely to take risks, and therefore may reject opportunities to innovate. They are likely to believe that most persons are decent, honest, and trustworthy in nature.

2.4.3. Neuroticism

Neuroticism is the level of emotional stability of an individual (Mei *et al.*, 2017; Digman 1990). Thus, emotional stability refers to the extent in which an individual seems to be calm and secure (Yong, 2007; Llewellyn and Wilson, 2003). Individuals who score high on neuroticism typically experience things such as anxiety, hostility, anger, guilt, and depressed mood (Zhao and Seibert, 2006; Digman, 1990). Neurotic persons are easily frustrated (Swinton, 2010). However, entrepreneurs who are frequently challenged by the diversity of complex situations connecting management of scarce resources in tandem with pressures of enlightening legitimacy in the face of pressures from stakeholders need to exhibit a high degree of optimism and emotional intelligence (Fricke *et al.*, 2017 and Parsons *et al.*, 2017). Ideal entrepreneurs will therefore exhibit a low degree of neuroticism.

2.4.4. Openness

Openness refers to being inquisitive about new and challenging materials and to be imaginative (Digman 1990; Abu Elanain, 2008). Individuals that exhibit openness could be creative thinkers, who are independent, have the desire to involve and understand the world and engage in diverse activities (Peetsma and Van der Veen 2011; Yong, 2007; Llewellyn and Wilson, 2003). This implies that open-minded people might appear to be impulsive, overly inquisitive and will easily become bored. As such, they are often misunderstood by others for their individualistic nature.

Entrepreneurs have greater openness compared to administrative personnel, due to their need to be creative in the utilisation of scarce resources (Nordvik and Brovold, 1998). Openness has been found to positively influence citizenship behaviour (Abu Elanain, 2008). Although, openness is a long-term sustainable business venture (Ciavarella *et al.*, 2004). Ciavarella *et al.* point out that openness could support the emotional, artistic, adventurous, creative thinker, and is correlated with imagination, ideas, curiosity, and seeking a variety of experiences, being independent, and disliking routine tasks.

2.4.5. Conscientiousness

Conscientiousness refers to an individual's meticulousness, conformance with procedures and the desire to upholding high standards of performance (Llewellyn and Wilson, 2003; Yong, 2007). Conscientious individuals are motivated by a strong sense of industriousness, responsibility and need for achievement that promotes their dependability at work (Ciavarella *et al.*, 2004). Need for achievement has been found to have a positive connection to the competitive advantage of business (Ong and Ismail, 2008). Conscientiousness has been positively linked to the long-term survival of a business venture (Ciavarella *et al.*, 2004). Conscientious students are characterised by a precise manner of working which strongly improves performance during assessment. Conscientiousness students are considered as focused, reliable, organised, determined and ambitious (Digman, 1990). Consequently, a person who is high in conscientiousness will make efforts to be organised, careful, responsible, and is able to persevere at a tedious task for a longer period than people with without this trait.

2.5. THE ENTREPRENEURSHIP CURRICULUM

According to Dugassa (2012), the aim of entrepreneurship education curricula is to develop and motivate potential entrepreneurs (students) to become real entrepreneurs. According to Urban (2006), this type of education is concerned more with facilitating entrepreneurship and less with studying theories. Farrington, Neethling, and Venter (2012) recommend that games, learning experiences, role models and any other influential variables should be incorporated and integrated into the curriculum. Meanwhile, Holden and Nabi (2008); Ndedi (2009) and Farrington, Neethling, and Venter (2012) stipulate that a good entrepreneurship education curriculum is made up of four phases:

- **The training stage:** This involves teaching/lecturing the entrepreneurship education courses or contents and remains the easiest part of entrepreneurship education.

Accordingly, this phase complements the early stage by providing the practical skills that entrepreneurs require when they are ready to set up their business.

- **The education phase:** This is the consolidation and designation of the contents of the programme, including awareness of the education.
- **The intention stage:** This is the stage where personal skills, attributes, and behaviour are developed or capacitated through education.
- **The actual career stage:** this is the final stage and entails the behaviour of starting a business venture (Rae, 2000; Rae and Carswell, 2000).

Castillo *et al.* (2012) allude that a well-designed entrepreneurship education curriculum examines the value of embedding the education within the existing course provision (pathways of students graduating into self-employment). Thus, the curriculum should be designed in such a way as to attain appropriate and achievable objectives, to cater for future content development and value attributes (Urban, 2006). According to Ndedi, (2009) such curriculum design calls for text and programmes to be structured to allow for the introduction of the entrepreneurship concept and the provision of hands-on experience and working models for students to develop skills. In addition, Castillo *et al.* (2012) further posits that a quality entrepreneurship education curriculum focuses on specific factors that potentially influence students' readiness for start-up activities. Ndedi, (2009) and Panagiotis, (2012) point out that entrepreneurship education curriculum design taught across the globe is made up of the following sub-topics or contents: entrepreneurship and small business management; entrepreneurship and enterprise development; innovation and creativity; opportunity recognition and business planning; entrepreneurship and new venture creation; small business consulting and small business financing. The next section discusses the relevance of entrepreneurship curricula for self-employment.

2.5.1. The importance of entrepreneurship curricula for self-employment

Entrepreneurship education is considered as an educational programme that provides students with entrepreneurial skills, competencies, and knowledge about pursuing an entrepreneurial career (Ekpoh and Edet, 2011; Ooi *et al.*, 2011). Entrepreneurship education is an effective means of inspiring student interest with regard to an entrepreneurial career, engaging entrepreneurial actions and increasing venturing rate of learners (Matlay, 2008; Izedonmi and Okafor, 2010; Ooi *et al.*, 2011). Matlay (2008) contends that graduates who acquire entrepreneurship skills in higher education institutions may be considered as entrepreneurs. However, several studies have suggested that entrepreneurship education is a limiting factor in demonstrating both the entrepreneurial interest of university students and their self-assessed

entrepreneurial skills (Oosterbeek *et al.*, 2010; Göksel and Aydintan, 2011; Graevenitz, *et al.*, 2010 and Hill, 2011). These unexpected outcomes may occur because students, having achieved a more realistic idea of the challenges and barriers to progress that entrepreneurs may face, may find their enthusiasm for an entrepreneurial career receding (Oosterbeek *et al.*, 2008).

Consequently, entrepreneurial behaviour is generally considered as capital, ideas, and resources, along with the use of creativity and empowerment (Borasi and Finnigan, 2010; Yemini, 2018). In addition, entrepreneurial knowledge and creative thinking shows a strong relationship with entrepreneurial behaviour, Borasi and Finnigan, (2010) with Yemini, (2018) argue that these attributes facilitate the relationship between entrepreneurial behaviour and educational level. These results indicate that the relationship between education and entrepreneurship is complex and more research is necessary to obtain a deeper understanding. Tung (2011) posits that in order to become an entrepreneur who is capable of tackling economic and social challenges, the individual must possess entrepreneurial attributes such as innovation, risk-taking, creativity, self-confidence, management skills, problem-solving skills, readiness for change and professional business skills. This suggests that it is important for the entrepreneurship curriculum to equip the student to overcome such risk in starting up business. Therefore, entrepreneurship is an area that is based on continuous changes and social interactions and therefore social orientation and market awareness, as they are two important aspects an entrepreneur should master, and should also be included when designing the entrepreneurship curriculum, in order to enhance student entrepreneurial interest (Kao, 1993).

2.5.2. The essentials of entrepreneurship teaching method/curricula for self-employment

Due to the current economic dilemma facing many countries across the globe, the idea of engendering better entrepreneurial behaviour has become a goal for many governments. It becomes urgent for the country to rethink educational delivery and produce graduates who can become independent and self-sustaining. Hence, entrepreneurship education has been introduced as a compulsory course in business faculties in tertiary institutions. Entrepreneurship education is a carefully-planned programme of instruction which is geared towards enhancing students to acquire entrepreneurial skills and competencies that will be used in establishing, managing and sustaining business ventures. Osuala (2004) adds that entrepreneurship education is a programme of training that provides valuable skills needed by graduates to avoid the trial and error real-world learning that frequently results in business failures. Inegbenebor (2006) concurs with Osuala (2004) and asserts that entrepreneurship education is all about learning the skills necessary to safely confront the risks inherent to establishing a business.

This suggests that entrepreneurship education should be an education that equips students with the skill to seek investment opportunities and respond to them by establishing a business venture. It should focus on developing knowledge and ability to develop skills; entrepreneurial behaviour, and attributes in a widely different context (Sousa, 2018; Holdsworth, 2018; Wilbanks 2015). Entrepreneurship education is an avenue for finding knowledge, acquiring human and social skills through a soundly packaged and appropriate course content, conducted through a series of achievable objectives and developed with a suitable methodology that enhances the teaching and learning process (Kwong & Thompson, 2016; Din *et al.*, 2016 and Fulgence, 2015). In addition, Olaniyi (2016) also postulates that entrepreneurship education is employed to encourage and train graduates of secondary schools and higher institutions to take up self-employment. This implies that students achieve greatly when basic skills are acquired to enable them to become independent and have confidence in their ability to become economically self-reliance. Thus, Deen (2018) in his study revealed that there is growing evidence that entrepreneurship education has the ability to motivate students for self-employment, productivity, and economic growth through the establishment of small and medium business.

2.5.3. Entrepreneurship education as a compulsory subject

The greatest problem in teaching is either to teach a consistent subject matter or meeting students' needs (Darling-Hammond, 2012). In EE, consistent subject matter highlights scientific thoughts, theory and knowledge acquisition, while undergraduates focus highlights on entrepreneurial methods, practical, action value and creation (Wing, 2019). The consistent subject matter is easy to measure, predictable, meets the “requirements” of HEIs technique and denotes passive learning (like any other courses) while the students’ needs are difficult to measure, unpredictable, costly, do not conform to institutional procedures and require active learning (Lazear,2004). Although challenging, the main aim of EE in engineering is to achieve an integrated blend of both approaches (Cincera,2018).

Gedeon(2014) and Vallier *et al.* (2014) state that in designing an entrepreneurship programme, it is important to have a proper definition of the programme's objective. Lacking a good understanding of what something is, it will be difficult to teach and assess the effectiveness of the course. In general, EE is aimed at highlighting what entrepreneurship could be, maximising the potential for motivating entrepreneurial insight and attributes and finally equip students with the will to take appropriate action. However, within the current literature of EE, there is a strong emphasis upon teaching (Cincera, 2018; Neck and Greene, 2011; Ferriani, 2009 and idler, 2008). This can be seen in the remarks, arguments, and feedback about the specific teaching methods,

especially the traditional approach that has failed to nurture students to become an entrepreneur. Olsen and Mykletun (2012) strongly argue that there ought to be a strong emphasis on teaching “for” as opposed to ‘about’ in EE.

Classrooms should be a world of ideas for students to learn theories that would teach them what they ought to do to succeed in life (Fiet, 2001). However, as the “attrition” rate in the course increases, it is possible to conduct learning sessions in smaller groups, which would focus on the interactive aspects of education. Students at this phase are often inspired by more dynamic methods of teaching, such as simulation and business games, lectures from entrepreneurs, interviews with high-growth entrepreneurs, group and team techniques for creating new business ideas, and practical case studies (Ahmad, 2015).

2.5.4. The need for effective implementation of an entrepreneurship curriculum in engineering

The approaches for teaching entrepreneurship differ extensively (Porter, 1994). These differences are because of the assumptions about what EE ‘is about’ (Olsen and Mykletun, 2012). Hence, before any discussion about the effectiveness or the suitability of a teaching technique is carried out, there is a need to resolve the conceptual misunderstanding of the different explanations concerning entrepreneurship. The links and distinctions of definition can cause a problem if not clearly defined, especially as entrepreneurship and elements of it, such as innovation, are closely related with governmental policy and business strategy in many countries (Olsen and Mykletun, 2012), including South Africa. The problem with this definition of EE is that it places the entrepreneur narrowly into an economic and business environment (Cheng *et al.*, 2009).

Recent research by Brizek, and Khan (2008) claims that in hospitality academia “entrepreneurship is considered generally in terms of individuals who started new ventures.” Therefore, Bosma and Levie (2010) propose that “intrapreneurship”, or the creation of innovation within an organisation, is a significant factor for the development of companies, especially those in the engineering industries (Morrison *et al.*, 2010). Henceforth, based on the differences in the definition of what entrepreneurship is, it would be wrong to argue that a particular teaching method is effective or ineffective compared to other methods when not all the programmes share similar definitions or objectives. Pardo (2013) reiterates the same argument, stating that before making any appraisal about the effectiveness of entrepreneurship education, one needs to understand the teaching goals of entrepreneurship educators and why they pursue those goals. Furthermore, it would be

flawed to accept that all EE objectives are equip students to initiate new business ventures. In addition, some educators still oppose the idea of students venturing into business while they are still pursuing their studies (Fayolle and Gailly, 2008). Despite this “analysis”, little is known about the expected outcomes and intentions of entrepreneurship instructors (Pardo 2013).

Although previous work in entrepreneurship education has pointed out the existence of a variety of teaching goals in entrepreneurship courses (Bechard and Toulouse, 1998), most articles on the topic only describe what educators did, without further consideration of the needs behind the teaching activities (Rae, 2003; Rae and Carswell, 2000; Hisrich, Peters and Shepherd, 2005). Hytti and O’Gorman (2004) state that depending on the objectives of EE, there are various ways to offer entrepreneurship education. If the objective of the education is to increase the understanding of what entrepreneurship is about, then the most effective way to accomplish the objective is to provide information through public channels such as media, seminars, or lectures. These techniques are effective in terms of sending the significant information to a broader population in a relatively short period if it used in a way that encourages involvement from the audience (Read and Kleiner 1996). If the objective is to equip individuals with entrepreneurial skills, which are directly relevant to work, the best way is to provide education and training that supports individuals to involve themselves directly in the entrepreneurial process, such as industrial training. It is vital to note that lecturers or trainers play a crucial role in determining the effectiveness of the presentation or training (Read and Kleiner 1996). Finally, if the objective of education is to prepare individuals to act as entrepreneurs, the most effective technique is to facilitate experiments by trying entrepreneurship in a controlled environment, for example through business recreation or role-playing where students are encouraged to use their creativity (Deale, 2016) and experience the elements of real situation (Read and Kleiner 1996).

2.6. MOTIVATIONAL FACTORS

The characteristics and motivational aspects of entrepreneurs have received much attention in research (Kao, 1995; Koh, 1996; Kuratko and Hogetts 2007; Liang and Dunn 2007; Shane *et al.*, 2003; Zhuplev, *et al.*, 1998). Most entrepreneurs believe in injecting personal core values into their business practices. Motivation is significant for UES to go into business in order to be self-employed. Understanding what is driving UES to start businesses is a significant component of assessing them and their business readiness.

Understanding their own motivations, as well as ‘drivers’ to start up a business, will boost the individual in making better decision about starting a business and can also help him/her to know

if this is the right time to start a business, during and after study. UES motivations are grouped into intrinsic and extrinsic motivations. To be motivated is to have a reason for actions of some kind. Therefore, a person that has a high level of desire to bring about a state of affairs or even is considered motivated while a person that has 'no drive or inspiration to act is thus considered as unmotivated' (Ryan & Deci, 2000). Intrinsic motivation means the desire for somebody to do something because he/she enjoys doing it, while extrinsic motivation reflects the desire to do something due to external rewards such as money and awards. Hence a person who is intrinsically motivated will enjoy the process of starting a business more than an individual who is extrinsically motivated (Simola, 2011).

Similarly, Moy *et al.* (2001) claim that the motivation for students to start up new ventures relies on general motivators such as extrinsic rewards, independence/autonomy, intrinsic rewards, family security, and change management, as well as other factors that may have made the individual select for entrepreneurship as their future career. Kuratko and Hodgetts (2007) concur with Moy *et al.* (2001) and claim that the goals of entrepreneurs are the sustenance of their business development. A study by Zhuplev, *et al.* (1998) which focused on how Russian and American business owners start up their own businesses, shows essentially identical motivators of the business owners to launch new ventures (security, material wealth and self-accomplishment).

2.7. CHALLENGES OF SUSTAINING A NEW VENTURE ON THE PART OF UES

Motivational factors involved in starting up and sustaining a business have been considered, but the challenge is the operational and maintenance factors, particularly for new businesses. A considerable body of research has identified and explained challenges experienced by entrepreneurs when starting up their new business (Young & Welsch, 1993). According to Young and Welsch (1993) any new entrepreneur is likely to face obstacles during the early stage of establishing their new business. Therefore, this suggests that UES should be prepared in an environment where those challenges are discussed and analysed with an open mind. Young and Welsch (1993) point out the various challenges that UES could experience while starting a new business: lack of information on various aspects of business, lack of financial assistance, high rate of inflation and excessive taxation. In addition, Kozan *et al.* (2006) point out that lack of financing hindered technological development and resource aggregation in most small business owners in Turkey, and this state of affairs is likely to hold true wherever small business owners face similar challenges.

Similarly, Moy *et al.* (2001) found that exogenous and endogenous factors are major obstacles that challenge entrepreneurs when starting and sustaining new ventures. They further argue that high interest rates, high labour costs, and strict government regulation are exogenous factors, while lack of technical knowledge, lack of managerial experience, and excessive risk are endogenous factors. Zhuplev *et al.* (1998) also revealed that government regulations, high taxes and a dearth of start-up capital were the main problems for both UES and countries business owners. In contrast, Fleming's (1996) study of students' attitudes towards business ownership identified that the problem experienced by students where entrepreneurship was concerned were lack of finance and lack of experience, both of which hinder the path towards university students' desired future career choice.

2.8. GOVERNMENT SUPPORT OF ENTREPRENEURSHIP EDUCATION

A broad knowledge regarding interest in entrepreneurship would lead to starting up businesses and enhance entrepreneurial interest for new entrepreneurs, while simultaneously improving the effectiveness of the policies designed to strengthen the entrepreneurial activity (Reynolds *et al.*, 2004). Hazudin *et al.* (2015) postulate that entrepreneurship policy and programme design must be planned to allow for different gender perceptions regarding entrepreneurship. This is because undergraduate businesses are like a solo-owned business in partnership with government aides (Reynolds *et al.*, 2004). Being a solo-owned business requires a major effort concerning acceptance of risk, financial resources, time and energy.

On the other hand, family and friends are essential supportive factors, as they can play major roles. For example, these figures can benefit the would-be entrepreneur by being role models with regard to entrepreneurship skills, playing a financial sponsor role, sharing their knowledge or working for free while the business is being developed (Hoffmann *et al.*, 2015; Lindquist *et al.*, 2015; Nicolaou and Shane, 2010). In view of the close relationship between students and universities, these have been assuming a critical supportive role in the form of financial support, through scholarships or allowances, by providing business facilities free of charge with initiatives such as network spaces par excellence or company incubators (Edwards and Muir, 2005). This will motivate the entrepreneurial interest of the students to start up their business and create job and economic growth in the country.

2.9. THEORETICAL FRAMEWORK

2.9.1. The theory of Personal Behaviour (TPB)

The theory is a social-psychological theory that explains behaviour such as decision-making. The theory of personal behaviour (TPB) explains behavioural decision-making processes of human beings by aiming at understanding and predicting the behaviour of individuals, assuming that the successful completion of human behaviours is mainly controlled by individual will. According to Ajzen (1991) the behavioural intention of individuals is determined by two factors: attitudes and the subjective norm, in which the subjective norm is influenced by normative beliefs in society and attitudes can be divided into positive or negative aspects. Ajzen (1985) is of the view that human behaviour is mostly affected by external factors and objective circumstance, rather than completely controlled by individual will.

Although the original purpose of TPB is to explain how individuals plan their behaviour to achieve specific goals, most studies have focused on how to predict individual behaviour through tracking the influence of various elements in order to achieve specific objectives. Such studies are widely seen in the areas of health communication, marketing, management, clinical medicine and so on. The challenge with the TPB theory is that it largely ignores factors such as threats, fear and positive or negative feelings (Dutta-Bergman, (2005). Armitage *et al.* (1999) assert that mood could affect attitude, subjective norms, perceived behaviour control and intention to a considerable extent. When the individual is in a negative emotional state, the attitude is more likely closely related to intention, while when the person is in a positive emotional state, the subjective norm is more likely closely related to the intention (Armitage *et al.*, 1999). The diagram below in Figure 2 presents the theory of personal behaviour

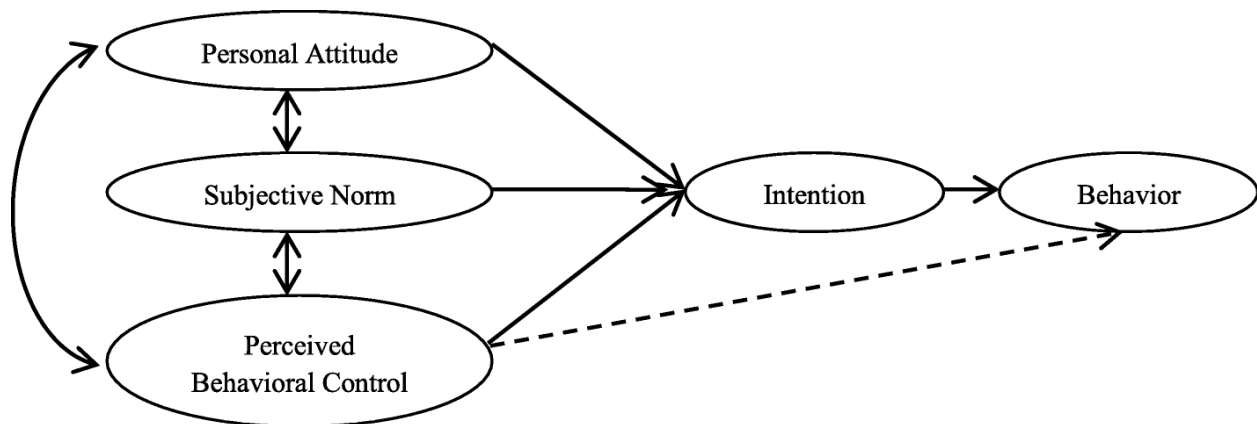


Figure 2:2 Theory of planned behaviour (TPB) (Source: Ajzen, 1991)

2.10. CHAPTER SUMMARY

This chapter reviewed the literature related to the study by defining an entrepreneur, explaining the different levels of entrepreneurial interest regarding entrepreneurship education. It then reviewed the importance of the literature on entrepreneurship education curriculum, discussing why it is important and its contents. The challenges of entrepreneur education were also discussed. In addition, the chapter also covered the theoretical framework of the theory of planned behaviour, which was adopted to frame the study. Therefore, the next chapter discusses the research methodology employed to conduct the study.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1. INTRODUCTION

The previous chapter provided a review of the scholarly literature and the theoretical framework adopted to guide the study. This chapter presents the most significant tool for any body of research, which is the data collection. Research methodology describes the various research methods available and that are in use for any body of research. Data acquired through such study depends on the arrangement process and techniques of research.

There are two primary ways of conducting research, namely experimental and library (Fink, 2019). Experimental research is the use of questionnaires and case studies and library research makes use of written materials like books, journals and all other pertinent literature existing. In addition, the research design for this study adopted exploratory research. The researcher focused on investigating and examining factors influencing undergraduate students' entrepreneurial interest, the level of their entrepreneurial interest and ascertaining undergraduate students' awareness towards entrepreneurship. The researcher gathered data systematically to gain more in-depth understanding about the entrepreneurial interest of the undergraduates.

3.2. RESEARCH PHILOSOPHIES

Social science research involves testing of hypotheses by providing data which either supports or disproves the hypothesis (Neuman, 2002). The research philosophy adopted determines the development and nature of a particular body of knowledge, as the philosophical position of research guides and justifies the researcher's beliefs and theoretical decisions (Greene, 2006). The main pillars of social science research are positivism or realism; and interpretivism (Biggam, 2015).

3.2.1. Positivism/Realist

Positivism is the terminology used to illustrate the quantitative characteristics of research, as positivist research is characterised by the ability of the researcher to test hypotheses derived from existing theories, through observations and measurements of social realities (Biggam, 2015). Positivist research is a paradigm that is based on scientific knowledge or experimental tests (Neuman, 2002). He further explains positivism as a research pattern or framework that involves a deductive approach, with an accurate measurement of qualitative data that allows for finding and confirmation of causal laws to permit the prediction of human behaviour. However, Struwig

et al. (2001) emphasise that not all characteristic of quantitative research could be said to be positivist. Henn *et al.* (2009) defines the characteristics of the positivist research philosophy as researchers using the scientific method, emphasising control, objectivity and standardisation; seeking to recognise processes of causes and effect of phenomena, and to test theories.

Positivist knowledge is based on what can be tested by observation of tangible evidence.

In addition, positivist research would always be influenced by human participation and observation, even though it attempts to minimise those influences, due to the necessity of acquiring quantifiable research data. The adoption of the quantitative approach inherently requires experiments, questionnaires, interviews and statistical analysis, which is dependent on the participant responses, so human participation and thus influence of human characteristics is unavoidable (Biggam, 2015). According to Eriksson and Kovalainen (2015) and Saunders *et al.* (2018) positivist research is the knowledge derived based on results obtained from the application of scientific methods to test observations and hypothesis, as the research aims at examining critical influencing factors and proffering solutions.

3.2.2. Interpretivism and Constructionism

Eriksson and Kovalainen (2015) state that research philosophies aim at interpreting and understanding the theoretical content of data by adopting social science principles. Moreover, the authors posit that the philosophical background of interpretivist research is mainly an interpretive or explanatory phenomenology to give subjective meanings to an objective phenomenon; therefore, interpretivism is the adoption of unstructured qualitative approach in data collection such as detailed interviews with the participants. Similarly, Henn, Weinstein and Foard (2009) further state that the major focus of an interpretivist researcher is to understand, interpret and provide meaning to social realities for the research.

Kumar (2011) points out the main four assumptions of the interpretivism philosophy of research: subjective knowledge and social processes and actions are relative; the knowledge acquired is sustained by qualitative methods and social relationship with participants; interpretivist philosophy exhibits a critical position on, and examination of, forgotten, hidden or undiscovered knowledge (objective information); languages used for interpreting data are derived from social interaction with the participants at a particular location and period.

The primary idea of the interpretivist research pattern is to work with subjective meaning by acknowledging its existence, understanding the meaning incorporated as building block for

theorising, and reconstructing the meaning while avoiding distortion (Goldkuhl, 2012). This research study combines the positivist and interpretivist approaches, as seen in the research methodology section.

3.3. RESEARCH METHODOLOGY

Hall (1996) claims that the philosophy and the general rules for conducting research are expressed as 'research methodology'. The research methodology is a comprehensive macro framework that offers principles of reasoning associated with model assumptions that validate different schools of research (O'Leary, 2013). Therefore, research methodology is holistic process of acquiring; analysing and interpreting data with the intention of reaching a conclusion that broadens the knowledge of a study (Leedy and Ormrod, 2010). Leedy and Ormrod delineate the primary functions of research methodology as follows:

- To set a standard for data collection; and
- To gather the data collected in proper sequence and interpret them.

Research is recurring in life, entailing a couple of conditional and coherent steps in providing a comprehensive solution to the research questions (Collis & Hussey, 2013). The most important concern of researchers is to design a methodology that could solve research problems. Biggam (2015) highlights the relationship between the research methodologies, data collection methods and techniques of data analysis:

- What data to be collected (concept of research);
- Why data should be collected (significance of research);
- From whom to collect data (target population);
- When data will be gathered; and
- How data will be analysed.

The common principles used in research methodology, even though not exhaustive, are illustrated in this section, whereas the exact method adopted for this research is provided in the research method section of the study.

3.3.1. Quantitative research method

Pietersen and Maree, (2007) affirm that quantitative research is a systematic method of using numerical data from a selected sample group of a population to generalise the findings to the study population. Kothari (2004) posits that the measurement of quantities, numbers and amounts is fundamentally quantitative research; therefore, the quantitative research method adopts the

use of statistical analysis with results presented numerically. Similarly, Thomas (2003) opines that the qualitative research method allows researchers to obtain generalisable and foreseeable results from a large population within a short time and at minimum cost, as the research method allows for major indicators of credibility such as validity, reliability, generalisability, and reproducibility. O'Leary (2013) points out that the qualitative research method is considered an objective positivist undertaking, with large scale, but little depth. Additionally, Maree and Pietersen (2007) claim that the quantitative research method is characterised by three major elements:

- objectivity;
- numerical results;
- generality

The quantitative research method is a goal-oriented process of research that affirms intersubjective realities as a standard for quality assurance (Thomas, 2003); thus, collection of quantitative data frequently involves the use of a closed-ended questionnaire or checklist, as this provides respondents with understandable questions and answers based on research objectives (Creswell and Clark, 2007; Dahlberg, 2010). Leedy and Ormrod (2010) points out the methods for conducting quantitative research are:

- descriptive research;
- theoretical studies;
- correlational studies;
- developmental studies (case studies and surveys)

To construct questions in quantitative research, Flick (2011) stresses the following concerns:

- the actual questions to be posed;
- the researcher's understanding of formulating questions;
- the kind of questions to be posed;

Dahlberg and McCaig(2010) affirm that the following fundamental points should be noted by a quantitative researcher:

- what to ask;
- what the answer is;
- whom to ask;
- why to ask;

- how to ask.

Flick (2011) and Kumar (2011) point out the advantages and disadvantages of quantitative research, summarised below.

3.3.1.1. Advantages of quantitative research method

- The quantitative approach possesses clarity and distinction between design and method of data collection.
- The quantitative approach allows the study of a large number of cases for certain aspects in a relatively short time.
- The design of quantitative research is specific, well-structured and clearly defined and recognised.
- The results obtained have a high degree of generalisation.

3.3.1.2. Disadvantages of quantitative research method

- The respondents may interpret questions differently from each other.
- The distance between the researcher and the study population is relatively wide.
- The aspects of research studied are not inevitably the relevant aspects of the participants.

3.3.2. Qualitative research method

Qualitative research is a broad approach of research that includes a number of methods, philosophies and techniques requiring both deductive and inductive logic, accepting subjectivity, embracing multiple perspectives of realities, and recognising the effect of such on the participants and researchers (Leedy and Ormrod, 2005). O'Leary (2013) describe the qualitative research method as generally characterised by small numbers and in-depth cases. The qualitative research method includes the adoption and collection of various empirical data, including interviews, observations, historical studies and life stories (Creswell *et al.*, 2007). Furthermore, qualitative research is a holistic method of eliciting in-depth descriptive data regarding a certain phenomenon with the aim of improving knowledge (O'Leary, 2013). Similarly, Flick (2011) affirms that the qualitative research method is mostly concerned with acquiring a deep understanding of the social, cultural and behavioural blueprint of people in a particular environment by interacting with the participants of the study. Silverman (2016) states a common belief that the research approach gives a more in-depth understanding of phenomena than the quantitative methodological approach.

A qualitative research methodology shows the relationship between ranges of research patterns including epistemology, ontology, nomothetic approaches, positivism and ethnography (Nieuwenhuis, 2007). Nonetheless, Butler-Kisber (2010) argues that, despite the advantages of the qualitative research method, researchers are still facing research challenges such as:

- Transparency;
- Validity of results (trustworthiness);
- Reflexivity of researcher;
- Voice interpretation (interpretation of participants' voices for authenticity and ethical purposes);
- Generality of results (vague and indefinite results);
- Access and consent (participants' endorsement);

The advantages and disadvantages of the qualitative approach to research, as revealed by Flick (2011) and Kumar (2011) are stated as:

3.3.2.1 Advantages of the qualitative research method

The strength of qualitative research is the ability to study phenomena in-depth.

As the qualitative research method allows for detailed and exact analysis of a few cases, participants have more freedom to determine issues that are relevant in the context.

3.3.2.2 Disadvantages of qualitative research method

The analysis of qualitative data consumes more time, with generated results not broadly generalisable.

The design of qualitative research projects is less specific, lacking in consistent structural depth.

3.3.3. Mixed method research

This research method is the adoption of philosophical hypotheses in the collection and analysis of both quantitative and qualitative data in a single research work (Creswell and Clark, 2007); and the implementation of both quantitative and qualitative research approaches provides a better understanding of the research focus (Creswell and Clark, 2007). A combination of research methods increases the researcher's chance of realising valid research results, in the sense that one method overrides the mistakes of the other method, thus reducing factors such as personal bias. Creswell and Clark (2007) reveal that mixed method research enhances the integration of practical and theoretical viewpoints that challenge the quantitative and qualitative methods

independently. Therefore, the researcher chooses to adopt a mixed methodological approach in the interest of combining quantitative and qualitative research practically, with the focus of compensating the paradigmatic inadequacies in the different two approaches (Flick, 2011). Creswell and Clark (2007) point out the importance of integrating both qualitative and quantitative research methods, arguing that:

- Mixed method research gives the researcher an extensive view of the study.
- Mixed method research encourages the researcher to utilise various paradigms associated with qualitative and quantitative research methods.
- Mixed method research provides answers to questions that the qualitative or quantitative approach cannot answer unassisted.

Likewise, O'Leary (2013) states that the strategies of mixed method research are mostly designed in the following ways:

- **Using a question-driven perspective:** The researchers neither select this approach for qualitative or quantitative interest areas; rather, researchers choose this approach because it favours the adoption of an examination of research questions and best answers the questions, irrespective of the research concept.
- **Using a qualitative perspective with acceptance of quantitative data:** Researchers who implement this methodological approach presume quality rather than quantity, and thus subscribe more to the underlying hypothesis of the qualitative conduct.
- **Using a quantitative perspective with acceptance of qualitative data:** Researchers who use this method understand more of the underlying assumptions of the quantitative method, but accept that qualitative data might be helpful to validate the study.

Contrarily, Creswell *et al.* (2007) assert that researchers are faced with several challenges, in spite of the advantages of mixed method research:

- Mixed method research requires multidisciplinary, specialised teamwork for data interpretation.
- The process of collecting and analysing multiple data is time- and resource-consuming.
- Mixed method research requires an intricate data collection process.

3.4. RESEARCH APPROACH

3.4.1. Deductive approach

Walliman (2011) claims that the deductive approach to research was initially masterminded by the ancient Greeks, and then modified by Aristotle through the use of deductive syllogism. The author further suggests that the deductive approach to research comprises logical arguments and valid reasoning that commence with general statements, with the intent of attaining a particular conclusion. Dahlberg and McCaig (2010) point out that the deductive research approach involves the process of generating assumptions from a broad statement to reach a precise, explicit and clearly defined conclusion (a 'top-down' research approach). Further, Bryman (2015) posits that results from a deductive research approach are achieved by testing assumptions resulting from experiment and observation rather than theory; thus, the principles of the deductive approach can be adapted to qualitative research.

3.4.2. Inductive approach

The inductive research approach involves starting with a specific observation or survey and deriving general conclusions as results afterwards (Walliman, 2011) and it is mostly used in scientific research. The approach is a 'bottom up' research approach that contributes to comprehension of reality first and ultimately produces a theory (Mouton, 1996). The inductive research approach, as compared to the deductive approach, provides a particular character to a general known truth about a theory, so the validity of the results is dependent on the strength of supporting evidences. For example, the stronger the supporting evidence, the more likely the conclusions established are valid (Mouton, 1996). Nevertheless, Walliman (2011) argues that an inductive result can only be considered as valid if it meets these conditions of the inductive research approach:

- observed empirical data obtained corresponding with the general results;
- a large population size for observation or survey;
- an observation or survey coordinated and repeated under different conditions.

3.4.3. Inductive/deductive approach

The inductive/deductive research approach is a mix of observational reasoning and logical argument in research, relating to the process of developing and testing hypotheses to form a basis for strong additional knowledge. It is primarily scientifically-based (Walliman 2011). Significantly, the knowledge obtained after being tested can either be accepted or rejected, based on the aim of the research study, as the combination of the deductive and inductive research

approaches indicates the process of seeking valid result statements from the opposing schools of thought (Mouton, 1996).

In scientific research, researchers are required to start the research process with an inductive exploratory study to generate assumptions that will be tested using the deductive exploratory approach to reach a valid conclusion, thereby adopting the principles of both the qualitative and quantitative methodology for research (Henn *et al.*, 2006).

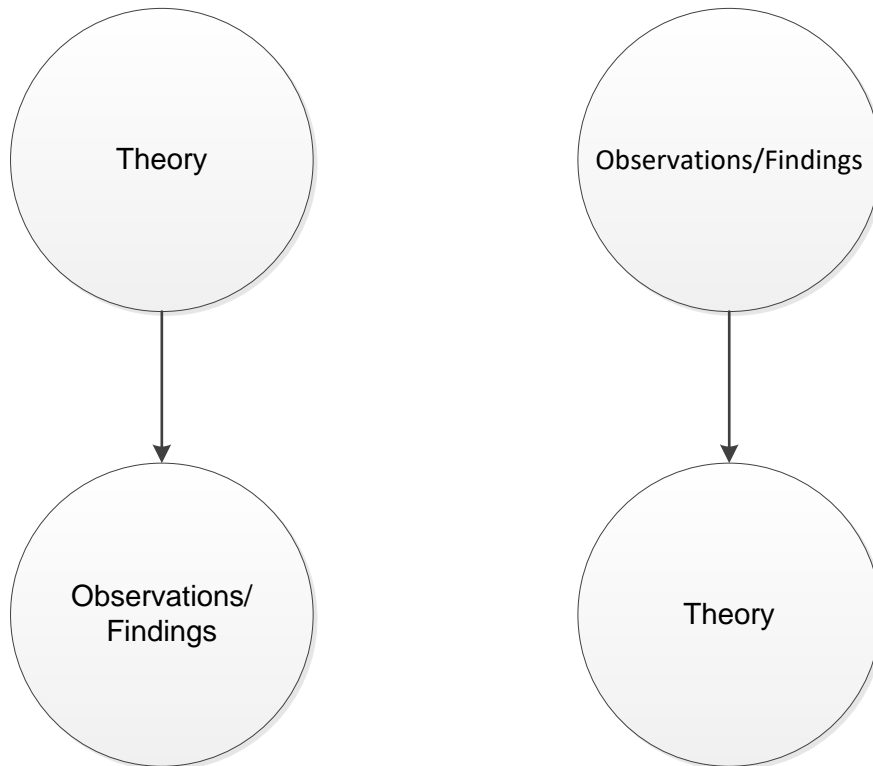


Figure 3: 1 Deductive and Inductive research approaches (Source: Bryman, 2015)

3.5. RESEARCH STRATEGIES

Leedy and Ormrod (2010) as well as Walliman (2011), reveal quite a number of research strategies for the adoption of qualitative, quantitative and mixed method research. These research strategies comprise structured interviews, case studies, historical research, phenomenological study, experimental studies, action research and theoretical research studies (Biggam, 2015; Bryman, 2015; Creswell, 2013; Leedy and Ormrod, 2010 and Walliman, 2011)

3.5.1. Survey research

Survey research is a systematic process requiring the selection of respondent samples by the researchers before the survey tools are administered (questionnaires or conducted interviews) for data collection, based on values, beliefs and views (Pietersen and Maree 2007). Likewise, O’Leary (2013) defines survey research as “the process of data collection by asking a selected number of individuals the same questions based on their characteristics, attitude, and ways of living or opinion through a questionnaire administration”. Survey research is undertaken purposely to provide the researcher with statistical information on particular subjects/challenges that require testing the robustness of an existing theory (Henn *et al.*, 2009). The volume of information derived from survey participants is vital in determining the validity and reliability of the study (Dahlberg & McCaig, 2010).

Cohen, Manion and Morrison (2013) and Henn *et al.* (2009) expressly state that the basic aim of survey research is to “explore, understand and interpret a phenomenon that exists presently”. A survey researcher chooses the kind of population that best suits an investigation of the research topic, formulates a research instrument and devises a means of administering the instrument (Bryman, 2015). Dahlberg and McCaig (2010) reveal that the generalisation of research results in any study is dependent on the response rate of the research population; consequently, effective survey research is characterised by Pietersen (2007) as possessing:

- large sample size;
- numerous variables measured to generate related hypothesis for testing;
- generalisable results.

3.5.1.1 Cross-sectional studies

This involves the use of observation of a cross-section of a population or phenomenon that exists at a particular time (Babbie, 2015). Exploratory and descriptive studies are often cross-sectional in nature for the purpose of achieving variation in respect to organisations, people or event population (Pietersen and Maree, 2007). Bryman (2015) argues that data obtained through a cross-sectional study may be validated by pre-testing, allowing for intervention and post-testing after days, weeks, months or years, to derive the desirable variation in the study.

3.5.1.2 Longitudinal studies

Longitudinal studies are concerned with the observation of the same sample or phenomenon over an extended timeframe (Babbie, 2015). A notable quality of longitudinal studies is that the observer is involved for a specific period of time; thus, changes and relationships can be observed

(Bryman, 2015). Most importantly, it is suitable for collecting data to derive factual information on a continuous basis (Walliman, 2011).

3.5.2. Experimental designs

O' Leary (2013) points out that experimental design requires researchers to purposely vary an independent variable (major determinant of the research) in examining the impact on the dependent variable (the main object of study inquiry). The designs comprise goal-directed acts performed upon study groups for the purpose of analysing the impact of one on the other (Flick, 2011). Experimental design involves at least two experimental groups. Kumar (2011) details challenges inherent in the experimental design:

- matching increase in difficulty when carried out on more than one variable;
- variables that are hard to measure, such as opinion or attitude, posing a challenge;
- choosing a variable to serve as the basis of matching is sometimes challenging.

3.6. HISTORICAL RESEARCH

Leedy and Ormrod (2010) define historical research as an attempt carried out by a researcher to interpret historic events through the collection and analysis of applicable historic documents or oral histories. Historical research is a systematic holistic process of explaining, analysing and interpreting past situations based on information derived from a selected population (Pietersen and Maree, 2007). Likewise, Walliman (2011) describes historical research as a systematic and objective process of locating, evaluating and integrating research findings to reach a factual conclusion derived from historic events. Walliman (2011) states the importance of historic research as follows:

- It helps provide solutions to contemporary problems that occurred in the past.
- It stresses the relevancies and defects of interfaces in the culture of a selected population (asking 'why' and 'how' things happened).
- It provides an opportunity for the reappraisal of past collated data supporting theories, hypotheses or generalised conclusions to give further insight to present and future trends.

In addition, historical research requires the researcher to give critical, analytical scrutiny to minutes, reports or documents about events (Nieuwenhuis, 2007). Nieuwenhuis further lists four types of historic research that are useful in general surveys:

- Recollection (including oral histories and autobiographies).
- The primary source (archived documents or other original sources).

- Running records (documents or archives maintained by organisations).
- The secondary source (works of other scholars on the focus of the study).

3.7. ACTION RESEARCH

Leedy and Ormrod (2010) state that action research is an applied research form that is aimed at finding solutions to the original problems of a specific group of people by using communal resources. McNiff and Whitebread (2011) explain action research as “a form of analysis conducted by professional practitioners to evaluate and improve the existing work performed by resolving issues involving their job”. The basic aim of an action researcher as a mediator is to assist in planning and realising effective solutions to problems suffered by participants; hence, action research is guided by the desire to take an action to enhance a practice or resolve an issue (Nieuwenhuis, 2007).

Dahlberg and McCaig (2010) posit that the main purpose of action research is to enable changes and to learn from experience. However, in order to successfully conduct action research; it is necessary that the researcher acquire the ability to understand and interpret the problems faced and to proffer possible solutions (Kumar and Phrommathed, 2005). Ebersöhn, Eloff and Ferreira (2007) detail the characteristics of action research as:

- Action research seeks to derive solutions to practical problems.
- It is aimed at effecting a change.
- It is an interactive strategy for knowledge development.
- It is a cyclical research process of planning, solution implementing and reasoning.
- It requires the participation of the research sample and the researcher.

3.8. COMPARATIVE RESEARCH

This is a systematic process of searching for the similarities and differences between events, over a specific period of time (Nieuwenhuis, 2007). Comparative research is the process of defining research concepts, itemising the concepts as operational variables and generating the hypothetical relationships between the variables before carrying out a test on hypotheses (Yanow, 2014). Most significantly, it is necessary for a comparative researcher to compare the experiences of different people, from different backgrounds, based on situations at a particular time (Nieuwenhuis, 2007). Nieuwenhuis (2007) argues that comparative research proffers first-hand accounts of events that are usually reported by the observers. Nieuwenhuis explains that the content of information derived from comparative research is valid, provided there is no forgery or overstated facts.

3.9. CASE STUDY RESEARCH

Case study research involves subjecting a unit of investigation to analysis at different levels by individuals within a group of people, community, organisations or phenomenon (Hennet *et al.*, 2006). Case study research can involve the study of a single case, comparative studies (multiple cases) or respective studies, using historical sources, documentation and interviews (Flick, 2011). Barbour (2001) argues that the adoption of a single case study is significantly profitable because of the possibility to closely examine the case that is being studied. Similarly, Bryman (2015) posits that qualitative research may be comparatively suitable for a case study, due to the characteristics of qualitative research to provide an in-depth study.

Walliman (2011) opines that both quantitative and qualitative research methods may be adopted for case study research.

3.10. RESEARCH DESIGN

This refers to the plan or strategy for conducting a body of research (Henn *et al.*, 2006). The design of research involves explaining the processes to plan for data collection and analysis, and to select empirical material (situation, cases and individuals) in order to provide answers to research questions given the time and resources available (Flick, 2011). Silverman, (2016) argues that, rather than adopting the most attractive research design, research design should involve careful consideration of the appropriate research methods capable of providing answers to research questions in a valid, objective, accurate and economical way. Henn *et al.* (2006) states three good qualities of research design as follows:

- The research design should be adequately structured.
- The method should be sufficiently reliable.
- The research design should aim to generate large scale, statistically-based studies.

Similarly, Kumar (2011) contends that competent research design provides adequate answers to the following questions:

- How will a selected sample be contacted?
- What method of data collection will be used, and why?
- Will a sample or the whole population be selected?
- How will the study population be identified?
- Who will constitute the study population?
- In the case of questionnaires, where will the responses be returned?

- How should respondents contact the researcher in case of queries?
- Where will interviews be conducted?
- How will ethical issues be addressed?

3.11. RESEARCH DESIGN FOR THIS STUDY

The researcher adopted a mixed method research approach for triangulation purposes, through exploration of both qualitative and quantitative research surveys for data collection. Qualitative research uses an approach to investigate and understand the meaning persons or groups attribute to a social or human problem (Leedy and Ormrod, 2010; Creswell, 2013). A quantitative method, on the other hand, focuses on gathering numerical data and generalising it across groups of persons (Sibanda, 2009). A semi-structured questionnaire was developed and used to evaluate the status of undergraduate engineering students' interest regarding entrepreneurship. A questionnaire survey with closed and open-ended questions was developed to solicit participants' opinions pertaining to the critical factors affecting undergraduate engineering students' entrepreneurial interest and determine possible ways of sustaining self-employment after graduation from higher institutions.

The quantitative method was used to collect data from undergraduate students in the Faculties of Engineering in the selected institutions in the Western Cape to identify the extent of the entrepreneurial interest shown by engineering undergraduate students and to examine the appropriate entrepreneurial curricula that will consolidate higher education engineering undergraduate students' knowledge towards being interested on job creation. The qualitative method was adopted to evaluate the modality of motivating the entrepreneurial interest of engineering undergraduate students, with an eye towards pointing them in the direction of sustainable employment. The research data were obtained with the aid of a structured questionnaire survey (quantitative method) that was validated by conducting semi-structured interviews (qualitative method) shortly after the questionnaire survey. The researcher purposely adopted the quantitative method with the intent of attaining reliable and generalisable conclusions.

3.11.1. Exploratory study

An exploratory study is a necessary aspect of a research questionnaire design for gaining more insight into the research problem and to proffer solutions (Dahlberg and McCaig, 2010). The questionnaire was the main data collection instrument used for the exploratory study. The research instrument (questionnaire) was pre-tested amongst research undergraduate students and lecturers in the department of Construction Management and Quantity Surveying and Civil

Engineering, at the Cape Peninsula University of Technology, to certify the relevance of the chosen research instrument. Neuman (2002) explained that the distribution of pre-test or pilot study questionnaires will improve the reliability of research work.

The exploratory study was undertaken to elicit the perceptions of undergraduates concerning the significance of the research subject to the entrepreneurship skills in South Africa. The input regarding entrepreneurship skills through the questionnaires administered and interviews conducted resulted in required adjustments being made in the formulation of the main questionnaire to better achieve the purpose of the research. The process of questionnaire adjustment involved rephrasing research questions, removal of inappropriate questions, addition of relevant questions and overall restructuring of the research questionnaire. The pilot study undertaken supported the researcher in justifying the significance of the research subject, the relevance of variables contained in the research questionnaire, and better familiarised the researcher with interview procedures.

Adler and Clark (2007) suggest that undertaking practice interviews enables interviewer preparation for the actual experience of developing conversation generators. The questionnaires reclaimed from the sample population from the exploratory study were analysed using Statistical Package for the Social Sciences (SPSS) Software 25.

3.11.2. Population and sample size

O'Leary (2013) defines population as the total unit of a particular class or group from which a sample is drawn. Bryman (2015) explained that population is a collection of people, items or animals considered for a study, as the term population does not necessarily refer to a group of people being considered for the study, but varies depending on the nature and field of study. The population of this study is comprised of engineering undergraduate students in universities in the Western Cape of South Africa. Taking the large population size into consideration, a sampling technique was used to select respondents for the study. Flick (2011) maintains that the sample of any population in research is a minimised illustration of the population. Nevertheless, for the purpose of result validity and generalisation in qualitative research, it is believed that the bigger the sample size, the higher the possibility of achieving the aim of the research (O'Leary, 2013).

The engineering institutions who constitute the research sample, as previously mentioned, directly or indirectly contribute to the factors that influence the selection of an appropriate entrepreneurial interest. Therefore, the study sample is unarguably a suitable representation of university undergraduate students in South Africa.

3.11.3. Sampling technique

O'Leary (2013) defines the process of selecting elements of a population to be included in research as sampling. Pietersen (2007) contends that sampling is the process of making random selection from a population to derive a generalised finding from the entire population. When conducting sampling the sampling design, sample size and sample frame are crucial factors (Leedy and Ormrod, 2010). Leedy and Ormrod add that a sample frame is a set of people likely to be selected based on the sampling technique adopted.

To consider the complex nature of the university management, ethics clearance and geographical distribution, and the fact that the target population has a very busy schedule; engineering universities in Cape Town were selected by the adoption of “simple random sampling and convenience sampling techniques”. Biggam (2015) and Pietersen (2007) maintain that a simple random sample is a subset of individuals (a sample) chosen from a larger set (a population) for data collection and result generalisation. They further explain that a simple random sample is an unbiased surveying technique. As mentioned above, taking into account the accessibility of engineering universities and availability of engineering undergraduate students as a result of their busy schedule, the questionnaires were administered by hand to engineering undergraduates in Cape Town. The simple random sampling technique was adopted in this phase of questionnaire administration for easy generalisation of findings.

Subsequently, university lecturers in engineering departments were interviewed to validate the data obtained from the questionnaires. The university engineering lecturers were selected for interviews using the convenience sampling technique. The interviews were conducted with the aim of determining higher education engineering undergraduates' level of level of entrepreneurial interest, with an eye towards sustainability of employment in South Africa. Biggam (2015) defined convenience sampling as a technique in exploratory research used to derive ideas and insights based on information that is conveniently available to the researcher. Convenience sampling, as the name implies, is a quick and inexpensive method in research to validate data obtained in the course of the study (Pietersen and Maree, 2007).

3.11.4. Data collection techniques

Data collection techniques involve the process of exploring a range of data sources to gather information for a research study (Struwig *et al.*, 2001). The selection of data collection techniques implemented for a study is directly dependent on the sample frame, nature of the sample, research topic and the facilities available for data collection (Leedy and Ormrod, 2010). The data collected in a research study consist of both secondary and primary data (Struwig *et al.*, 2001). A triangulation data collection technique was adopted for this research (i.e. questionnaires, interviews and a literature review). Thomas (2003) argues that the process of triangulation views a research problem from different perspectives by using a mixture of data collection methods, rather than just one. Literature reviews, questionnaires and interviews were used to obtain data for this study as subsets of secondary and primary data collection.

3.11.5. Secondary data collection

Secondary data are data available and obtained from research conducted by other researchers (Struwig *et al.*, 2001). Therefore; both quantitative and qualitative research adopts secondary sources as a method of data collection (Dahlberg and McCaig, 2010). The secondary data collection for this study was obtained through the review of previous and present literature. Kumar (2011) points out that a review of literature serves to improve and consolidate the researcher's knowledge base and supports in integrating the findings with the existing body of knowledge. Dahlberg and McCaig (2010) state that the review of literature enables a researcher to explore the depth of evidence that has been gathered in a research area and reveals areas that are under-researched. O'Leary (2013) notes that for new knowledge to be created, it is important to consult previous innovations. The sources of data for the review of literature included textbooks, journals, articles, conference proceedings, dissertations and theses.

3.11.6. Primary data collection

Primary data are new data generated for a research project (Struwig *et al.*, 2001). Primary data are the most valid data obtained in research (Leedy and Ormrod, 2010). The collection of primary data entails eliciting data directly from a survey sample by a researcher; thus, it is significant that researchers structure questions in a clear and understandable format to obtain appropriate data from study respondents (Kumar and Phrommathed, 2005). The primary data collected for this study was obtained through administration of quantitative closed-ended questionnaires to survey respondents, as well as semi-structured qualitative interviews. The questionnaires were administered to respondents via hand delivery and Survey Monkey and retrieved through the

same media, while the interviews were conducted face-to-face with university engineering undergraduate students and lecturers.

3.11.7. The questionnaire

Questionnaires are tools used for data collection containing questions and statements designed to elicit information from study respondents (Adler and Clark, 2007). Research questions may be observed from different viewpoints, but should address a pertinent issue (Flick, 2011). Questionnaire design is extremely important, because it assists in the realisation of the research objectives, while poorly designed questionnaires result in insufficient or irrelevant data that cannot be properly interpreted; hence, it is required that the researcher consider the type of data to be collected and the method of analysis to be implemented when designing the questionnaire (Dahlberg and McCaig, 2010).

Dahlberg and McCaig (2010) suggest that the effect of poorly-designed questionnaires results in obtaining irrelevant or insufficient information in research situations. Pietersen and Maree (2007) outline certain vital requirements in the design of a questionnaire:

- the total appearance of the questionnaire (quality of paper used, font and font size, for example);
- the question sequence (questions should be easy to answer);
- response categories;
- wording of questions (careful selection of clear words)

Questionnaires are divided into two main categories (Pietersen and Maree 2007).

- open-ended questions
- closed-ended questions

3.11.8. Open-ended questions

Hopkins (2014) affirms that the closed-ended questions are usually used in testing hypotheses, and open-ended questions are most appropriate in generating the research hypothesis. He added that open-ended questions tend to explore and discover the validity and reliability of the questionnaire. Open-ended questions are questions that are asked without providing a precise guide to possible answers, as this form of question is usually designed with the respondents' undiluted opinions in mind (Kumar and Phrommathed, 2005). Pietersen and Maree (2007) as well as Leedy and Ormrod (2010) outline the advantages and disadvantages of open-ended questions:

3.11.8.1. Advantages of open-ended questions

- Complex questions are duly answered with detailed justification.
- The respondents' opinions are revealed.
- Participants respond to questions honestly with the assurance of remaining anonymous.

3.11.8.2. Disadvantages of open-ended questions

- Data coding tends to be difficult.
- It requires a great deal of time for respondents to complete (thinking and writing). Answers are variable in content as a result of the unstructured questions.
- The use of statistical analysis in this design has proven abortive.

3.11.9. Closed-ended questions

Kumar (2011) explains that closed-ended questions are questions that describe possible responses in questionnaire design. Closed-ended questionnaires proffer a set of sequential questions demanding that respondents select the most suitable answers (Pietersen and Maree, 2007). Burns (1997) confirms that the use of closed-ended questions in research provides the researchers the benefit of achieving sufficient information to reach amore generalisable conclusion. Closed-ended questions invoke the possibility of daunting respondents who find none of the alternatives suitable, heightening the probability of unsuitable responses (Kumar and Phrommathed, 2005). Leedy and Ormrod (2010) list the advantages of closed-ended questions as:

- The questions are short, precise and easy to answer.
Coding and statistical analysis are easily done.

Nevertheless, even though there are advantages to closed-ended questions, Pietersen and Maree (2007) highlights the disadvantages of closed-ended questions as follows:

- The answers are very simple with no background details.
- Answering the questions is too easy and answers given may mislead the researcher.
- The respondents' true opinions might not be an option to choose from.
- The questionnaires are generally too lengthy.

3.11.10. Questionnaire design

Questionnaire design is the most crucial part of survey research, and important in data collection for quantitative research (Kumar and Phrommathed, 2005). Kumar and Phrommathed illustrates that to guarantee the validity and reliability of the research questions in a questionnaire design, the researcher ought to ensure a correlation between the research aims, research questions and research objectives of the study. The research questionnaire for this study was designed using closed-ended questions, with questions accepting the four-point Likert scale to control the answers allowed by survey respondents. The questionnaire was designed based on the information derived from reviewed literature, in correlation with the objectives of the study.

The questionnaire for the study was designed in sections, with each section aiming at achieving a particular objective of the study. The first section of the questionnaire was used to elicit biographical information of survey respondents. The second sections addressed the first objective of the research, with the aim of examining the perceptions of respondents on the appropriate entrepreneurial curricula that will consolidate higher education engineering undergraduate student's knowledge towards being interested on job creation. The third section of the questionnaire identifies the modality of motivating the entrepreneurial interest of engineering undergraduate students, with the goal being sustainable employment, purposely to address the third objective. The four sections of the questionnaire identified the effective management system techniques employed to sustain the entrepreneurial interest of engineering undergraduate students, thereby addressing the fourth objective.

The questionnaire for this study was designed under these principles highlighted by Adler and Clark (2007):

- Avoid loaded words – avoid words that trigger an emotional response.
- Avoid the use of double negative questions – questions that require respondents to disagree with a negative statement.
- Administer questions in the language of the respondents.
- Avoid threatening questions – questions that make respondents feel frightened or embarrassed to give an honest answer.
- Avoid ambiguous words – words that can be given more than one meaning.
- Avoid compound questions – more than two or more questions in a single question.

3.11.11. Interview

Interviews conducted in surveys are of two main kinds – structured and semi structured – based on the purpose to be achieved from the research (Leedy and Ormrod, 2010). Flick (2011) opines that qualitative interviews should begin conversation between the interviewer and the interviewee. Kumar (2011) argues that interviews give the researcher a level of spontaneity, flexibility and power to dialogue and interact with survey respondents. Due to the probing power and flexibility advantage of semi-structured interviews, a qualitative method was adopted to explore the in-depth background knowledge of engineering undergraduate entrepreneurial interest in South Africa to validate quantitative data obtained on the critical factors that enhance engineering undergraduates' interest.

Plowright (2013) maintains that a less structured interview design may be more appropriate to explore an interviewee's feelings and complete opinions on the subject being studied. Kumar (2011) states that flexibility, freedom and spontaneity make the unstructured interview one of the most commonly used methods of data collection in qualitative interviews. The study respondents were informed, prior to the meeting, of the focus of the interview and the relevance of the research study, hence giving the respondents sufficient time to prepare for the interview. A total of 522 were selected for the validation of data and the interview for this study was phone-recorded with permission from the respondents.

The interview was restricted to engineering students alone for validation of quantitative data. Serpell and Ferrada (2007) explain that students are agents responsible for communicating entrepreneurial interest objectives to engineering undergraduates. Dingsdag *et al.* (2008) further posits that students are the most noticeable and approachable people in university and generally believed by undergraduates to be "the most visible people of the university". Moreover, students are in a position to discuss the appropriate entrepreneurial curricula that will consolidate higher education engineering undergraduate student's knowledge towards being interested on job creation; hence, the interview explores the effectiveness and efficiency of various methods of enhancing the higher education engineering undergraduates' level of entrepreneurial interest, with an eye towards sustainability of employment in South Africa.

Table 3: 1 Questionnaire design

Section	Section title	Section objective
1	Biographical information	
2	To identify the extent of the entrepreneurial interest of engineering undergraduates in South Africa	Objective 1
3	To identify the appropriate entrepreneurial curricula that will consolidate higher education engineering undergraduate student's knowledge towards being interested on job creation in South Africa	Objective 2
4	To ascertain the modalities that could motivate the entrepreneurial interests of engineering undergraduates' students in regard to sustainable employment	Objective 3
5	To establish the effective management system techniques employed to sustain the entrepreneurial interest of engineering undergraduate students	Objective 4

3.11.12. Research aim and objectives

The aim of this study is to establish the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment in South Africa. To establish the research aim and obtain viable and reliable results, Table 3.1 shows the medium through which the research objectives were achieved.

Table 3:2 Methods of achieving research objectives

Objectives	Achieving Objectives
To identify the extent of the entrepreneurial interest of engineering undergraduate students in South Africa	Review of relevant literature, interview and questionnaire underpinned by descriptive analysis
To identify the appropriate entrepreneurial curricula that will consolidate higher education engineering undergraduate student's knowledge towards being interested on job creation in South Africa	Review of relevant literature, interview and questionnaire underpinned by descriptive analysis
To ascertain the modality of motivating the entrepreneurial interest of engineering undergraduate students in regard to sustainable employment	Review of relevant literature, interview and questionnaire underpinned by descriptive analysis
To establish the effective management system techniques employed to sustain the entrepreneurial interest of engineering undergraduate students	Review of relevant literature, interview and questionnaire, underpinned by descriptive analysis

3.11.13. Data analysis for the study

Data analysis includes testing, tabulating, categorising and examining the results to address the aim of a study (Yin, 2003 and Yin, 2002). The quantitative data obtained from the structured questionnaire were analysed using Statistical Package for the Social Sciences (SPSS) 25 software and descriptive statistics, while the qualitative data gathered from interviewees were analysed using a qualitative content analysis method. The main aim of adopting the qualitative research approach is to validate quantitative data and ensure reliability of research findings. Frequency tables, charts and bar charts were drawn from analysed quantitative data and presented.

3.11.14. Descriptive statistics

Descriptive statistics is the act of explaining or summarising quantitative data achieved in a study in a significant manner and understandable format (Lapan and Quartaroli, 2009) such as tables and charts. The descriptive statistics present a fundamental overview of each data variable by using descriptive statistical tools (O'Leary, 2013). Moreover, Struwig et al. (2001) maintain that the purpose of statistical tools in data analysis is to present an overall and straightforward picture of a large amount of data. There are three measures of central tendency: mean, median and mode (Henn *et al.*, 2006). The study variables are broadly described with mean values and respective percentages of the respondents. This study adopted mean, percentage and standard deviation in analysing the quantitative data obtained in the study.

3.11.15. Content analysis

Content analysis is an in-depth and systematic process of analysing the content of a body of knowledge with the aim of achieving a significance, theme, pattern and flaws study (Leedy and Ormrod, 2010). Content analysis mainly involves the coding and transcribing of human communication (written or oral) or other means of communication: video tapes and internet blogs (Babbie, 2015). Flick (2011) adds that a content analysis approach enables the researcher to omit irrelevant words and terms by paraphrasing and giving a summary of accounts. Content analysis is deeply rooted in the qualitative research strategy, with the plan of producing the quantitative accounts of the raw material in terms of the precise category (Bryman, 2015).

According to Thomas (2003) content analysis is an effective method for answering a large set of questions with few lines of statement. Nevertheless, when compared to the use of questionnaires, content analysis is more time-consuming in terms of data processing and transcribing (Thomas, 2003). Leedy and Ormrod (2010) argue that the method of data analysis is normally not designed as a standalone approach, as it adopts the principles of other methods to ascertain new theories. Content analysis is an inductive and iterative process where similarities and differences in text are explored to support or disconfirm a theory (Thomas, 2003). In this study, the researcher reported a summary of the relevant contents in the transcribed data obtained from the interviewees, while less important information was removed in the reporting process.

3.11.16. Data validity and reliability

It is necessary to test for validity and reliability of research instruments (Leedy and Ormrod, 2010). Validity is defined as the research instrument used to demonstrate the fulfilment of the desired purpose of the design, whereas reliability ensures consistency in findings, when continually used (Struwig *et al.*, 2001). Leedy and Ormrod (2010) maintain that testing the validity and reliability of the survey tool importantly establishes the probability of obtaining relevant data in drawing meaningful conclusions at the end of the study, thus discarding the need to consider the validity and reliability of a study, which might distort the validity of the research.

Struwig *et al.* (2001) maintain that the validity of a research tool denotes the extent to which the tool measures what it is designed for, while the reliability denotes the consistency of the results produced by the tool, when used with consistency, over a period of time. The principles of validity and reliability vary depending on the nature of the research (Biggam, 2015).

3.11.16.1. Validity

The validity of research refers to the credibility of the research findings (Struwig *et al.*, 2001). The logic that underpins the formulation of research tools and statistical confirmation gathered through the use of research instruments forms the basis of ascertaining the validity of research instruments (Kumar and Phrommathed, 2005). Plowright (2013) contends that validity is explained as the quality of research to reflect the true report of a phenomenon that is being researched and ultimately confirms the accuracy of the results obtained. In addition, Denscombe (2014) argues that the validity of research is addressed by the use of respondent validation, grounded data and triangulation.

For this study, the validity of results was achieved through validation of quantitative data obtained from engineering undergraduate students' entrepreneurial interest, with qualitative interviews conducted with university engineering lecturers.

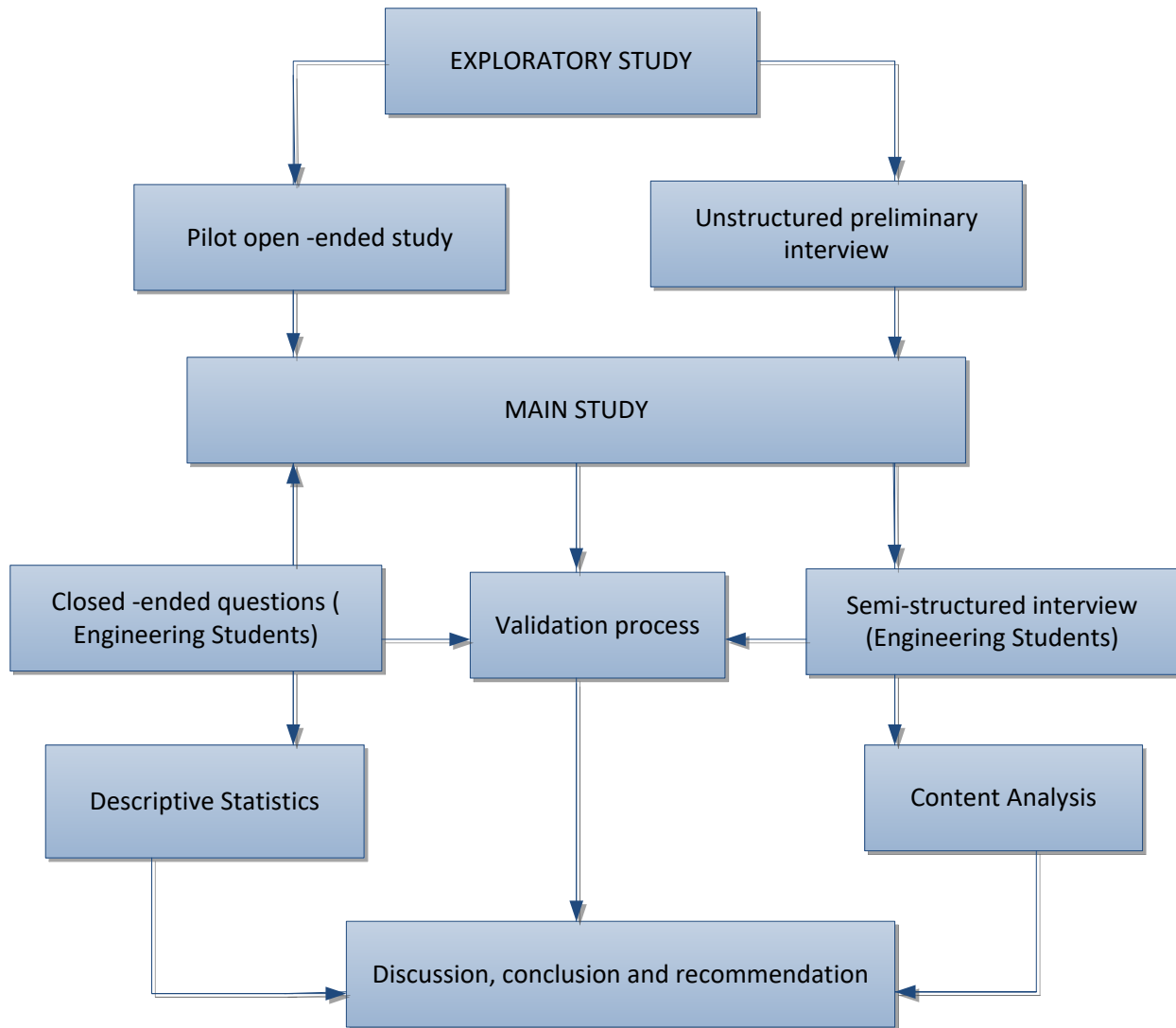
3.11.16.2. Reliability

Research reliability is the ability of future researchers to embark on the same research project and generate the same results, interpretations and claims (Leedy and Ormrod, 2010). Moreover, research is denoted as reliable if the findings of the study remain constant when conducted by another researcher in stable conditions (Silverman, 2016). The reason for conducting a reliability test is to minimise the errors and biases in a survey; the greater the degree of consistency and stability of an instrument, the greater the reliability of the instrument (Kumar & Phrommathed, 2005). For the purpose of this research, reliability was guaranteed by testing scaled research questions using Cronbach's alpha coefficient in SPSS (25) software as it was noted that the closer the coefficient is to 1, the more reliable the survey instrument is. Tavakol and Dennick (2011) contend that score values between 0.70-0.95 are standardised values for the reliability of a test to be proven. Therefore, the optimal Cronbach's coefficient alpha value should be above 0.7.

Figure 3.2 presents the research approach for the study. Exploratory research was conducted through pre-test of open-ended questions and unstructured preliminary interviews. The main study was tailored to the perceptions of the respondents explored through the exploratory study; thus, the main study adopted the quantitative (questionnaires) and qualitative (semi-structured interview) approach to data collection. The quantitative data was descriptively analysed, while the qualitative data was analysed using content analysis. The qualitative data was used to validate the quantitative data obtained from the research respondents to realise the aim of the study.

3.11.16.3. The research method for the study

This is the research methodology framework below were used in carrying out the study in the Western Cape Province.



Source: Developed by the researcher

Figure 3:2 Research method

3.12. CHAPTER SUMMARY

This chapter presents a comprehensive overview of the research methodology adopted for the research study. This study adopts a mixed methodological (quantitative and qualitative) method to accomplish the aim and objectives of the study. The quantitative research questionnaire was structured and designed to elicit information from higher institution attendees and to establish the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment in South Africa. Literature reviews, oral interviews and administration of questionnaires were used in collecting the secondary and primary data for the study. Questionnaires were piloted amongst university engineering lecturers and engineering undergraduate students in the Department of Construction Management and Quantity Surveying and Civil Engineering, to ensure the validity of the research instruments. The reliability of the results was assured by testing scaled questions with Cronbach's alpha coefficient reliability test.

CHAPTER FOUR

INTERPRETATION OF DATA ANALYSIS

4.1. INTRODUCTION

This chapter presents the results of a quantitative data analysis using descriptive statistical techniques. Moreover, detailed information on the participants taking part in the qualitative interviews were reported and tabulated under suitable sections. The results of statistical analysis were interpreted: inferences were drawn from the results. Moreover, the discussion was thoroughly in chapter five (5) to bring the research conclusions into focus.

4.2. EXPLORATORY STUDY

The exploratory study was conducted in universities in the Western Cape of South Africa. The study was conducted to ascertain critical factors that could enhance undergraduate engineering entrepreneurial interest regarding sustainable self-employment. The exploratory study was also conducted to establish questionnaire clarity for the main study in the Engineering and Built Environment departments. The study population comprises mainly of Engineering and Built Environment students. The population sampling technique adopted for the exploratory study was the 'simple random sampling method'. Thirty (30) questionnaires were administered. The respondents were requested to complete the questionnaire and make constructive comments where necessary. Sequentially, comments and additional input from the respondents were considered and appropriate modifications were made in the questionnaire design for the main survey.

4.3. QUESTIONNAIRE SURVEY FOR THE MAIN STUDY

Quantitative data collection for this study was conducted through the use of a questionnaire survey. A total of seven hundred and twenty-five (725) questionnaires were administered to engineering students in the Western Cape Province of South Africa. Four hundred and thirty-two (432) questionnaires were administered in person to selected respondents, of which three hundred and fifty-six (356) questionnaires were adequately completed and retrieved. Subsequently, two hundred and ninety-three (293) were administered online via electronic mail: one hundred and sixty-six (166) questionnaires were completed and sent back electronically. Ultimately, then, five hundred and twenty-two (522) questionnaires were retrieved and used for analysis.

4.4 SECTION A: UNIVERSITY OF TECHNOLOGY (UOT) A

A.4.4. BIOGRAPHICAL INFORMATION OF THE UNIVERSITY OF TECHNOLOGY

The research was a purposive sampling, which confirmed that the three years and final students are able to answer research questionnaires for reliability and validity of this research study.

Table 4:1A.4.1 Biographical information of respondents

S/n	Respondents	Frequency	Percentage %
	Departments		
1	Chemical Engineering	23	7.3
	Civil Engineering	76	24
	Clothing & Textile Technology	15	4.7
	Construction Management & Quantity Surveying	101	31.9
	Electrical Electronic & Computer Engineering	45	14.2
	Industrial & Systems Engineering	12	3.8
	Mechanical Engineering	44	13.8
	Level of Study		
	First Year	-	-
	Second Year	-	-
	Third Year	107	33.8
	Fourth Year (Bachelor Hon)	210	66.2
	Gender		
	Male	188	59.3
	Female	129	40.8
	Age Group		
	11 – 15yrs	-	-
	16 - 20yrs	15	4.7
	21 – 25yrs	302	95.3
	Race		
	Black	120	38
	White	55	17.4
	Coloured	70	22.1
	Indian	30	9.5
	others	42	13

A.4.4.1. DEPARTMENT INFORMATION

The results in Table 4: 1 A.4.1 present the characteristics of the undergraduates responding. The information obtained was from University A, with 7.3% of the respondents from Chemical Engineering; 24% of respondents from Civil engineering; 7.4% from Clothing and Textile Technology; 31.9% from Construction Management and Quantity Surveying; 14.2% from Electrical Electronic and Computer Engineering; 3.8% from Industrial and Systems Engineering; and 3.81% from Mechanical Engineering. From this result, it is an evident that the majority of respondents took entrepreneurial education seriously, an indication that the data provided by the respondents in their survey could be reliable for guiding decisions.

A.4.4.2. RESPONDENTS' LEVEL OF STUDY

Table 4.1 A.4.1 shows that 66.2% of the survey participants were fourth year, while 33.8% were in their third year of study. This level of study distribution indicates that most of the participants were final-year students.

A. 4.4.3 RESPONDENTS' GENDERS

Table 4.1 A.4.1 shows that the majorities (59.3%) of survey participants were male, and female participants represented only 40.8%. This gender distribution indicates that male participants are significantly higher in number than female students. However, this inference doesn't suggest that the female participation is not significantly reliable for this research study. In fact, these results proved that the respondents were qualified; inference suggests that equality of the genders is significantly consistent for this research.

A.4.4.4 RESPONDENTS' AGE GROUPS

Table 4.1 A.4.1 presents the age groups of survey respondents. It was found that none of the respondents was between the ages of eleven to fifteen years (11 – 15yrs). The age group between sixteen to twenty years accounted for 4.7% of study participants. The highest percentage of respondents fell between the ages of twenty-one and twenty-five, representing 95.3% of the total respondents. The age group between twenty-six and thirty was not represented, and neither were the higher age groups. The table indicates that 95.3% of survey respondents were younger than thirty-five years of age. Analysis of the respondents' age groups showed that an overwhelming 95.3% were younger than thirty-five years of age, proving that the respondents were young and when supported with entrepreneurship education, were ready to start up their business after graduation.

A.4.4.5 RESPONDENTS' RACE

The results in Table 4.1 A.4.1 present the racial distribution of the respondents. The information obtained was from the University of Technology, with 38% of the respondents being black; 17.4% of respondents being white; 22.1% from coloured; 9.5% from Indian and 13% of other descent. From this result, it is evident that the majority of respondents undertook entrepreneurial education, an indication that the data provided by the respondents in their survey could rely upon response for making decisions pertaining to becoming self-employed.

4.4. RELIABILITY OF RESEARCH FOR UOT

Table 4:2. A.4.2 Reliability of research instrument

	Headings	Number of the items	Cronbach's alpha coefficient value
Section B	Extent of entrepreneurial interest of the engineering undergraduates	18	0.73
Section C1	Attitude-based behaviours regarding entrepreneurial interest	11	0.78
Section C2	Knowledge behaviours regarding entrepreneurial interest	10	0.80
Section C3	Perceived behaviours regarding entrepreneurial interest	11	0.70
Section C4	Personality traits encouraging entrepreneurial interest	11	0.79
Section D1	The importance of the entrepreneurship curriculum content	18	0.81
Section D2	The essential on the entrepreneurship curriculum content	18	0.74
Section D3	The compulsory on the entrepreneurship curriculum content	18	0.76
Section D4	The needs for the entrepreneurship curriculum content	18	0.83
Section E	Motivational factors regarding entrepreneurial interest	22	0.75

A.4.6 EXTENT OF ENTREPRENEURIAL INTEREST OF THE ENGINEERING STUDENTS

Table 4.3.A.4.6 presents the opinions of survey respondents in the order of their entrepreneurial interest related the extents towards becoming self-employed during and after study. Respondents were requested to indicate the extent to which each of the identified factors affected their interest, using a four (4) point Likert scale: 1=Very compulsory, 2 = compulsory, 3=slightly compulsory. 4= Not compulsory. In Table 4.3.A.4.6, the students felt happy and proud if one of my family members was self-employed, with a mean value of 3.74, and this was identified as the most significant factor. A high percentage (96.7%) of respondents indicated very compulsory in becoming self-employed, whereas a minority (4%) of respondents chose not compulsory, indicating that does not affect them in becoming self-employed during and after study. However, it can be inferred that this factor is widely regarded as a major contributor to their entrepreneurial interest. An overwhelming number of respondents (95.9%) compulsorily indicated that they knew of someone who did not have a degree yet becoming self-employed (mv=3.70) also a notable factor in the extent of their entrepreneurial interest. Thus, this factor maintained a slightly closer mean value

(3.62), indicating that they would rather become an entrepreneur than a salary earner, while 10% of the respondents indicated 'not compulsory' regarding their interest. A large percentage (90.8%) of respondents indicated that they would like to start their own business rather than become unemployed (mv=3.56) is very compulsory towards their entrepreneurial interest, and 86.7% of respondents stated that they could take advantage of market conditions when running a business (mv=3.54) as the extent of the entrepreneurial interest of the engineering undergraduates are listed below (Table 4.3.A.4.6)

Table 4:2 A.4.6 Entrepreneurial interests

Entrepreneurial interest	Total Responds	Very Compulsory	Compulsory	Slightly Compulsory	Not Compulsory	MV	SD	Ranking
I feel happy and proud if one of my family members is self-employed	317	42.1	54.6	3.3	0.0	3.74	0.70	1
I know of someone without a degree who became self-employed	317	49.1	46.8	4.1	0.0	3.70	0.75	2
I would rather become an entrepreneur than become a salary earner	317	46.4	45.2	4.1	4.3	3.62	0.87	3
I would like to start my own business rather than become unemployed	317	35.6	55.2	4.8	4.4	3.56	0.64	4
I can take advantage of market conditions when running a business	317	43.4	43.3	4.5	8.8	3.54	0.86	5
I was appointed to be a leader in a business	317	30.2	50.2	10.5	9.1	3.49	0.60	6
I feel bad when I see graduates from reputable universities unable to secure a job	317	39.2	37.1	13.2	10.5	3.46	0.73	7
I would prefer a salaried job due to bad experiences of people I know who have owned a business	317	34.0	36.5	19.5	10.0	3.40	0.61	8
My gender will have a negative effect on starting a business	317	30.6	37.6	14.8	17.0	3.39	0.85	9
I feel motivated every time I see someone is doing better in business	317	30.8	35.6	23.7	9.9	3.38	0.79	10
My family background does not allow for financial support to start my own business	317	29.9	33.9	22.8	13.4	3.37	0.66	11
I would like to be the manager of someone else's business	317	12.6	47.5	30.6	9.3	3.35	0.81	12
I would like to get a salaried job due to family resistance to me starting a business	317	12.1	47.2	23.7	17.0	3.33	0.65	13

I do not want to become an entrepreneur in someone else business	317	18.3	38.9	21.3	21.5	3.29	0.78	14
I will make every effort to manage my own business	317	17.4	38.3	23.6	20.7	3.28	0.83	15
I would like to learn about business-related courses in the engineering field	317	19.7	34.1	22.6	23.6	3.24	0.80	16
I do not have the finances to start my own business	317	19.4	32.5	27.4	20.7	3.20	0.77	17
I have the necessary communication skills to become self-employed	317	7.7	42.9	20.2	29.2	3.15	0.72	18

A.4.7 ATTITUDE-BASED BEHAVIOURAL FACTORS ENHANCING ENTREPRENEURIAL INTEREST

Table 4.4.A.4.7 presents the perception of the respondents ‘attitude-related behavioural factors responsible for enhancing the entrepreneurial interest of engineering students. The respondents were required to use a four (4) point Likert scale: 1=Very satisfied, 2=Satisfied, 3= Dissatisfied, 4=Very Dissatisfied. The findings from the table show that 98.6% of the students stated that they would rather be a CEO than secure a job after graduation (mv=3.69). An entrepreneurship course offering them good opportunities in terms of their career (mv=3.65) is a significant factor responsible for enhancing engineering student entrepreneurial interest. In addition, 94.5% of students indicated that they would like to control what they do and not be controlled by someone else (3.60). The table also shows that students stated that they did not need to worry about managing risk (Mv= 3.55), to own a company, as an entrepreneur is more attractive (mv=3.50), being an entrepreneur is more satisfying (mv=3.40). All these factors could contribute to student attitudes regarding entrepreneurial interest aimed at becoming self-employed.

Table 4:3 A.4.7 Attitude-based behavioural factors

Attitude factors	Total Responds	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	MV	SD	Ranking
I would rather be a CEO than secure a job after graduation.	317	40.3	58.3	1.4	0.0	3.69	0.69	1
An entrepreneurship course will offer me good opportunities in terms of my career.	317	39.2	57.5	3.3	0.0	3.65	0.65	2
I like to control what I do and not be controlled by someone else.	317	30.4	64.1	5.5	0.0	3.60	0.66	3
I do not need to worry about managing risk.	317	37.9	55.3	6.8	0.0	3.55	0.71	4
To own a company as an entrepreneur is more attractive for me.	317	54.8	35.6	6.8	2.8	3.50	0.73	5
Being an entrepreneur is more satisfying for me.	317	42.6	46.7	6.5	4.2	3.40	0.80	6
Entrepreneurship courses are practical and affordable to me.	317	30.6	56.6	5.9	7.3	3.35	0.70	7
If I had the opportunity and resources, I would like to start a business.	317	27.4	57.5	8.6	6.5	3.34	0.79	8
If I start my business, I will certainly be successful.	317	36.4	43.7	11.0	8.9	3.30	0.67	9
Entrepreneurial courses aren't necessary since there are established companies.	317	22.1	28.4	24.8	24.7	3.32	0.74	10
I would rather be a job-seeker than to be a CEO, due to high risk involved after graduation.	317	23.6	25.2	26.9	24.3	3.15	0.77	11

A.4.8 KNOWLEDGE-BASED BEHAVIOURALFACTORS ENHANCING ENTREPRENEURIAL INTEREST

Table 4.5.A.4.8 presents the perceptions of survey respondents regarding how knowledge-based behavioural factors could enhance students' entrepreneurial interest. Respondents were requested to indicate the extent of the effect that knowledge-based behavioural factors had on their entrepreneurial interest, following a four (4) point Likert scale: 1 = Very poor, 2 = Poor, 3 = Good and 4 = Very good. In Table 4.5.A.4.8, students having the ability to apply their academic backgrounds to start up a business, with a mean value of 3.80, were identified as the most significant knowledge-based behavioural factor that could enhance their entrepreneurial interest. A high number (93.7%) of respondents felt they had the ability to understand what measures were required to grow a business, whereas a minority (6.3%) of respondents indicated that their ability to process raw materials into finished goods for profit-making (3.70) was the significant factor for them. However, it can be inferred that this factor is widely regarded as a major contributor to increasing the entrepreneurial interest of the students. An overwhelming number of respondents

(90.4% of the students) stated that having the ability to determine an appropriate location for a good business (mv=3.66) was a notable factor enhancing their interest. Thus, this factor maintained a slightly closer mean value as can use my academic knowledge to manage the risk involves, with a less 12.5% of the respondents does not have knowledge. A high percentage (84.3%) of respondents stated that the ability to understand the nature of business (mv=3.60) is a significant factor that could enhance student entrepreneurial interest, and 80.5% of respondents listed the ability to provide solutions to problems identified (mv=3.41) as a notable knowledge-based behavioural factor responsible for enhancing engineering students' entrepreneurial interests.

Table 4:4 A.4.8 Knowledge-based behavioural factors

Knowledge behaviour	Total Respond	Very Poor	Poor	Good	Very Good	MV	SD	Ranking
I have the ability to apply my academic background to start up a business.	317	0.0	5.5	56.6	37.6	3.80	0.73	1
I have the ability to understand what measures to take to grow a business.	317	0.0	6.3	51.3	42.4	3.79	0.63	2
I have the ability to process raw materials into finished goods for profit-making.	317	0.0	9.6	47.2	43.2	3.70	0.74	3
I have the ability to determine appropriate locations for a successful business.	317	4.3	7.4	46.8	41.5	3.66	0.78	4
I can use my academic knowledge to manage risk.	317	6.8	7.8	47.3	38.3	3.62	0.72	5
I have the ability to understand the nature of business.	317	7.4	8.3	42.1	42.2	3.60	0.61	6
I have the ability to provide solutions to identified problems.	317	8.7	10.8	39.8	40.7	3.41	0.67	7
I have the ability to identify business operational problems.	317	7.4	14.5	46.9	31.2	3.33	0.68	8
I can determine the amount of work needed to start up my business	317	11.5	12.6	50.3	25.6	3.18	0.69	9
I do not have the necessary business knowledge to start up a business	317	9.5	18.7	31.3	40.5	3.12	0.71	10

A.4.9 PERCEIVED BEHAVIOURAL FACTORS THAT COULD ENHANCE ENGINEERING STUDENTS' ENTREPRENEURIAL INTEREST

Table 4.6.A.4.9 presents the views of survey respondents in the order towards their perceived behaviours related factors that could enhance the engineering students' entrepreneurial interest. Respondents were requested to indicate the extent to which each of the identified factors could enhance their entrepreneurial interest, following a four (4) point Likert scale: 4=Strongly agree, 3=Agree, 2=Disagree and 1=Strongly disagree. In Table 4.9, knowing how to develop an entrepreneurial project, with a mean value of 3.80, was identified as the most significant perceived related behavioural factor that could enhance student entrepreneurial interest. A high proportion (98.2%) of respondents strongly agreed that this factor could enhance their entrepreneurial interest, whereas a minority (1.8%) of respondents disagreed, indicating that it did not enhance their entrepreneurial interest. However, it can be inferred that this factor is widely regarded as a major contributor to their entrepreneurial interest. An overwhelming number of respondents (97.5%) agreed that perceived ease of starting a business (mv=3.75) was a notable factor enhancing their interest. Thus, this factor maintained a slightly closer mean value as "to maintain a business would be easy for me" (mv=3.72), while 4.3% of the respondents disagreed that this factor was significant. 93.6% of the respondents agreed that if they tried to start a business, they would have a high probability of succeeding (mv=3.70) was an important factor that could enhance engineering students' interest, and 91.9% of respondents regarded having thought seriously about starting a business (mv=3.66) as a notable perceived related factor responsible for enhancing their entrepreneurial interest.

Table 4:5 A.4.9 Perceived behavioural factors

Perceived behaviours	Total Respondents	Strongly Disagree	Disagree	Agree	Strongly Agree	MV	SD	Ranking
I know how to develop an entrepreneurial project.	317	0.0	1.8	57.1	41.1	3.80	0.79	1
To start a business would be easy for me.	317	0.0	2.5	51.1	46.4	3.75	0.89	2
To maintain a business would be easy for me.	317	0.0	4.3	55.7	40.0	3.72	0.70	3
If I tried to start a business, I would have a high probability of succeeding.	317	0.0	6.4	45.8	47.8	3.70	0.67	4
I have thought seriously about starting my own firm.	317	3.7	4.4	53.8	38.1	3.66	0.62	5
I could become self-employed after my engineering programme.	317	3.6	6.1	49.6	40.7	3.64	0.66	6
To start my own firm would probably be the best way for me to take advantage of my business-related education.	317	4.3	7.9	39.2	48.6	3.55	0.80	7
I have the ability to anticipate technical developments by interpreting surrounding social trends.	317	6.5	8.4	46.3	38.8	3.50	0.66	8
My ability to cope with failure can be improved through education in school.	317	8.4	11.2	45.5	34.9	3.43	0.73	9
Creative thinking skills can be acquired through entrepreneurship learning.	317	8.6	15.2	41.8	34.4	3.32	0.84	10
I find myself being curious about a lot of things and people I encounter in life.	317	10.6	15.5	24.2	49.7	3.20	0.63	11

A.4.10 PERSONALITY TRAITS

Table 4.7.A.4.10 presents the opinions of the respondents on personality-related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = Agree, 4 = strongly disagree. The findings from the table show that most of the students would like to create their own business (mv=3.74) and when they read about a new innovation, they try to understand the value it will create. Both of these were regarded as significant factors affecting their entrepreneurial interest (mv=3.68). In addition, being confident in their skills and abilities to start a business (mv=3.66), liking to create business (mv=3.62) and being able to identify potential stakeholders for a new product (mv=3.60) were identified as top personality-related factors. The table also shows personality-related behavioural factors that could enhance engineering students' entrepreneurial interest in becoming self-employed.

Table 4:6 A.4.10 Personality traits

Personality Traits	Total Respond	Strongly Disagree	Disagree	Agree	Strongly Agree	MV	SD	Ranking
I like to create business.	317	0.0	3.8	52.3	43.9	3.74	0.86	1
When I read about a new innovation, I try to understand the value that it will create.	317	0.0	4.3	55.6	40.1	3.70	0.81	2
I am confident of my skills and abilities to start a business.	317	0.0	6.1	37.5	56.4	3.67	0.62	3
I extend to use new opportunity to rebrand my product.	317	3.6	6.3	44.6	45.5	3.65	0.73	4
I will start my own business if I detect an opportunity.	317	4.8	5.7	47.3	42.2	3.60	0.74	5
I have leadership skills that are needed to be an entrepreneur.	317	6.7	9.0	44.8	39.5	3.55	0.89	6
Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future.	317	6.1	13.2	38.4	42.3	3.49	0.71	7
I am confident of my skills and abilities to start a business.	317	10.7	11.8	37.5	40.0	3.44	0.62	8
I have the mental maturity to be an entrepreneur.	317	11.3	14.5	40.1	34.1	3.42	0.60	9
I'm able to identify potential stakeholders for a new product or service.	317	15.4	14.2	46.7	23.7	3.40	0.78	10
I am able to address stakeholder interests in a business plan.	317	13.4	18.8	20.7	47.1	3.39	0.80	11

A.4.11. THE IMPORTANCE OF ENTREPRENEURSHIP CURRICULUM CONTENTS

Table 4.8.A.4.11 presents the importance of aspects of an entrepreneurship curriculum that could enhance entrepreneurial interest. These guidelines were evaluated by the respondents based on a four (4) point Likert scale: 1 = very important, 2 = important, 3 = slightly important and 4 = not important. A significant percentage (86.8%) of the respondents agreed that risk-bearing (mv=3.80) was important in enhancing the entrepreneurial interest of the engineering students. Most of the respondents (96.7%) also agreed that the support of internship was significant (mv=3.77). The presence of Entrepreneurship tutors(mv=3.75) was identified by the respondents as another key factor that could increase entrepreneurial interest. Moreover, training workshops, practical experience, inviting guest speakers for official speeches, mentorship in business-related projects, extracurricular activities related to entrepreneurship and site visitation were considered as important guidelines to improve the entrepreneurship curriculum and were consequently ranked based on the mean values of 3.73, 3.70, 3.68, 3.64, 3.60 and 3.57 respectively.

Table 4:7 A.4.11 Entrepreneurship curriculum importance

Important	Total Responses	Very Important	Important	Slightly Important	Not Important	MV	SD	Ranking
Risk-bearing	317	51.8	46.5	1.7	0.0	3.80	0.78	1
Support for internship	317	42.3	54.4	3.3	0.0	3.77	0.70	2
Entrepreneurship tutors	317	45.4	49.5	5.1	0.0	3.75	0.77	3
Training workshops	317	38.7	52.8	5.3	3.2	3.73	0.81	4
Practical experience	317	35.3	55.0	5.5	4.2	3.70	0.84	5
Inviting guest speakers for official speech	317	43.4	45.8	6.5	4.3	3.68	0.72	6
Mentorship in business-related project.	317	37.3	50.4	6.2	6.1	3.64	0.82	7
Extracurricular activities related to entrepreneurship	317	33.8	52.1	7.8	6.3	3.60	0.83	8
Site visitation	317	21.4	62.5	8.9	7.7	3.57	0.74	9
Class practical on business-related courses	317	40.5	40.7	9.6	9.2	3.55	0.75	10
Research projects on business-related courses	317	31.1	49.2	11.4	8.3	3.49	0.67	11
Watch videos and records related to entrepreneurship	317	40.7	38.1	12.3	8.9	3.44	0.62	12
Process-oriented learning	317	31.6	45.5	12.7	10.2	3.41	0.61	13
Bilateral learning	317	33.4	39.6	14.5	12.5	3.40	0.66	14
My lecturer provides group discussion on business-related courses	317	28.6	42.0	16.2	13.2	3.39	0.69	15
Group discussion on business-related courses	317	24.8	43.7	17.2	14.3	3.36	0.71	16
Business planning ideas	317	23.8	42.4	18.0	15.8	3.33	0.76	17
Inviting guest speakers for seminars	317	24.2	39.7	19.5	16.6	3.29	0.80	18

A.4.12 THE ESSENTIAL COMPONENTS OF AN ENTREPRENEURSHIP CURRICULUM

Table 4.9.A.4.12 presents the perception of the respondents on the essentials of an entrepreneurship curriculum. Respondents were requested to indicate the extent to which each of the identified essentials could enhance their entrepreneurial interest, using a four (4) point Likert scale with values as follows: 1 = very essential, 2 = essential, 3 = slightly essential. 4= not essential. The majority (97.5%) of respondents indicated that support for internship (mv=3.83) is very essential factor in determining the entrepreneurship curriculum to be selected. However, a minority of respondents (2.5%) indicated that this had little influence determining entrepreneurial interest of the engineering students. Moreover, business planning ideas, risk-bearing, process-

oriented learning, bilateral learning, extracurricular activities related to entrepreneurship, mentorship in business-related projects, group discussion on business-related courses and practical experience could enhance the entrepreneurship curriculum with the percentages of 96.4%, 94.4%, 92.3%, 90.1%, 89.2%, 87.9%, 85.3 and 83.3% respectively.

Table 4:8 A.4.12 entrepreneurship curriculum essentials

Essential	Total Respondents	Very Essential	Essential	Slightly Essential	Not Essential	MV	SD	Ranking
Support for internship	317	41.6	55.9	2.5	0.0	3.83	0.65	1
Business planning ideas	317	43.7	52.7	3.6	0.0	3.80	0.71	2
Risk-bearing	317	45.3	49.1	5.6	0.0	3.77	0.70	3
Process-oriented learning	317	41.6	50.7	7.7	0.0	3.74	0.79	4
Bilateral learning	317	55.9	34.2	5.3	4.6	3.70	0.89	5
Extracurricular activities related to entrepreneurship	317	47.2	42.0	6.6	4.2	3.68	0.67	6
Mentorship in business-related projects	317	35.3	52.6	6.8	5.3	3.64	0.82	7
Group discussion on business-related courses	317	45.7	39.6	7.9	6.8	3.65	0.73	8
Practical experience	317	40.4	44.9	6.8	7.9	3.63	0.83	9
Entrepreneurship tutors	317	39.4	42.7	9.3	8.6	3.60	0.77	10
Training workshops	317	37.7	42.9	12.5	6.9	3.57	0.72	11
Watching videos and recordings related to entrepreneurship	317	38.6	40.6	11.5	9.3	2.55	0.87	12
Site visitation	317	36.3	41.1	13.2	9.4	3.57	0.74	13
My lecturer provides group discussion on business-related courses	317	28.9	47.0	13.3	10.8	3.54	0.74	14
Class practical on business-related courses	317	35.0	37.3	14.0	13.7	3.55	0.75	15
Research projects on business-related courses	317	22.0	48.7	18.3	11.0	3.51	0.81	16
Inviting guest speakers for official speeches	317	24.6	45.0	20.6	9.8	2.50	0.69	17
Inviting guest speakers for seminars	317	33.7	34.8	17.2	14.2	3.30	0.84	18

A.4.13 THE CONTENTS OF ENTREPRENEURSHIP CURRICULUM COMPULSORY

Table 4.10.A.4.13 presents the perceptions of engineering student on the compulsory on the entrepreneurship curriculum content that could enhance their entrepreneurial interest in becoming self-employed after graduation. Respondents were required to indicate the extent to which each of the identified factors has an influence in becoming self-employed using a four (4) point Likert scale with values as follows: 1 = very compulsory, 2 = compulsory, 3 = slightly compulsory. 4 = not compulsory. A significant 97.4% of respondents indicated practical experience(mv=3.84) was ranked as a top very compulsory factor that could enhance the entrepreneurship curriculum with

regard to entrepreneurial interest of the engineering students. Moreover, entrepreneurship tutors, training workshops, and site visitation are all indicated topmost factors (96.2%, 93.5%, and 92.1% respectively). In addition, inviting guest speakers for official speeches, mentorship in business-related projects, extracurricular activities related to entrepreneurship, research projects on business-related courses, supporting internship, business planning ideas and risk-bearing (mean values of 3.75, 3.73, 3.70, 3.67, 3.64, 3.61 and 3.60 respectively) were identified to be significant in improving the entrepreneurship curriculum.

Table 4:9 A.4.14 Entrepreneurship curriculums compulsory

Compulsory	Total	Very Compulsory	Compulsory	Slightly Compulsory	Not Compulsory	MV	SD	Ranking
Practical experience	317	48.1	49.3	2.6	0.0	3.84	0.81	1
Entrepreneurship tutors	317	37.8	59.2	3.8	0.0	3.81	0.72	2
Training workshops	317	45.3	48.2	6.5	0.0	3.80	0.73	3
Site visitation	317	35.3	56.8	4.4	3.5	3.78	0.66	4
Inviting guest speakers for official speeches	317	38.7	51.6	5.2	4.5	3.75	0.70	5
Mentorship in business-related projects	317	34.8	54.2	7.4	3.6	3.73	0.69	6
Extracurricular activities related to entrepreneurship	317	39.3	47.0	8.1	5.6	3.70	0.68	7
Research projects on business-related courses	317	36.7	47.9	9.1	6.3	3.67	0.76	8
Support for internship	317	36.9	45.2	12.5	5.4	3.64	0.80	9
Business planning ideas	317	38.5	42.0	10.8	8.7	3.61	0.79	10
Risk-bearing	317	42.1	38.0	38.0	23.3	3.60	0.78	11
Watching videos and recordings related to entrepreneurship.	317	43.7	35.7	10.4	10.2	3.57	0.64	12
Process-oriented learning.	317	33.4	43.1	12.6	10.9	3.55	0.63	13
Bilateral learning.	317	30.8	44.4	15.3	9.5	3.50	0.60	14
My lecturer provides group discussion on business-related courses	317	33.7	39.3	14.3	12.7	3.48	0.71	15
Group discussion on business-related courses	317	42.7	29.2	16.9	11.2	3.44	0.61	16
Class practical on business-related courses	317	38.6	31.7	17.4	12.3	3.41	0.74	17
Inviting guest speakers for seminars	317	36.9	31.6	16.7	14.8	3.37	0.65	18

4.5. A.4.15 THE NECESSARY CONTENTS OF THE ENTREPRENEURSHIP CURRICULUM

Table 4.11.A.4.15 presents the opinions of the respondents on need-related factors responsible for increasing the entrepreneurial interest of the engineering students. The respondents were required to use a four (4) point Likert scale: 1 = most needed, 2 = very needed, 3 = needed. 4 = not needed. A significant percentage (97.5%) of the respondents agreed that inviting guest speakers for official speeches (mv= 4.00) is needed to improve the entrepreneurship curriculum. Moreover, inviting guest speakers for seminars, supporting internships, business planning ideas, risk-bearing (with percentage of 96.4%, 96%, 94.6% and 93.1%) were identified by the respondents as another key ingredient of the entrepreneurship curriculum. Additionally, mentorship in business-related projects, extracurricular activities related to entrepreneurship, practical experience, entrepreneurship tutors, training workshops and site visitations were considered as important additions to improve the entrepreneurship curriculum and were consequently ranked based on the mean values of 3.77, 3.76, 3.73, 3.66, 3.61 and 3.61, respectively.

Table 4:10.A.4.15 Entrepreneurship curriculum needed

Needed	Total Respond	Very Needed	Needed	Slightly Needed	Not needed	MV	SD	Ranking
Inviting guest speakers for official speeches	317	39.3	58.2	2.5	0.0	4.00	0.64	1
Inviting guest speakers for seminars	317	42.0	54.4	3.6	0.0	3.90	0.72	2
Supporting internships	317	46.7	49.3	4.0	0.0	3.88	0.73	3
Business planning ideas	317	36.8	57.8	5.4	0.0	3.82	0.78	4
Risk-bearing	317	50.6	42.5	3.5	3.4	3.80	0.86	5
Mentorship in business-related projects	317	37.5	53.9	2.3	6.3	3.77	0.70	6
Extracurricular activities related to entrepreneurship	317	42.7	48.1	5.6	3.6	3.76	0.67	7
Practical experience	317	45.3	44.2	6.2	4.3	3.73	0.76	8
Entrepreneurship tutors	317	39.3	49.5	7.9	3.3	3.66	0.79	9
Training workshops	317	43.2	43.2	8.5	5.1	3.61	0.88	10
Site visitation	317	47.3	37.0	8.8	6.9	3.60	0.81	11
Process-oriented learning	317	48.4	34.4	11.6	5.6	3.58	0.77	12
Bilateral learning	317	38.9	42.6	9.9	8.6	3.55	0.75	13
My lecturer provides group discussion on business-related courses	317	35.3	44.2	11.2	9.3	3.50	0.68	14
Group discussion on business-related courses	317	30.6	47.3	12.1	10.0	3.49	0.66	15
Class practical on business-related courses	317	20.3	55.5	13.4	10.8	3.44	0.74	16
Research projects on business-related courses	317	35.7	36.7	15.0	12.6	3.41	0.82	17
Watching videos and recordings related to entrepreneurship	317	38.5	32.1	17.8	11.6	3.40	0.69	18

A.4.16 MODALITIES THAT MOTIVATE ENTREPRENEURIAL INTEREST OF ENGINEERING STUDENTS

Table 4.12.A.4.16 shows the ranking results for each motivational factor (e.g. intrinsic rewards, extrinsic rewards, independence/autonomy, family background and change management) according to the opinions of the respondents on personality-related factors responsible for increasing entrepreneurial interest. The respondents were required to use a four (4) point Likert scale: 1 = very satisfied, 2 = satisfied, 3 = dissatisfied, 4 = very dissatisfied. "To prove I can do it" was ranked as the first priority in the intrinsic rewards motivational factor, with a mean value of 3.70. "To increase my income opportunity" (mv=3.70) was also ranked as having major significance under the extrinsic rewards motivational factor, and was identified as the most significant factor under the independence motivational factor (mv=3.62). Similarly, with regards to family background, students indicated that acquiring personal security (mv3.47) is very significant in motivating their entrepreneurial interest. "To develop new ideas, innovations and initiatives" (mv=3.56) had the highest ranking in the change management section. Hence, 4:12 A.4.16 is listed total of 10 motivational factors, consisting of two intrinsic rewards, two extrinsic rewards, two independences/autonomy, family background and change management recorded to have high levels of motivation, that could enhance the entrepreneurial interest of the engineering. These ten motivational factors are to enjoy the excitement and to meet the challenge (IR1&2), to increase personal income and to acquire personal wealth(ER1&2), to maintain personal freedom (IAR1), to respond to change and to recognise opportunities (CMR1&2), to obtain self-employment (IAR2), to build a business to pass on and to take up the family business (FBR1&2) with the mean values of 3.62, 3.56, 3.53, 3.45, 3.40, 3.40, 3.37, 3.37, 3.36 and 3.33 respectively.

Table 4:11 A.4.16 Modalities that could motivate engineering students' entrepreneurial interest

Motivational Factors	Total	Very Satisfied	Satisfied	Dissatisfied	Strong Dissatisfied	MV	SD	Ranking
Intrinsic Rewards								
To prove I can do it	317	45.2	53.1	1.7	0.0	3.70	70.4	1
To enjoy the excitement	317	38.6	56.8	4.6	0.0	3.62	0.81	2
To meet the challenge	317	43.0	47.5	6.3	3.2	3.56	0.65	3
To gain public recognition	317	43.3	45.6	6.9	4.2	3.40	0.73	4
To be free from corporate organisation	317	35.3	49.9	9.5	5.3	3.38	0.75	5
To obtain personal growth	317	37.4	43.2	10.2	10.2	3.25	0.77	2
Extrinsic Rewards								
To increase my income opportunity	317	46.7	42.6	10.7	0.0	3.62	0.70	1
To increase my personal income	317	42.6	43.3	8.9	5.2	3.53	0.84	2
To acquire personal wealth	317	32.9	47.5	11.3	8.3	3.45	0.88	3
Independence/Autonomy								
To acquire personal security	317	49.0	47.4	3.6	0.0	3.47	0.81	1
To maintain my personal freedom	317	42.5	53.1	4.4	0.0	3.40	0.72	2
To obtain self-employment	317	42.6	49.7	4.3	3.4	3.37	0.76	3
To control my own destiny	317	43.5	46.6	5.4	4.5	3.36	0.77	4
To allow for early retirement	317	36.7	53.2	5.2	4.9	3.33	0.74	5
To be my own boss	317	38.6	44.1	10.4	6.9	3.24	0.66	6
Family Background								
To secure a future for family members	317	46.7	42.9	8.1	2.3	3.66	0.74	1
To build a business to pass on	317	32.6	53.3	9.6	4.5	3.36	0.73	2
To take up the family business	317	39.7	40.5	8.3	11.5	3.33	0.78	3
Change Management (adopting changes)								
To develop new ideas, innovations and initiatives	317	47.7	46.8	5.5	0.0	3.54	0.79	1
To respond to change	317	35.4	54.2	5.3	4.3	3.40	0.70	2
To recognise opportunities	317	40.7	47.6	7.4	4.3	3.37	0.74	3
To exploit opportunities	317	35.8	45.6	10.2	10.4	3.33	0.78	4

4.8 SECTION B: TRADITIONAL UNIVERSITY (TU) B

Table 4:12 B.4.17 Reliability of research instrument

Question numbers	Headings	Number of the items	Cronbach's alpha coefficient value
Section B	Extent of entrepreneurial interest of the engineering undergraduates	18	0.83
Section C1	Attitude-based behaviours regarding entrepreneurial interest	11	0.78
Section C2	Knowledge-based behaviours regarding entrepreneurial interest	10	0.77
Section C3	Perceived behaviours regarding entrepreneurial interest	11	0.70
Section C4	Personality traits encouraging entrepreneurial interest	11	0.71
Section D1	The importance of the entrepreneurship curriculum content	18	0.82
Section D2	The essentials of the entrepreneurship curriculum content	18	0.75
Section D3	The compulsory on the entrepreneurship curriculum content	18	0.72
Section D4	The necessary contents of the entrepreneurship curriculum content	18	0.76
Section E	Motivational factors regarding entrepreneurial interest	22	0.73

B.4.4. BIOGRAPHICAL INFORMATION OF THE TRADIONAL UNIVERSITY

The research was a purposive sampling, which confirmed that the three years and final students are able to answer research questionnaires for reliability and validity of this research study.

Table 4:13.B.4.18.1 Biographical information of respondents

S/n	Respondents	Frequency	Percentage %
	Departments		
	Chemical Engineering	43	21
	Civil Engineering	35	17.1
	Electrical Electronic and Computer Engineering	67	32.7
	Mechanical Engineering	60	29.3
	Level of Study		
	First Year	-	-
	Second Year	-	-
	Third Year	96	46.8
	Fourth Year (bachelor's degree)	109	53.2
	Gender		
	Male	104	50.7
	Female	78	38
	Other	23	11
	Age Group		
	11 – 15yrs	-	-
	16 - 20yrs	43	21
	21 – 25yrs	162	79
	Race		
	Black	70	34.1
	White	40	19.5
	Coloured	58	28.3
	Indian	22	10.7
	others	15	7.3

B.4.18.2 DEPARTMENT INFORMATION

The results in Table 4.14.B.4.18.1 present the characteristics of the respondents. The information obtained was from University B, with 21% of the respondents from Chemical Engineering; 17.1% of respondents from Civil Engineering; 32.7% from Electrical, Electronic and Computer Engineering; 29.3% from Mechanical Engineering. From this result, it is evident that the majority of respondents undertook serious entrepreneurial education, an indication that the data provided by the respondents in their survey response could be relied upon for making decisions.

B.4.18.3 RESPONDENTS' LEVEL OF STUDY

Table 4.14.B.4.18.1 shows that 53.2% of the survey participants are fourth year (bachelor's degree) while third-year participants represent 46.8%. This level of study distribution indicates that most participants are in their fourth year of study.

B.4.18.4 RESPONDENTS GENDERS

Table 4.14.B.4.18.1 shows that the majority (50.7%) of survey participants are male and female participants represent only 38%, with the category of 'other' making up 11%. This gender distribution indicates that male participants are significantly higher in number than their female counterparts. However, this inference doesn't suggest that the female participation is not significantly reliable for this research study. In fact, these results proved that the respondents were qualified; inference suggests that equality of the gender is significantly consistent for this research.

B.4.18.5 RESPONDENTS AGES GROUP

Table 4.14.B.4.18.1 presents the age groups of survey respondents. It was found that none of the respondents was between the ages of eleven to fifteen year (11 – 15yrs). The age group between sixteen to twenty years made up of 21% of study participants. The highest percentage of respondents fell between the ages of twenty-one and twenty-five, representing 79% of the total respondents. Other age groupings contained no participants. The table indicates that 79% of survey respondents were younger than thirty-five years of age. Analysis of respondents' age groups showed that an overwhelming 79% were younger thirty-five years of age, proving that the respondents were ready to start up their business after graduation, competent and with valid engineering undergraduate entrepreneurial education toward a sustainable of employment.

B.4.18.6 RESPONDENTS RACE

The results in Table 4.14.B.4.18.1 present the racial breakdown of the respondents. The information obtained was from the Traditional University, with 34.1% of the respondents being black; 19.5% of respondents were white; 28.3% were coloured; 10.7% were Indian and 7.3% of other origin. From this result, it is evident that the majority of respondents undertook entrepreneurial education, an indication that the data provided by the respondents in their survey response could be relied upon for making decisions pertaining to becoming self-employed.

B.4.19 EXTENT OF ENTREPRENEURIAL INTEREST OF THE ENGINEERING STUDENTS

Table 4.15.B.4.19 presents the opinions of survey respondents in the order of their entrepreneurial interest related the extents in becoming self-employed during and after studying. Respondents were requested to indicate the extent to which each of the identified factors affected their interest, using a four (4) point Likert scale: 1 = Very compulsory, 2 = compulsory, 3 = slightly compulsory. 4 =not compulsory. In Table 4.19, “I feel motivated every time I see someone is doing better in business”, with a mean value of 3.68, was identified as the most significant factor. A high number (90%) of respondents indicated very compulsory in becoming self-employed, whereas a minority (10%) of respondent rated it not compulsory, indicating that the factor does not impact significantly. However, it can be inferred that this factor is widely regarded as a major contributor to their entrepreneurial interest. An overwhelming number of respondents (89.3%) compulsorily indicated feeling happy and proud if one of my family members is self-employed (mv=3.62) also a notable toward their extent of entrepreneurial interest. Thus, this factor maintained a slightly closer mean value, I feel motivated every time I see someone is doing better in business, while 2% of the respondents indicated not compulsory towards their interest. Another large percentage (86.2%) of respondents indicated preferring to become an entrepreneur rather than a salary-earner (mv=3.60) was very compulsory towards their entrepreneurial interest, and 78.7% of respondents stated that having the communication skills to become self-employed (mv=3.55) as extent of entrepreneurial interest of the engineering undergraduates are listed below (Table 4.15.B.4.19).

Table 4:14 B.4.19 Entrepreneurial interest of the traditional university (B)

Entrepreneurial interest	Total Respondents	Very Compulsory	Compulsory	Slightly Compulsory	Not Compulsory	MS	SD	Ranking
I feel motivated every time I see someone is doing better in business.	205	30.6	58.6	5.7	4.3	3.68	0.79	
I feel happy and proud if one of my family members is self-employed.	205	45.3	44.0	10.7	0.00	3.62	0.60	
I would rather become an entrepreneur than become a salary earner.	205	25.3	53.4	16.8	4.5	3.60	0.75	
I have the necessary communication skills to become self-employed.	205	46.9	39.3	10.2	3.6	3.55	0.71	
I will make every effort to manage my own business.	205	27.2	59.3	9.7	14.5	3.50	0.82	
I do not have the finances to start my own business.	205	23.1	49.0	14.4	13.5	3.49	0.69	
I do not want to become an intrapreneur in someone else's business.	205	28.9	42.5	17.4	11.2	3.45	0.77	
I was appointed to be a leader in a business.	205	32.1	37.5	11.2	19.2	3.43	0.73	
My gender will have a negative effect on starting a business.	205	36.8	31.6	13.4	18.2	3.38	0.83	
I would prefer a salaried job due to bad experiences of people I know who have owned a business.	205	25.2	40.2	24.8	9.8	3.36	0.62	
My family background does not allow for financial support to start my own business.	205	23.1	39.9	14.8	22.2	3.33	0.64	
I would like to get a salaried job due to family resistance to me starting a business.	205	23.3	38.3	25.7	12.7	3.32	0.73	
I know of someone without a degree who became self-employed.	205	13.7	46.0	27.1	11.3	3.31	0.67	
I feel bad when I see graduates from reputable universities unable to secure a job.	205	21.8	37.1	24.4	16.7	3.31	0.79	
I can take advantage of market conditions when running a business.	205	18.0	40.5	26.7	14.8	3.26	0.65	
I would like to start my own business rather than become unemployed.	205	17.1	39.9	18.6	24.4	3.26	0.78	
I would like to learn about business-related courses in the engineering field.	205	21.5	34.1	19.5	24.8	3.24	0.81	
I would like to be the manager of someone else's business.	205	15.7	38.7	27.7	18.2	3.10	0.74	

B.4.20 ATTITUDE-BASED BEHAVIOURAL FACTORS ENHANCING ENTREPRENEURIAL INTEREST

Table 4.16.B.4.20 presents the perception of the respondents on attitude-related behavioural factors responsible for enhancing engineering student entrepreneurial interest. The respondents were required to use a four (4) point Likert scale: 1 = Very satisfied, 2 = Satisfied, 3 = Dissatisfied, 4 = Very Dissatisfied. The findings from the table show that 87.3% of the student stated that “being an entrepreneur is more satisfying” (mv=3.65) and “if I start my business, I will certainly be successful” (mv=3.62) are significant factors responsible for enhancing engineering student entrepreneurial interest. In addition, 81.3% of students indicated that entrepreneurship courses offer good opportunities in terms of their career (3.60), and this was identified as one of the factors. The table also shows that students stated that they would rather be a CEO than to secure a job after their graduation. (Mv= 3.57), they liked to control what they did and not be controlled by someone else (mv=3.50), they did not need to worry about managing risk (mv=3.42). All these could contribute to student attitudes regarding entrepreneurial interest.

Table 4:15B.4.20 Attitude factors

Attitude factors	Total Respondents	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	MS	SD	Ranking
Being an entrepreneur is more satisfying for me.	205	50.2	45.1	6.7	6.0	3.65	0.77	1
If I start my business, I will certainly be successful.	205	29.4	53.9	5.7	11.0	3.62	0.67	2
An entrepreneurship course will offer me good opportunities in terms of my career.	205	38.9	42.2	5.4	13.5	3.60	0.65	3
I would rather be a CEO than secure a job after graduation.	205	30.6	42.0	11.7	15.7	3.57	0.69	4
I like to control what I do and not be controlled by someone else.	205	40.0	30.2	22.1	7.7	3.50	0.65	5
I do not need to worry about managing risk.	205	37.9	29.1	7.3	25.7	3.42	0.71	6
To own a company as an entrepreneur is more attractive for me.	205	25.6	40.8	24.1	9.5	3.40	0.73	7
If I had the opportunity and resources, I would like to start a business.	205	22.4	30.2	27.4	10.8	3.34	0.79	8
Entrepreneurial courses aren't necessary since there are established companies.	205	22.8	37.6	28.7	10.9	3.37	0.80	9
Entrepreneurship courses are practical and affordable to me.	205	27.0	30.6	19.5	22.9	3.35	0.70	10
I would rather be a job-seeker than to be a CEO, due to high risk involved after graduation.	205	23.2	22.1	30.1	24.6	3.32	0.74	11

B.4.21 KNOWLEDGE-BASED BEHAVIOURAL FACTORS ENHANCING ENTREPRENEURIAL INTEREST

Table 4.17.B.4.21 presents the perceptions of survey respondents regarding knowledge-based behavioural factors enhancing entrepreneurial interest. Respondents were requested to indicate the knowledge-based behaviours which enhanced their entrepreneurial interest, following a four (4) point Likert scale: 1 = Very poor, 2 = Poor, 3 = Good and 4 = Very good. In Table B.4.21 students having the ability to understand what measures are needed to grow a business, with a mean value of 3.69, was identified as the most significant knowledge-based behavioural factor that could enhance their entrepreneurial interest. A high number (83.3%) of respondents felt they had the ability to understand what measures were needed to grow a business, whereas a minority (6.7%) of respondents indicated that did this. However, it can be inferred that this factor is widely regarded as a major contributor to enhancing the entrepreneurial interest of the students. An overwhelming number of respondents (78.2% of the students) stated their having the ability to identify business operational problems (mv=3.63) was a notable factor their interest. Thus, this

factor maintained a slightly closer mean value than the ability to understand what measures are necessary to grow a business, with 22.5% not having this knowledge. Another 78% of respondents stated that the ability to provide solutions to problems identified (mv=3.63) is a significant factor that could enhance student entrepreneurial interest, and 78% of respondents listed the ability to apply their academic backgrounds to start up a business (mv=3.48) as a notable knowledge-based behavioural factor responsible for enhancing engineering students' entrepreneurial interests (Table 4.17.B.4.21).

Table 4:16 B.4.21 Knowledge-based behavioural factors

Knowledge behaviour	Total Respond	Very Poor	Poor	Good	Very Good	MS	SD	Ranking
I have the ability to understand what measures to take to grow a business.	205	7.3	12.4	54.6	25.5	3.69	0.63	1
I have the ability to identify business operational problems.	205	15.2	6.6	49.9	28.3	3.63	0.68	2
I have the ability to provide solutions to identified problems.	205	11.5	10.3	44.4	33.8	3.51	0.67	3
I have the ability to apply my academic background to start up a business.	205	9.0	14.2	38.5	38.3	3.48	0.69	4
I can determine the number of workers needed to start up my business.	205	10.3	15.6	30.3	43.8	3.42	0.73	5
I have the ability to process raw materials into finished goods for profit-making.	205	14.0	12.6	30.2	43.2	3.40	0.74	6
I have the ability to understand the nature of business.	205	5.4	24.0	35.4	35.2	3.33	0.61	7
I do not have the necessary business knowledge to start up a business.	205	7.4	24.2	33.4	35.8	3.22	0.71	8
I can use my academic knowledge to manage risk.	205	8.3	25.3	47.3	19.1	3.19	0.72	9
I have the ability to determine appropriate locations for a successful business.	205	10.6	29.7	17.7	42.0	3.10	0.78	10

B.4.22 PERCEIVED BEHAVIOURAL FACTORS THAT COULD ENHANCE ENGINEERING STUDENTS' ENTREPRENEURIAL INTEREST

Table 4.18.B.4.22 presents the views of survey respondents in the order towards their perceived behaviours related factors that could enhance the engineering students' entrepreneurial interest. Respondents were requested to indicate the extent to which each of the identified factors could enhance their entrepreneurial interest, following a four (4) point Likert scale: 4 = Strongly agree, 3 = Agree, 2 = Disagree and 1 = Strongly disagree. In Table 4.7, knowing how to develop an entrepreneurial project, with a mean value of 3.64, was identified as the most significant perceived

related behavioural factor that could enhance student entrepreneurial interest. 86.5% of respondents strongly agreed that this factor could enhance their entrepreneurial interest, whereas a minority (13.5%) of respondents disagreed, indicating that it did not enhance their entrepreneurial interest. However, it can be inferred that this factor is widely regarded as a major contributor to their perceived behaviour regarding entrepreneurial interest. An overwhelming number of respondents (84.9%) agreed that their perception that if they tried to start a business, they would have a high probability of succeeding (mv=3.60) was a notable factor enhancing their perceived behaviours. Thus, this factor maintained a slightly closer mean value than the idea that creative thinking skills can be acquired through entrepreneurship learning, with less than 20% of the respondents disagreeing that this factor was significant. Another large percentage (78.4%) of respondents agreed that the perceived ease of maintaining a business (mv=3.55) was an important factor that could enhance engineering student interest, and 74.7% of respondents perceived that the ability to anticipate technical developments by interpreting surrounding social trends (mv=3.50) was a notable factor responsible for enhancing the engineering students entrepreneurial interest (Table 4.18.B.4.22).

Table 4:17 B.4.22 Perceived behaviours

Perceived behaviours	Total Respond	Strongly Disagree	Disagree	Agree	Strongly Agree	MS	SD	Ranking
I know how to develop an entrepreneurial project.	205	5.4	8.1	48.4	38.1	3.64	0.80	1
If I tried to start a business, I would have a high probability of succeeding.	205	8.7	8.4	35.5	49.4	3.60	0.67	2
Creative thinking skills can be acquired through entrepreneurship learning.	205	7.3	11.2	54.8	26.7	3.59	0.84	3
To maintain a business would be easy for me.	205	9.2	12.4	37.1	41.3	3.55	0.70	4
I have the ability to anticipate technical developments by interpreting surrounding social trends.	205	9.5	15.8	43.6	31.1	3.50	0.66	5
To start a business would be easy for me.	205	9.3	19.3	45.8	25.7	3.40	0.89	6
I have thought seriously about starting my own firm.	205	15.8	14.2	33.8	36.2	3.33	0.67	7
I could become self-employed after completing my engineering programme.	205	13.7	18.3	29.6	39.0	3.28	0.66	8
The ability to cope with failure can be improved through education in school.	205	12.2	24.2	25.5	38.1	3.23	0.73	9
I find myself being curious about a lot of things and people I encounter in life.	205	9.6	29.5	35.3	25.6	3.15	0.67	10
To start my own firm would probably be the best way for me to take advantage of my business-related education.	205	15.6	26.8	29.2	28.4	3.08	0.80	11

B.4.23 PERSONALITY TRAITS FACTORS

Table 4.19.B.4.23, presents the opinions of the respondents on personality-related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = Agree, 4 = strongly disagree. The findings from the table show that most of the students would like to start their own business if they detected an opportunity (mv=3.70) and that they intended to use new opportunities to rebrand their product(mv=3.68). Both of these were regarded as significant factors that could enhance their entrepreneurial interest. In addition, the traits of having leadership skills that are needed to be an entrepreneur (mv=3.66), liking to create business (mv=3.62) and being able to identify potential stakeholders for a new product (mv=3.60) were identified as top personality-related factors. The table also shows personality trait-related behavioural factors that could enhance engineering students' entrepreneurial interest in becoming self-employed.

Table 4:18 B.4.23 Perceived traits factors

Personality traits	Total Respond	Strongly Disagree	Disagree	Agree	Strongly Agree	MS	SD	Ranking
I will start my own business if I detect an opportunity.	205	10.0	5.3	46.3	38.4	3.70	0.74	1
I intend to use new opportunities to rebrand my product.	205	8.3	8.1	49.1	34.5	3.68	0.74	2
I have leadership skills that are needed to be an entrepreneur.	205	11.3	20.9	28.3	39.8	3.66	0.89	3
I like to create business.	205	9.2	15.2	48.2	27.4	3.62	0.86	4
I'm able to identify potential stakeholders for a new product or service	205	7.9	17.3	38.9	35.9	3.60	0.78	5
I have the mental maturity to be an entrepreneur.	205	8.6	20.5	48.3	22.6	3.59	0.62	6
I am confident of my skills and abilities to start a business.	205	14.9	16.8	37.5	30.8	3.56	0.62	7
I want to become a good engineer as well as a successful entrepreneur.	205	9.3	24,5	27.5	38.7	3.50	0.77	8
I am able to address stakeholder interests in a business plan.	205	5.9	32.0	43.5	18.6	3.49	0.80	9
When I read about a new innovation, I try to understand the value that it will create.	205	17.1	22.5	25.6	34.8	3.45	0.86	10
Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future.	205	12.2	28.3	26.6	32.9	3.35	0.74	11

B.4.24: THE IMPORTANCE OF THE CONTENTS OF THE ENTREPRENEURSHIP CURRICULUM

Table 4.20.B.4.24 presents the importance of aspects of the entrepreneurship curriculum that could enhance entrepreneurial interest of the engineering students in becoming self-employed. These guidelines were evaluated by the respondents based on a four (4) point Likert scale: 1 = very important, 2 = important, 3 = slightly important and 4 = not important. A significant percentage (86.8%) of the respondents agreed that mentorship in business-related projects (mv=3.63) was important in enhancing the entrepreneurial interest of the engineering students. Most of the respondents (84.6%) also agreed that supporting internship was significant (mv=3.60). Business planning ideas (mv=3.55) was identified by the respondents as another key factor that could enhance the entrepreneurial curriculum to increase the entrepreneurial interest of the engineering students. Moreover, extracurricular activities related to entrepreneurship, inviting guest speakers for official speeches, process-oriented learning and group discussion on business-related courses were considered as important factors to improve the entrepreneurship curriculum and were consequently ranked with mean values of 3.49, 3.48 and 3.40, respectively.

Table 4:19 B.4.24 Curriculum importance

Important	Total Respond	Very Important	Important	Slightly Important	Not Important	MS	SD	Ranking
Mentorship in business-related projects.	205	43.3	43.5	7.9	5.3	3.63	0.82	1
Support for internship.	205	46.3	38.3	9.2	6.2	3.60	0.75	2
Business planning ideas.	205	44.3	36.2	8.3	11.2	3.55	0.76	3
Extracurricular activities related to entrepreneurship.	205	45.2	32.2	12.2	10.4	3.49	14.8	4
Inviting guest speakers for official speeches.	205	29.1	46.8	14.6	9.5	3.48	0.72	5
Process-oriented learning.	205	42.5	30.6	15.2	11.7	3.45	34.9	6
Group discussion on business-related courses.	205	30.8	39.5	18.2	11.5	3.40	0.71	7
Research projects on business-related courses.	205	49.3	20.1	12.2	18.4	3.37	0.76	8
Training workshops.	205	38.1	28.5	22.2	11.2	3.36	0.81	9
Class practical on business-related courses.	205	17.1	45.2	20.5	17.2	3.35	0.75	10
Bilateral learning.	205	33.1	27.1	21.8	18.0	3.28	0.72	11
Entrepreneurship tutors.	205	13.6	46.3	25.8	14.3	3.31	0.78	12
Site visitations.	205	26.3	31.4	14.8	27.5	3.31	0.74	13
My lecturer provides group discussion on business-related courses.	205	39.8	15.8	25.2	19.2	3.30	0.78	14
Inviting guest speakers for seminars.	205	21.6	34.0	25.6	18.6	3.29	0.82	15
Risk-bearing.	205	13.9	39.5	35.5	11.1	3.24	0.78	16
Practical experience.	205	16.1	35.8	25.3	22.8	3.22	0.83	17
Watching videos and recordings related to entrepreneurship.	205	21.4	28.8	36.6	13.2	3.17	0.62	18

B.4.25: THE ESSENTIALS OF THE ENTREPRENEURSHIP CURRICULUM CONTENT

Table 4.21.B.4.25 presents the perception of the respondents regarding the essentials of the entrepreneurship curriculum. Respondents were requested to indicate the extent to which each of the identified essentials could enhance their entrepreneurial interest, using a four (4) point Likert scale with values as follows: 1 = very essential, 2 = essential, 3 = slightly essential, 4 = not essential. The majority (88.6%) of respondents indicated that inviting guest speakers for official speeches ($mv=3.59$) was a very essential factor in determining the entrepreneurship curriculum to be selected. However, a minority of respondents (21.4%) indicated that this had little influence in the determining of entrepreneurial interest of the engineering students. Moreover, entrepreneurship tutors, group discussion on business-related courses, mentorship in business-related projects, research projects on business-related courses and extracurricular activities related to entrepreneurship were seen as important, with the percentages of 86.5%, 85.1%, 82.6%, 80.8% and 78.5% respectively.

Table 4:20 B.4.25 Curriculum essentials

Essential	Total Respond	Very Essential	Essential	Slightly Essential	Not Essential	MS	SD	Ranking
Inviting guest speakers for official speeches.	205	43.9	38.9	11.4	0.0	3.59	0.76	
Entrepreneurship tutors.	205	49.4	37.1	5.2	8.3	3.45	0.78	
Group discussion on business-related courses.	205	41.7	43.4	10.0	4.1	3.42	0.74	
Mentorship in business-related projects.	205	43.4	39.2	9.2	8.2	3.40	0.71	
Research projects on business-related courses.	205	39.4	41.0	8.9	10.3	3.37	0.80	
Extracurricular activities related to entrepreneurship.	205	43.4	35.1	10.3	11.2	3.35	0.74	
Watching videos and recordings related to entrepreneurship.	205	35.8	40.6	11.6	12.0	3.33	0.75	
Process-oriented learning.	205	31.6	41.2	9.1	18.1	3.30	0.73	
Bilateral learning.	205	34.5	35.8	23.8	5.9	3.29	0.77	
My lecturer provides group discussion on business-related courses.	205	22.2	47.0	20.0	10.8	3.28	0.73	
Practical experience.	205	48.2	18.9	12.4	20.5	3.27	0.82	
Training workshops.	205	47.0	19.6	22.3	11.1	3.22	0.76	
Site visitation.	205	29.3	34.0	21.3	15.4	3.20	0.79	
Class practical on business-related courses.	205	17.1	43.7	17.7	21.5	3.18	0.79	
Research projects on business-related courses.	205	20.1	39.5	11.9	28.5	3.15	0.80	
Support for internship.	205	10.1	47.3	18.0	24.6	3.28	0.78	

Business planning ideas.	205	20.0	36.3	14.0	16.0	2.94	0.74	
Risk-bearing.	205	29.3	40.7	26.5	17.2	2.89	0.73	
Inviting guest speakers for seminars	205	17.6	33.7	28.0	20.7	2.80	0.83	

B.4.26: THE CONTENTS OF ENTREPRENEURSHIP CURRICULUM COMPULSORY

Table 4.22.B.4.26 presents the perceptions of engineering student on the compulsory on the entrepreneurship curriculum content that could enhance their entrepreneurial interest in becoming self-employed after graduation. Respondents were required to indicate the extent to which each of the identified factors has an influence in becoming self-employed using a four (4) point Likert scale with values as follows: 1 = very compulsory, 2 = compulsory, 3 = slightly compulsory. 4 = not compulsory. A significant 85.6% of respondents indicated Inviting guest speakers for official speeches (mv=3.49) was ranked as top very compulsory factor that could enhance the entrepreneurship curriculum to entrepreneurial interest of the engineering student towards becoming self-employed. Moreover, business planning ideas, risk-bearing, and mentorship in business-related projects are all indicated topmost factors 83.5%, 82.6%, and 80.7% respectively. In addition, extracurricular activities related to entrepreneurship, Entrepreneurship tutors, watch videos and records related to entrepreneurship and training workshops mean value of 3.39, 3.37, 3.36 and 3.32 respectively were identified to have a large significant to improve the entrepreneurship curriculum. All these could enhance with same mean value, although less significant than one another, considering the standard deviation of different factors in the below.

Table 4:21 B.4.26: Curriculum compulsoriness

Compulsoriness	Total Responds	Very Compulsor	Compulsor y	Slightly Compulsor	Not Compulsor	MS	SD	Ranking
Inviting guest speakers for official speeches	205	48.0	37.6	4.3	10.1	3.49	0.73	1
Business planning ideas	205	46.5	36.7	3.3	13.2	3.43	0.71	2
Risk-bearing.	205	35.9	46.7	4.1	13.3	3.40	0.74	3
Mentorship in business-related projects	205	29.4	51.3	14.6	4.7	3.39	0.69	4
Extracurricular activities related to entrepreneurship	205	28.6	50.7	6.0	14.7	3.37	0.70	5
Entrepreneurship tutors	205	42.0	35.8	13.6	8.6	3.36	0.74	6
Watching videos and recordings related to entrepreneurship.	205	32.5	43.7	14.6	9.2	3.32	0.73	7
Training workshops.	205	26.5	48.5	15.4	9.6	3.31	0.78	8
Site visitation.	205	45.9	27.9	12.3	14.6	3.30	0.76	9
Practical experience.	205	49.7	22.2	14.7	13.4	3.28	0.77	10
Process-oriented learning.	205	21.0	49.0	17.5	12.5	3.27	0.72	11
Support for internship.	205	36.7	31.9	16.7	14.7	3.26	0.81	12

My lecturer provides group discussion on business-related courses.	205	33.7	32.3	18.0	16.0	3.21	0.72	13
Bilateral learning.	205	29.5	35.2	8.0	14.6	3.18	0.75	14
Group discussion on business-related courses.	205	42.7	20.2	19.8	17.3	3.15	0.68	15
Class practical on business-related courses.	205	30.7	29.8	26.2	13.3	3.11	0.75	16
Research projects on business-related courses.	205	28.5	29.3	17.3	24.9	3.10	0.74	17
Inviting guest speakers for seminars.	205	31.6	24.7	30.4	13.3	3.06	0.78	18

B.4.27: THE CONTENTS OF ENTREPRENEURSHIP CURRICULUM NEEDED

Table 4.23.B.4.27 presents the opinions of the respondents on needs related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = mostly needed, 2 = very needed, 3 = needed. 4 = not needed. A significant percentage (85.4%) of the respondents agreed extracurricular activities related to entrepreneurship ($m_v=3.67$) is needed to improved entrepreneurship curriculum that will increase the engineering student entrepreneurial interest in becoming self-employed. Moreover, inviting guest speakers for official speeches, support for internship, site visitation, training workshops with percentage of 83.2%, 81.8%, 80.6 and 79.4% was identified by the respondents as another key guideline to improve the entrepreneurship curriculum. Additionally, mentorship in business-related projects, practical experience, risk-bearing and entrepreneurs tutor were considered as important guidelines to improve the entrepreneurship curriculum and were consequently ranked based on the mean value of 3.38, 3.37, 3.33 and 3.30, respectively.

Table 4:22 B.4.27: Curriculum needs

Needs	Total Respond	Very Needed	Needed	Slightly Needed	Not needed	MS	SD	Ranking
Extracurricular activities related to entrepreneurship	205	49.3	36.1	9.3	5.3	3.67	0.76	1
Inviting guest speakers for official speeches	205	42.7	40.5	12.2	4.6	3.64	0.67	2
Support for internship.	205	36.7	45.1	10.3	7.9	3.62	0.78	3
Site visitation.	205	42.5	38.1	13.2	6.2	3.50	0.75	4
Training workshops.	205	40.2	39.2	10.7	9.9	3.40	0.76	5
Mentorship in business-related projects	205	39.3	38.3	13.3	9.4	3.38	0.72	6
Practical experience.	205	28.1	48.0	14.6	9.3	3.37	0.74	7
Risk-bearing.	205	33.2	41.7	11.8	13.3	3.33	0.79	8
Entrepreneurship tutors	205	42.0	30.0	15.7	12.3	3.30	0.79	9
Inviting guest speakers for Seminars	205	22.5	48.0	18.2	11.3	3.28	0.78	10
Class practical on business-related courses	205	33.1	35.2	12.1	19.6	3.27	0.74	11
Business planning ideas	205	46.7	19.5	22.7	11.1	3.26	0.76	12

Research projects on business-related courses	205	30.7	33.9	22.1	13.3	3.21	0.82	13
My lecturer provides group discussion on business-related courses	205	35.3	27.6	21.1	16.0	3.19	0.68	14
Bilateral learning.	205	31.1	29.3	23.0	16.6	3.16	0.75	15
Group discussion on business-related courses	205	25.3	33.8	20.9	20.0	3.12	0.77	16
Watching videos and recordings related to entrepreneurship.	205	28.0	29.5	26.3	16.2	3.09	0.76	17
Process-oriented learning.	205	32.0	23.8	12.7	31.5	3.08	0.77	18

B.4.28 MODALITIES THAT MOTIVATE THE ENTREPRENEURIAL INTEREST OF ENGINEERING STUDENTS

Table 4.24.B.4.28 shows the ranking results for each motivational factor (e.g. intrinsic rewards, extrinsic rewards, independence/ autonomy, family background and change management) the opinions of the respondents on personality-related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = very satisfied, 2 = satisfied, 3 = dissatisfied, 4 = very dissatisfied. To be free from corporate organisation was ranked as the first priority in the intrinsic rewards motivational factor, with a mean value of 3.56. To increase my personal income (mv=3.44) was also ranked as having major significance under the extrinsic rewards motivational factor, to be my own boss (mv=3.50) were identified as most significant factor under the independence motivational factor. Similarly, in family background students indicated that to secure a future for family members (mv3.66) is very significant in motivating their entrepreneurial interest. To develop new ideas, innovations and initiatives (mv=3.47) had the highest ranking in the manage management (adopting changes) in motivational factor. Hence, Table 4.24.4.28, a total of 10 motivational factors, consisting of two intrinsic rewards, two extrinsic rewards, two independences/ autonomy, family background and change management were recorded to have high levels of motivational factor that could enhance the entrepreneurial interest of the engineering students for sustainable self-employment. These ten motivational factors are to meet the challenge (IR1), to acquire personal security obtain self-employment (IAR1), to exploit opportunities (CMR1), to exploit opportunities (ER1), to enjoy the excitement (IR2), to acquire personal wealth (ER2), to control my own destiny (IAR2), to respond to change (CM2), to build a business to pass on and To take up the family business (FBR1&2) with the following mean values of 3.47, 3.46, 3.40, 3.40, 3.36, 3.36, 3.36, 3.33, 3.30, and 3.29, respectively.

Table 4:23 B.4.28 Motivational factors

Motivational Factors	Total Respond	Very Satisfied	Satisfied	Dissatisfied	Strong Dissatisfied	MS	SD	Ranking
Intrinsic Rewards								
To be free from corporate organisation	205	28.0	49.3	16.0	6.6	3.56	0.70	1
To meet the challenge	205	36.7	39.3	18.3	5.3	3.46	0.77	2
To enjoy the excitement	205	39.3	38.0	19.3	11.3	3.39	0.71	3
To prove I can do it	205	22.7	56.0	18.4	3.0	3.28	0.76	4
To obtain personal growth	205	28.0	40.7	5.3	16.2	3.26	0.72	5
To gain public recognition	205	12.0	65.3	12.7	10.0	3.20	0.73	6
Extrinsic Rewards								
To increase my personal income	205	34.0	43.3	8.0	14.6	3.44	0.75	1
To increase my income opportunity	205	46.7	33.3	10.7	9.3	3.40	0.70	2
To acquire personal wealth	205	32.7	40.7	9.3	17.3	3.36	0.69	3
Independence/Autonomy								
To be my own boss	205	38.0	42.0	8.4	11.6	3.50	0.66	1
To acquire personal security	205	45.5	30.7	9.1	14.7	3.47	0.71	2
To control my own destiny	205	44.0	29.5	21.2	5.3	3.36	0.65	3
To allow for early retirement	205	30.2	40.7	23.3	5.8	3.33	0.74	4
To obtain self-employment	205	35.3	32.0	18.1	14.6	3.27	0.72	5
To maintain my personal freedom	205	25.5	39.5	26.7	8.2	3.26	0.75	6
Family Background								
To secure a future for family members	205	36.7	40.7	14.7	7.9	3.66	0.70	1
To build a business to pass on	205	24.0	51.2	17.3	7.5	3.36	0.75	2
To take up the family business	205	22.7	47.5	12.5	17.3	3.33	0.69	3
Change Management (adopting changes)								
To develop new ideas, innovations and initiatives	205	26.7	51.6	12.0	9.7	3.47	0.73	1
To exploit opportunities	205	39.5	34.7	14.7	11.1	3.40	0.78	2
To respond to change	205	33.6	37.3	23.3	5.8	3.36	0.60	3
To recognise opportunities	205	18.9	46.7	16.0	18.4	3.30	0.77	4

SECTION C: COMBINATION STUDY OF UNIVERSITY OF TECHNOLOGY (A) AND TRADITIONAL UNIVERSITY (B)

4.6. C 4.29.1 BIOGRAPHICAL INFORMATION OF RESPONDENTS

The research was a purposive sampling, which confirmed that the three years and final students are able to answer research questionnaires for reliability and validity of this research study

C 4.29.1 Biographical information of respondents

S/n	Respondents	Frequency	Percentage %
	Departments		
	Chemical Engineering	50	9.6
	Civil engineering	107	20.5
	Clothing & Textile Technology	76	14.6
	Construction Management & Quantity Surveying	106	20.3
	Electrical Electronic & Computer Engineering	97	18.6
	Industrial & Systems Engineering	12	2.3
	Mechanical Engineering	74	14.1
	Level of Study		
	First Year	-	-
	Second Year	-	.
	Third Year	167	32.0
	Fourth Year (Bachelor Degree)	221	42.3
	Fourth Year (Bachelor Hon)	134	25.7
	Gender		
	Male	323	61.9
	Female	175	33.5
	Other	24	4.6
	Age Group		
	11 - 15yrs	-	-
	16 - 20yrs	20	3.8
	21 – 25yrs	276	52.9
	26 – 30yrs	191	36.6
	31- 35yrs	35	6.7
	36yrs and above	-	-
	Race		
	Black	105	20.1
	Whites	212	40.6
	Colored	102	19.5
	Indian	72	13.8
	others	31	5.9

4.7. C.4.30 TESTING THE RELIABILITY OF THE RESEARCH INSTRUMENT

The reliability of the questions used in the study was tested with the Cronbach's alpha test using a Statistical Package for Social Sciences (SPSS) version 25, as this ensures reliability of research questions. Cronbach's alpha reliability test is an estimate of the internal uniformity related with the scores that can be derived from a scale or composite score (Tavakol and Dennick, 2011). Data in Table 4.3 shows that the Cronbach's alpha coefficient values are greater than 0.70 (>0.70), and Tavakol and Dennick (2011) certified that any score values between 0.70-0.95 are consistent values for the reliability of a test to be secured.

Table 4:24 4.30.1 Reliability of research instrument

Question numbers	Headings	Number of the items	Cronbach's alpha coefficient value
Section B	Extent of entrepreneurial interest of the engineering undergraduates	18	0.80
Section C1	Attitude behaviours regarding entrepreneurial interest	11	0.77
Section C2	Knowledge behaviours regarding entrepreneurial interest	10	0.74
Section C3	Perceived behaviours regarding entrepreneurial interest	11	0.76
Section C4	Personality traits encouraging entrepreneurial interest	11	0.79
Section D1	The importance of the entrepreneurship curriculum content	18	0.86
Section D2	The essential on the entrepreneurship curriculum content	18	0.73
Section D3	The compulsory on the entrepreneurship curriculum content	18	0.81
Section D4	The needs for the entrepreneurship curriculum content	18	0.84
Section E	Motivational factors regarding entrepreneurial interest	22	0.71

C.4.31 PRESENTATION OF FINDINGS

The research is designed to determine critical factors that could enhance undergraduate engineering entrepreneurial education toward a sustainable self-employment in South Africa. From the findings, the critical factors that could enhance undergraduate engineering entrepreneurial education toward a sustainable self-employment and the extent at which entrepreneurial interest of the students were presented.

C.4.32 EXTENT OF ENTREPRENEURIAL INTEREST OF THE ENGINEERING STUDENTS

Table 4.26.C.4.32 presents the opinions of survey respondents in the order of their entrepreneurial interest related to the extents in becoming self-employed during and after studying. Respondents were requested to indicate the extent to which each of the identified factors affected their interest, using a four (4) point Likert scale: 1 = Very compulsory, 2 = compulsory, 3 = slightly compulsory, 4 = not compulsory. In Table 4.3, I would rather become an entrepreneur than become a salary earner, with a mean value of 3.59, was identified as the most significant factor. A high 92.7% of respondents indicated very compulsory in becoming a self-employed, whereas a minority (5.3%) of respondents indicated not compulsory, indicating that does not affect them in becoming self-employed during and after studying. However, it can be inferred that this factor is widely regarded as a major contributor to their entrepreneurial interest. An overwhelming number of respondents 90.7% compulsorily indicated start my own business rather than become unemployed (mv=3.46) also a notable toward was their extent of entrepreneurial interest. Thus, this factor maintained a slightly closer mean value as becoming an entrepreneur than to become a salary earner, while 2% of the respondents indicated not compulsory towards their interest. Another large percentage (90.6%) of respondents indicated that they know someone who didn't have a degree yet become self-employed (mv=3.36) is very compulsory towards their entrepreneurial interest, and 90.5% of respondents stated that they feel motivated every time when they see someone is doing better in business (mv=3.33) as extent of entrepreneurial interest of the engineering undergraduates are listed below (Table C.4.32).

Table 4:25 C.4.32 The entrepreneurial interest

Entrepreneurial interest	Total	Very Compulsory	Compulsory	Slightly Compulsory	Not Compulsory	MS	SD	Ranking
I would rather become an entrepreneur than become a salary earner	522	39.4	53.3	5.3	00.0	3.59	0.86	1
I would like to start my own business rather than become unemployed	522	36.1	55.6	3.9	4.4	3.46	0.77	2
I was appointed to be a leader in a business	522	13.2	40.2	37.5	9.0	3.43	0.83	3
I know of someone without a degree who became self-employed	522	34.6	56.0	3.1	6.3	3.36	0.79	4
I would like to get a salaried job due to family resistance to me starting a business	522	12.6	45.2	36.4	5.7	3.35	0.77	5
I have the necessary communication skills to become self-employed	522	14.4	42.9	35.2	7.5	3.35	0.81	6
I feel motivated every time I see someone is doing better in business	522	34.9	55.6	3.7	5.7	3.33	0.79	7
I would prefer a salaried job due to bad experiences of people I know who have owned a business	522	12.6	42.5	40.0	4.8	3.31	0.76	8
My family background does not allow for financial support to start my own business	522	15.9	43.1	32.8	8.2	3.30	0.84	9
My gender will have a negative effect on starting a business	522	14.4	40.6	36.8	8.2	3.28	0.83	10
I will make every effort to manage my own business	522	17.2	43.3	33.7	5.7	3.27	0.81	11
I feel happy and proud if one of my family members is self-employed	522	16.7	45.0	32.6	5.7	3.27	0.80	12
I can take advantage of market conditions when running a business	522	14.9	47.5	33.7	3.8	3.26	0.75	13
I do not want to become an intreprenurin someone else's business	522	15.3	48.9	30.7	5.2	3.25	0.77	14
I would like to learn about business-related courses in the engineering field	522	18.0	44.1	33.1	4.8	3.24	0.81	15
I feel bad when I see graduates from reputable universities unable to secure a job	522	13.8	47.1	32.4	6.7	3.21	0.79	16
I do not have the finances to start my own business	522	18.4	49.0	27.4	5.2	3.19	0.79	17
I would like to be the manager of someone else's business	522	10.2	47.7	36.2	5.9	3.10	0.73	18

C.4.33. ATTITUDE BEHAVIOURAL FACTORS ENHANCING ENTREPRENEURIAL INTEREST

Table 4.27.C.4.33 presents the perception of the respondents on attitude behaviour related factors responsible for enhancing engineering student entrepreneurial interest. The respondents were required to use a four (4) point Likert scale: 1 = Very satisfied, 2 = Satisfied, 3 = Dissatisfied, 4 = Very Dissatisfied. The findings from the table show that 96.9% of the student were very satisfied to control what they did and not be controlled by someone else (mv=3.40) and had the opportunity and resources, they would like to start business (mv=3.34) are significant factors responsible for enhancing engineering student entrepreneurial interest. In addition, there is 86.3% of student indicated that they do not need to worry about managing risk to start a business (3.31) were identified as one of the factors. The table also shows that students stated that being an entrepreneur is more satisfying (mv= 3.30), entrepreneurship course will offer good opportunities in terms of student career (mv=3.25), Entrepreneurship courses are practical and affordable to students (mv=3.25), all these could contribute to student attitudes regarding entrepreneurial interest in becoming self-employed.

Table 4:26 C.4.33 Attitude behavioural factors

Attitude factors	Total	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	MS	SD	Ranking
I like to control what I do and not be controlled by someone else	522	37.7	59.2	3.1	00.0	3.40	0.65	1
If I had the opportunity and resources, I would like to start a business	522	22.4	50.2	27.4	00.0	3.34	0.70	2
I do not need to worry about managing risk	522	37.3	49.0	7.9	5.7	3.31	0.71	3
Being an entrepreneur is more satisfying for me	522	22.9	40.1	17.0	20.0	3.30	0.79	4
Entrepreneurship courses are practical and affordable to me	522	13.6	50.6	33.0	2.9	3.25	0.72	5
An entrepreneurship course will offer me good opportunities in terms of my career	522	37.7	44.2	8.1	10.0	3.24	0.75	6
I would rather be a job-seeker than to be a CEO, due to high risk involved after graduation	522	15.1	42.1	38.1	4.6	3.23	0.78	7
To own a company as an entrepreneur is more attractive for me	522	15.3	54.8	24.1	5.7	3.20	0.74	8
Entrepreneurial courses aren't necessary since there are established companies	522	32.8	38.2	18.7	10.3	3.19	0.76	9

If I start my business, I will certainly be successful	522	11.9	44.4	43.7	00.0	3.18	0.79	10
I would rather be a CEO than secure a job after graduation.	522	10.5	72.0	11.7	5.7	3.12	0.80	11

C.4.34 KNOWLEDGE-BASED BEHAVIOURAL FACTORS THAT COULD ENHANCE ENGINEERING STUDENTS' ENTREPRENEURIAL INTEREST

Table 4.28.C.4.34 presents the perceptions of survey respondents in the order of knowledge behaviours related factors could enhance students' entrepreneurial interest. Respondents were requested to indicate the knowledge behaviours to which each of the identified factors enhanced their entrepreneurial interest, following a four (4) point Likert scale: 1 = Very poor, 2 = Poor, 3 = Good and 4 = Very good. In Table 4.6, students have the ability to apply academic background to start up a business, with a mean value of 3.44, was identified as the most significant knowledge behaviours related factor that could enhance their entrepreneurial interest. A high 95.4% of respondents have the ability to apply academic background to start up a business, whereas a minority (4.6%) of respondents indicated that they do not have the ability to apply academic background to start up a business. However, it can be inferred that this factor is widely regarded as a major contributor to the increase the entrepreneurial interest of the students. An overwhelming number of respondents, 95.1% of the students, stated that they had the ability to understand the nature of business (mv=3.40) was a notable factor enhancing the engineering students interest. Thus, this factor maintained a slightly closer mean value as the ability to apply academic background to start up a business, with a less 1% of the respondents does not have knowledge. Another large percentage (91.4%) of respondents stated they can use academic knowledge to manage any risk involves in business (mv=3.39) is significant factor that could enhance student entrepreneurial interest, and 83.5% of respondents perceived they can determine number of workers that are needed to start up my business (mv=3.30) as a notable knowledge behaviours related factor responsible for enhancing engineering student entrepreneurial interests (Table 4.28.C.4.34).

Table 4:27 C.4.34 Knowledge-based behavioural factors

Knowledge behaviour	Total	Very Poor	Poor	Good	Very Good	MS	SD	Ranking
I have the ability to apply my academic background to start up a business	522	0.00	4.6	46.6	48.8	3.44	0.83	1
I have the ability to understand the nature of business	522	0.00	4.9	51.1	44.0	3.40	0.80	2
I can use my academic knowledge to manage risk	522	3.3	5.3	67.3	24.1	3.39	0.72	3
I can determine number of workers needed to start up my business	522	5.1	5.4	45.3	38.2	3.30	0.69	4
I have the ability to understand what measures to take to grow a business.	522	13.0	32.4	43.6	12.1	3.29	0.76	5
I have the ability to process raw materials into finished goods for profit-making	522	12.3	32.6	32.0	23.2	3.26	0.74	6
I have the ability to provide solutions to identified problems.	522	13.0	20.7	50.8	15.5	3.21	0.67	7
I have the ability to determine appropriate locations for a successful business	522	5.0	29.7	33.3	32.0	3.12	0.70	8
I have the ability to identify business operational problems	522	2.1	26.4	56.9	14.6	3.10	0.68	9
I do not have the necessary business knowledge to start up a business	522	20.2	10.0	30.0	30.8	3.09	0.71	10

C.4.35 PERCEIVED BEHAVIOURAL FACTORS THAT COULD ENHANCE ENGINEERING STUDENTS' ENTREPRENEURIAL INTEREST

Table 4.29.C.4.35 presents the views of survey respondents with regard to their perceived knowledge-based behavioural factors that could enhance the engineering students' entrepreneurial interest. Respondents were requested to indicate the extent to which each of the identified factors could enhance their entrepreneurial interest, following a four (4) point Likert scale: 4=Strongly agree, 3=Agree, 2=Disagree and 1=Strongly disagree. In Table 4: 29 C.4.35, the statement "if I tried to start a business, I would have a high probability of succeeding", with a mean value of 3.66, was identified as the most significant perceived knowledge-related behavioural factor that could enhance student entrepreneurial interest. A high percentage (97.3%) of respondents strongly agreed that this factor could enhance their entrepreneurial interest, whereas a minority (2.7%) of respondents disagreed, indicating that it did not enhance their entrepreneurial interest. However, it can be inferred that this factor is widely regarded as a major

contributor. An overwhelming number of respondents (96.8%) agreed that to start a business would be easy (mv=3.60). Thus, this factor maintained a slightly closer mean value, as only 3.2% of the respondents disagreed that this factor was significant. Another large percentage (93.5%) of respondents agreed that “I have thought seriously about starting my own firm” (mv=3.38) was an important factor that could enhance engineering students’ interest, and 92.2% of respondents perceived that they could become self-employed after completing their engineering programme in future (mv=3.35) as a notable perceived related factor responsible for enhancing the engineering students’ entrepreneurial interest (Table 4.29.C.4.35).

Table 4:28 C.4.35 Perceived behaviours

Perceived behaviours	Total	Strongly Disagree	Disagree	Agree	Strongly Agree	MS	SD	Ranking
If I tried to start a business, I would have a high probability of succeeding	522	0.00	2.7	55.0	42.3	3.66	0.67	1
To start a business would be easy for me.	522	0.0	3.2	51.1	45.7	3.60	0.81	2
I have thought seriously about starting my own firm.	522	3.2	3.1	53.8	39.7	3.38	0.70	3
I could become self-employed after completing my engineering programme.	522	00.0	7.7	49.6	42.6	3.35	0.68	4
I find myself being curious about a lot of things and people I encounter in life.	522	10.0	26.4	43.8	19.7	3.33	0.60	5
I know how to develop an entrepreneurial project.	522	5.0	26.8	47.1	21.1	3.24	0.83	6
Creative thinking skills can be acquired through entrepreneurship learning.	522	6.3	33.7	40.8	19.2	3.23	0.84	7
The ability to cope with failure can be improved through education in school.	522	5.0	14.0	60.5	20.5	3.16	0.73	8
I have the ability to anticipate technical developments by interpreting surrounding social trends.	522	6.3	27.0	62.5	4.2	3.14	0.76	9
To maintain a business would be easy for me.	522	5.0	28.9	57.1	9.0	3.10	0.70	10
To start my own firm would probably be the best way for me to take advantage of my business-related education.	522	4.8	15.5	49.2	30.5	3.05	0.72	11

C.4.36 PERSONALITY TRAITS BEHAVIOURAL FACTORS THAT COULD ENHANCE ENGINEERING STUDENTS' ENTREPRENEURIAL INTEREST

Table 4.30.C.4.36 presents the opinions of the respondents on personality-related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = Agree, 4 = strongly disagree. The findings from the table show that most of the students would like to create business (mv=3.65) and detect an opportunity is another significant factor that could enhance their entrepreneurial interest (mv=3.62). In addition, I am able to address stakeholder interests in a business plan (mv=3.57), When I read about new innovation, I try to understand the value that it will create more innovations (mv=3.50) and Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future (mv=3.40) were identified as top personality related factors. The Table 4.30.C.4.36 also shows personality traits behavioural factors that could enhance engineering students' entrepreneurial interest in becoming self-employed.

Table 4:29 C.4.36 Personality traits behaviours

Personality traits behaviour	Total	Strongly Disagree	Disagree	Agree	Strongly Agree	MS	SD	Ranking
I like to create business	522	00.0	2.1	52.3	44.6	3.65	0.86	1
I will start my own business if I detect an opportunity.	522	00.0	3.3	61.3	35.4	3.62	0.74	2
I am able to address stakeholder interests in a business plan	522	3.0	1.6	58.2	37.1	3.57	0.80	3
When I read about new innovation, I try to understand the value that it will create more innovations	522	2.0	3.0	50.6	44.4	3.50	0.86	4
Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future	522	13.0	31.0	53.6	2.3	3.40	0.74	5
I extend to use new opportunity to rebrand my product	522	3.6	30.1	50.8	15.5	3.34	0.74	6
I have the mental maturity to be an entrepreneur.	522	9.2	27.2	39.5	24.1	3.22	0.82	7
I'm able to identify potential stakeholders for a new product or service	522	5.6	33.1	46.7	14.6	3.12	0.78	8
I have leadership skills that are needed to be an entrepreneur.	522	11.3	20.9	48.3	19.5	3.11	0.89	9
I want to become a good engineer as well as a successful entrepreneur	522	9.8	27.8	54.4	8.0	3.10	0.77	10

I am confident of my skills and abilities to start a business.	522	2.5	34.5	57.5	5.6	3.08	0.62	11
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C.4.37 THE IMPORTANCE OF THE ENTREPRENEURSHIP CURRICULUM CONTENT

Table 4.31.C.4.37 presents the important of definite entrepreneurship curriculum that could enhance entrepreneurial interest of the engineering students in becoming self-employed. These guidelines were evaluated by the respondents based on a four (4) point Likert scale: 1 = very important, 2 = important, 3 = slightly important and 4 = not important. A significant percentage (96.7%) of the respondents agreed Inviting guest speakers for official speeches (mv=3.70) is important in enhancing the entrepreneurial interest of the engineering students. Most of the respondents (96.3%) also agreed that group discussion on business-related courses is significant (mv=3.55). Mentorship in business-related projects (mv=3.67) was identified by the respondents as another key factor that could enhance the entrepreneurial curriculum to increase the entrepreneurial interest of the engineering students. Moreover, research projects on business-related courses, support for internship, business planning ideas and training works were considered as important guidelines to improve the entrepreneurship curriculum and were consequently ranked based on the mean value of 3.50, 3.43 and 3.35, respectively.

Table 4:30.C.4.37 The importance of the entrepreneurship curriculum content

Important	Total	Very Important	Important	Slightly Important	Not Important	MS	SD	Ranking
Inviting guest speakers for official speeches	522	45.4	51.3	0.0	3.3	3.70	0.72	1
Mentorship in business-related projects	522	45.3	50.5	4.2	0.00	3.67	0.82	2
Group discussion on business-related courses	522	48.8	47.5	0.0	3.7	3.55	0.71	3
Research projects on business-related courses	522	46.3	43.8	3.7	9.9	3.50	0.76	4
Support for internship.	522	44.6	46.0	3.1	6.3	3.43	0.75	5
Inviting guest speakers for seminars	522	41.6	50.0	2.9	5.5	3.40	0.82	6
Watching videos and recordings related to entrepreneurship.	522	10.5	48.1	34.9	6.5	3,37	0.68	7
Training workshops.	522	18.4	48.1	25.7	7.9	3.36	0.81	8
Business planning ideas	522	13.8	47.1	32.4	6.7	3.35	0.76	9

Class practical on business-related courses	522	5.0	60.5	14.0	20.5	3.35	0.75	10
Site visitation.	522	6.3	62.5	4.8	27.0	3.31	0.74	11
Entrepreneurship tutors	522	7.1	51.9	34.7	6.3	3.30	0.78	12
Process-oriented learning.	522	21.6	50.0	25.5	2.9	3.29	0.66	13
Bilateral learning.	522	23.4	47.9	25.7	3.1	3.28	0.72	14
Extracurricular activities related to entrepreneurship	522	13.8	50.0	33.3	2.9	3.25	0.81	15
Risk-bearing.	522	13.2	40.2	37.5	9.0	3.24	0.78	16
Practical experience.	522	14.8	45.2	34.9	5.2	3.22	0.83	17
My lecturer provides group discussion on business-related courses	522	37.5	30.6	12.9	19.0	3.17	0.78	18

C.4.38: THE ESSENTIALS ON THE ENTREPRENEURSHIP CURRICULUM CONTENT

Table 4.32.C.4.38 presents the perception of the respondents regarding the essentials of the entrepreneurship curriculum. Respondents were requested to indicate the extent to which each of the identified essentials could enhance their entrepreneurial interest with selected, using a four (4) point Likert scale with values as follows: 1 = very essential, 2 = essential, 3 = slightly essential, 4 = not essential. The majority (97.3%) of respondents indicated that extracurricular activities related to entrepreneurship (mv=3.56) is very essential factor in determining the entrepreneurship curriculum to be selected. However, a minority of respondents (2.7%) indicated that this has little influence in the determining entrepreneurial interest of the engineering students. Moreover, mentorship in business-related projects, Inviting guest speakers for official speeches, watch videos and records related to entrepreneurship, bilateral learning and support for internship also could enhance the entrepreneurship curriculum with the percentage of 96.7%, 95.5%, 95.4%, 92.0% and 91.9% respectively, were rated by respondents having an influence to enhance the entrepreneurship curriculums.

Table 4:31 C.4.38 The essentials on the entrepreneurship curriculum content

Essential	Total	Very Essential	Essential	Slightly Essential	Not Essential	MS	SD	Ranking
Extracurricular activities related to entrepreneurship	522	47.2	50.1	2.7	0.00	3.56	0.74	1
Mentorship in business-related projects	522	43.4	53.3	2.1	2.2	3.54	0.71	2
Watching videos and recordings related to entrepreneurship.	522	39.8	55.6	1.5	3.1	3.53	0.75	3
Inviting guest speakers for official speeches	522	47.5	48.0	3.3	1.2	3.50	0.76	4
Group discussion on business-related courses	522	46.7	47.5	5.8	0.00	3.48	0.74	5
Bilateral learning.	522	40.8	51.2	5.3	2.7	3.40	0.77	6
Support for internship.	522	44.6	47.3	8.1	0.00	3.38	0.78	7
Entrepreneurship tutors	522	49.4	40.9	5.4	4.3	3.37	0.78	8
Business planning ideas	522	33.7	36.3	14.0	16.0	3.36	0.74	9
Research projects on business-related courses	522	32.0	39.0	16.7	12.0	3.31	0.80	10
Inviting guest speakers for seminars	522	23.7	33.7	28.0	14.6	3.29	0.83	11
Site visitation.	522	29.3	14.7	35.3	20.7	3.28	0.79	12
Risk-bearing.	522	29.3	40.7	15.3	14.7	3.28	0.73	13
My lecturer provides group discussion on business-related courses.	522	14.4	47.0	27.7	10.8	3.28	0.73	14
Class practical on business-related courses.	522	43.7	43.7	8.0	14.6	3.27	0.79	15
Training workshops.	522	47.0	14.5	10.8	27.7	3.26	0.76	16
Process-oriented learning.	522	3.6	56.8	8.4	31.3	3.24	0.73	17
Practical experience.	522	4.4	48.2	36.1	10.8	3.21	0.82	18

C.4.39: THE COMPULSORY ON THE ENTREPRENEURSHIP CURRICULUM CONTENT

Table 4.33.C.4.39 presents the perceptions of engineering student on the compulsory on the entrepreneurship curriculum content that could enhance their entrepreneurial interest in becoming self-employed after graduation. Respondents were required to indicate the extent to which each of the identified factors has an influence on becoming self-employed, using a four (4) point Likert scale with values as follows: 1 = very compulsory, 2 = compulsory, 3 = slightly compulsory. 4 = not compulsory. A significant 95.9% of respondents ranked site visitation (mv=3.67) as a very compulsory factor that could enhance the entrepreneurship curriculum. Moreover, class practical on business-related courses, inviting guest speakers for seminars, and risk-bearing are all indicated topmost factors with 95.9%, 95.5%, and 92.2% respectively. In addition, supports internship, training workshops and business planning ideas score mean values of 3.40, 3.39 and 3.39 respectively, and were identified to have a large significance. All these could enhance with

same mean value, although less significant than one another, considering the standard deviation of different factors in the below.

Table 4:32 C.4.39 The compulsory on the entrepreneurship curriculum content

Compulsory	Total	Very Compulsory	Compulsory	Slightly Compulsory	Not Compulsory	MS	SD	Ranking
Site visitation.	522	39.9	52.0	4.1	0.0	3.67	0.76	1
Class practical on business-related courses.	522	49.0	46.7	00.0	4.3	3.65	0.75	2
Inviting guest speakers for seminars	522	48.6	46.7	4.5	0.00	3.63	0.78	3
Risk-bearing.	522	45.5	46.7	3.3	4.5	3.50	0.74	4
Support for internship.	522	36.7	46.0	2.7	14.7	3.40	0.81	5
Training workshops.	522	55.3	27.3	1.3	16.0	3.39	0.78	6
Business planning ideas.	522	48.0	37.3	1.3	13.0	3.38	0.71	7
Entrepreneurship tutors.	522	42.0	39.3	10.7	8.0	3.37	0.74	8
Watching videos and recordings related to entrepreneurship.	522	33.7	43.7	8.0	14.6	3.32	0.73	9
Practical experience.	522	49.7	29.3	8.0	13.4	3.28	0.77	10
Process-oriented learning.	522	32.0	49.0	6.7	12.0	3.27	0.72	11
Mentorship in business-related projects.	522	24.0	52.0	9.3	14.6	3.26	0.69	12
Extracurricular activities related to entrepreneurship.	522	29.3	50.7	5.3	14.7	3.25	0.70	13
Group discussion on business-related courses.	522	42.7	30.7	9.3	17.3	3.25	0.68	14
Research projects on business-related courses.	522	46.7	29.3	17.3	6.6	3.23	0.74	15
My lecturer provides group discussion on business-related courses.	522	33.7	46.3	4.0	16.0	3.21	0.72	16
Inviting guest speakers for official speeches.	522	48.0	20.2	5.3	12.7	3.19	0.73	17
Bilateral learning.	522	20.0	57.3	8.0	14.6	3.18	0.75	18

C.4.40: NEEDS AND THE ENTREPRENEURSHIP CURRICULUM CONTENT

Table 4.34.C.4.40 presents the opinions of the respondents on needs-related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = mostly needed, 2 = very needed, 3 = needed. 4 = not needed. A significant percentage (98.6%) of the respondents agreed risk-bearing(mv=3.69) was needed to improve the entrepreneurship curriculum. Inviting guest speakers for official speeches, extracurricular activities related to entrepreneurship, group discussion on business-related courses and supporting internship, with

percentages of 97.5%, 96.4% and 95.5% respectively were identified by the respondents as key aspects to improve the entrepreneurship curriculum. Moreover, mentorship in business-related projects, site visitation and entrepreneurs tutor were considered as important guidelines to improve the entrepreneurship curriculum and were consequently ranked based on the mean values of 3.55, 3.50 and 3.42, respectively.

Table 4 33 C.4.40: the needs on the entrepreneurship curriculum content

Needed	Total	Very Needed	Needed	Slightly Needed	Not needed	MS	SD	Ranking
Risk-bearing.	522	68.0	30.6	1.4	0,00	3.69	0.79	1
Inviting guest speakers for official speeches.	522	49.3	48.2	2.5	00.0	3.67	0.76	2
Extracurricular activities related to entrepreneurship.	522	42.7	53.7	3.6	0.00	3.64	0.67	3
Group discussion on business-related courses.	522	29.50	66.0	4.5	0.00	3.60	0.77	4
Support for internship.	522	46.7	48.7	0.00	4.6	3.58	0.78	5
Mentorship in business-related projects.	522	50.7	42.9	0.00	6.4	3.55	0.72	6
Site visitation.	522	55.3	37.3	3.3	4.1	3.50	0.75	7
Entrepreneurship tutors	522	40.6	48.0	5.3	6.1	3.42	0.78	8
My lecturer provides group discussion on business-related courses.	522	35.3	46.0	2.7	16.0	3.39	0.68	9
Practical experience.	522	20.0	48.0	8.0	24.0	3.37	0.74	10
Class practical on business-related courses.	522	60.3	12.0	8.0	19.6	3.33	0.74	11
Training workshops.	522	52.0	9.3	10.7	28.0	3.30	0.76	12
Inviting guest speakers for seminars.	522	42.0	26.7	8.0	23.3	3.27	0.79	13
Business planning ideas.	522	46.7	16.0	22.7	14.7	3.26	0.76	14
Research projects on business-related courses.	522	30.7	46.7	9.3	13.3	3.21	0.82	15
Bilateral learning.	522	48.0	29.3	16.0	6.6	3.16	0.75	16
Watching videos and recordings related to entrepreneurship.	522	28.0	50.7	5.3	16.2	3.09	0.76	17
Process-oriented learning.	522	42.0	35.3	12.7	10.0	3.08	0.77	18

C.4.41 MOTIVATIONAL FACTORS REGARDING ENTREPRENEURIAL INTEREST

Table 4.35.C.4.41 shows the ranking results for each motivational factor (e.g. intrinsic rewards, extrinsic rewards, independence/autonomy, family background and change management) and the opinions of the respondents on personality-related factors responsible for increasing the entrepreneurial interest of the engineering students in becoming self-employed during and after studying. The respondents were required to use a four (4) point Likert scale: 1 = very satisfied, 2 = satisfied, 3 = dissatisfied, 4 = very dissatisfied. Enjoying the excitement was ranked as the first priority in the intrinsic rewards motivational factors, with a mean value of 3.59. Increasing person income opportunity (mv=3.55) was also ranked as having major significance under the extrinsic rewards motivational factor. Being one's own boss (mv=3.54) was identified as the most significant factor under the independence motivational factor. Developing new ideas, innovations and initiatives (mv=3.52) had the highest ranking in the change management (adopting changes) section. In addition, building a business to pass on (mv= 3.51) was notable as the highest ranking in the family background section. Hence, in Table 4.35.C4.41, a total of 10 motivational factors, consisting of two intrinsic rewards, two extrinsic rewards, two independences/autonomy, family background and change management were recorded to have high levels of motivational factors that could enhance the entrepreneurial interest of the engineering students for sustainable self-employment. These ten motivational factors were to be free from corporate organisation (IR1), to increase personal income(ER1), to gain public recognition (IR2), to control one's own destiny (IAR1), to secure a future for family members (FBR1), to obtain self-employment (IAR2), To take up the family business (FBR2), to acquire personal wealth (ER2), to recognise opportunities and to exploit opportunities (CMR1 and 2) with the mean values of 3.56, 3.46, 3.52, 3.42, 3.41, 3.37, 3.34, 3.31, 3.30, and 3.29, respectively.

Table 4.34.C.4.41 Motivational factors that could enhance student entrepreneurial interest

Motivational Factors	Total	Very Satisfied	Satisfied	Dissatisfied	Strong Dissatisfied	MS	SD	Ranking
Intrinsic Rewards								
To enjoy the excitement	522	39.3	57.3	3.4	0.00	3.59	0.91	1
To be free from corporate organisation	522	44.5	49.3	0.00	6.2	3.56	0.96	2
To gain public recognition	522	26.7	65.6	7.7	0.00	3.52	0.91	3
To obtain personal growth	522	44.2	40.7	5.3	9.8	3.26	0.92	4
To prove I can do it	522	22.7	56.0	18.4	2.9	3.18	0.86	5
To meet the challenge	522	46.7	39.6	8.4	5.3	3.11	0.97	6
Extrinsic Rewards								
To increase my income opportunity	522	46.7	47.8	0.00	5.5	3.55	0.90	1
To increase my personal income	522	48.6	43.3	8.0	0.00	3.46	0.95	2
To acquire personal wealth	522	42.7	40.7	9.3	7.3	3.31	0.99	3
Independence/Autonomy								
To be my own boss	522	48.4	42.3	7.3	2.0	3.54	0.86	1
To control my own destiny	522	46.8	45.3	4.6	3.3	3.42	0.95	2
To obtain self-employment	522	44.0	32.0	9.3	14.6	3.37	0.96	3
To maintain my personal freedom	522	22.0	39.0	26.7	12.0	3.26	0.85	4
To acquire personal security	522	29.3	30.7	25.3	14.7	3.17	0.81	5
To allow for early retirement	522	26.7	40.7	23.3	9.3	3.13	0.94	6
Family Background								
To build a business to pass on	522	34.0	53.4	7.3	5.3	3.51	0.95	1
To secure a future for family members	522	44.7	43.3	4.7	5.3	3.41	0.90	2
To take up the family business	522	45.7	35.7	12.3	7.3	3.34	0.99	3
Change Management (adopting changes)								
To develop new ideas, innovations and initiatives	522	38.7	56.0	0.00	5.4	3.52	0.77	1
To recognise opportunities	522	42.0	46.7	6.0	5.3	3.30	0.92	2
To exploit opportunities	522	38.0	34.7	14.7	12.7	3.29	0.78	3
To respond to change	522	38.0	37.3	23.3	1.3	3.15	0.60	4

The discussion was thoroughly in chapter five (5) to bring the research conclusions into focus as aligned with research main and objectives.

CHAPTER FIVE

5.0 DISCUSSION/ PRESENTATION OF THE FINDINGS

This chapter discusses findings of researchers with supported literatures that could enhance the engineering undergraduates entrepreneurial interest towards becoming self- employed after graduation.

5.1. EFFECT OF ENTREPRENEURIAL INTEREST ON THE ENGINEERING STUDENTS' INTERESTS IN BECOMING SELF-EMPLOYED

One of the objectives of this study is to determine the effect entrepreneurial interest has on the engineering undergraduates becoming self-employed. A significant factor identified in the research is that most of the students would prefer to be an entrepreneur than a salary earner. However, students were non-committal of becoming entrepreneurs and ready to do anything to become entrepreneurs.

Role models can contribute to some students committing themselves to becoming entrepreneurs. Rodrigues, Dinis, Do Paco, Ferreira and Raposo (2012) portray the view that entrepreneurial interest is established on more realistic perceptions of reality; it is reasonable to think that the training can act as a filter; those who are attracted by an entrepreneurial business are more committed to becoming entrepreneurs and to learn what is desirable to be successful (Oosterbeek *et al.* 2010).

Successful entrepreneurs and role models who have become successful entrepreneurs' impact positively on some students' interests in becoming entrepreneurs. Similarly, Hisrich and Peters (2002), role models form a significant part of students' entrepreneurial development. Being able to refer to a successful person assists entrepreneurs, who will believe that they are able to achieve the same success. Role models could be family members, parents, businesspeople and other entrepreneurs.

5.2. ATTITUDE TOWARD ENTREPRENEURSHIP EDUCATION AND IMPACT ON ENGINEERING STUDENTS' INTEREST IN BECOMING ENTREPRENEURS

According to the attitude-based behavioural factors, students generally showed moderate attitudes towards entrepreneurship education. This indicated that the engineering student were able to start businesses after graduation.

The findings from the study indicated that a majority of the respondents had a positive attitude towards the cultivation of entrepreneurial interest. The majority of the respondents (96.9%) were

very satisfied with the prospect of controlling what they did, rather than being controlled by someone else. 87.6% of them indicated that they would like to start businesses, if they possessed the resources to do so. These are significant factors responsible for enhancing engineering student entrepreneurial interest. This reveals that availability of resources to start businesses would influence the students in becoming self-employed, as this would affect the degree of entrepreneurial interest positively. Thus, 86.3% of students indicated that they did not need to worry about managing risk to start a business and 83.6% indicated that being an entrepreneur is more satisfying than conventional careers. The study found that entrepreneurial education had a strong positive effect on entrepreneurial interests.

There are two fundamental characteristics of entrepreneurial attitudes, specifically the ability to recognise opportunities and the ability to bear calculated risks (Nybakk and Hansen 2008). Nybakk and Hansen argue that people with entrepreneurial attitudes are more likely to start up new business ventures. Risk-takers are more likely to start new business projects and risk attitudes affect the degree of entrepreneurial interest (Antonites and Wordsworth 2009). According to Pretorius *et al.* (2005) there is no guarantee that individuals will act entrepreneurially unless their mind-set, readiness to take risks, confidence, attitude and behaviour have been impacted, regardless of the degree of entrepreneurial skill and knowledge an education programme provides.

Loewenstein, (2019); Dell (2008); Ford and Gross (2019) all maintain that entrepreneurship education and change in entrepreneurial attitude is significantly linked, and interest in entrepreneurship education increases students' attitude towards entrepreneurship positively, because entrepreneurship education provides them with knowledge and real-world skills, which make them feel safer and more confident in taking the entrepreneurial path. This consequently increases their entrepreneurial interest (Sata, 2013).

Herrington, Kew and Kew (2014) outline factors mitigating entrepreneurial activity in South Africa, such as reported successful young entrepreneurs, financial and business support and government support. In addition, the South African media very seldom covers successful entrepreneurs or businessmen, preferring to give the lion's share of coverage to politicians, sportsmen and entertainers. This entails that there are relatively few visible and accessible role models for young aspiring entrepreneurs like these engineering students. The lack of entrepreneurial experience and informal learning experiences contribute to the lack of "can-do"

attitude. Hence, there should be interventions from government to assist small and medium-sized enterprises make themselves known to people (Kgagara, 2011).

Psychologically, there are affirmations that entrepreneurs have sole values and attitudes toward work and life, and these needed drives for the individual to behave in positive ways (Tassawa, 2019). Nevertheless, entrepreneurship education is progressing, and personal attitudes towards it can be positively affected by lecturers and practitioners. Such practitioner impacts the specific attitudes of an individual positively or negatively within the precise area, hence improving the predictability of the behavioural intent. Researchers have shown that the influences of the practitioners were found to be stronger than personal attitudes on entrepreneurial interests in some studies (Tassawa, 2019). Another very significant factor is the fact that entrepreneurial competencies and attitudes can only be acquired or built through practical learning experiences (González-Serrano *et al.*, 2017). These clarify the external factors that enhanced attitude on entrepreneurial interest on entrepreneurial education.

5.3. KNOWLEDGE BEHAVIOUR CONTROL TOWARD ENTREPRENEURIAL EDUCATION ON ENGINEERING STUDENTS' INTEREST IN BECOMING ENTREPRENEURS

According to all tables for knowledge-related behavioural factors above, students generally showed moderate knowledge of entrepreneurship education. The findings from the study indicated that a majority of the respondents had a positive knowledge towards the behaviour of entrepreneurial interest. A majority of the respondents (95.4%) reported having the ability to apply skills and knowledge from their academic backgrounds to start a business, whereas a minority (4.6%) of students indicated that they did not. However, it can be inferred that this factor is widely regarded as a major contributor to the increase in the entrepreneurial interest of the students. An overwhelming number of respondents (95.1% of the students) stated that they had the ability to understand the nature of business and that this knowledge was a major factor in the enhancement of their entrepreneurial interest. Thus, this factor maintained a slightly closer mean value than the ability to apply academic background to start up a business, with a less 1% of the respondents does not have knowledge. Another large percentage (91.4%) of respondents stated that their ability to use their academic knowledge to manage any risk involved in business is a significant factor that could enhance student entrepreneurial interest, and 83.5% of respondents perceived the fact that they could determine the number of workers needed to start up their business as a notable knowledge-based behavioural factor responsible for enhancing engineering students' entrepreneurial interests.

The majority of engineering students' knowledge with hearing impairment to acquiring entrepreneurship skills at time when the quest of all stakeholders' world over is on empowerment via small business. From the research, the result reveals that the level of entrepreneur knowledge of students with hearing impairment is very high. This can be adduced to the fact that the orientation of people with hearing impairment has changed due to different teaching and re-orientation that has been available on pertaining to issue of independent living and self-employed. Udoye and Mba (2018); Binuomote *et al.*, (2018) as well as Oyewumi and Adeniyi (2013) contend that students are willing to establish and own businesses because of the rate of unemployment occasioned by the economic recession, and the teaching of entrepreneurship in various engineering schools and institutions. Similarly, knowledge of entrepreneurship among engineering students with hearing impairment is high. The positive knowledge demonstrated to acquiring entrepreneurship skills can be linked to high awareness in entrepreneurship education. This is because of entrepreneurship education and training going on among engineering students and youths in South African schools and/or by corporate organisations. This shows that the result is in line with that of Gibb (1993) who points out that positive knowledge to entrepreneur among students could be attributed to high awareness in entrepreneurship education. Hence, Giacominet al. (2011); Charney and Libecap (2000) as well as Martinet al. (2013) contend that a positive correlation exists between education (knowledge), attitudes and business creation.

According to Binuomote and Okoli (2015), engineering students need practical skills training for entrepreneurial development. It is not surprising that engineering graduates need all the practical skills listed, because the technical know-how relevant to an entrepreneur's area of business interest is very significant for business success. Rauch and Hulsink (2015) stated that having job-specific knowledge and techniques required to perform organizational roles is necessary. Therefore, engineering graduates should strive to attain mastery of the practical aspects of the business, so as to understand the secret of success in pursuing a business. Moreover, having specific knowledge and practical skills in a specific area of business could serve as a guarantee of effective performance. Akarahu and Baba (2011) supports this notion, claiming that there is no significance difference in the mean ratings of respondents on the technical competency required for successful business entrepreneurship.

The respondents rated engineering skills as needed to a high degree by business education graduates for entrepreneurship. This is in line with Okoro (2014), who posits that engineering students and graduates need information and communication technology skills to function well in in the presently highly competitive business market. Ikpesu (2014), too, states that computer

operation skills, networking and media communication skills are required for engineering students and graduates in respect of meeting their needs as future entrepreneurs.

Lee and Venkataraman, (2006) maintains that entrepreneurship is not a male subject activity and that unemployment is a syndrome experienced by both males and females, with or without special needs.

5.4. PERCEIVED BEHAVIOURAL CONTROL TOWARD ENTREPRENEURIAL EDUCATION ON ENGINEERING STUDENTS' INTERESTS TO BECOME ENTREPRENEURS

Entrepreneurial education has a strong positive effect of perceived behavioural control on entrepreneurial interest among university students. Thus, if the students perceive or believe that it is easier to become an entrepreneur, it will highly motivate them to become one. However, the students' confidence level in their ability to start and run a business needs to be improved. 97.3% of respondents strongly agreed that this factor could enhance their entrepreneurial interest, whereas 2.7% disagreed, indicating that it does not enhance their entrepreneurial interest. However, it can be inferred that this factor is widely regarded as a major contributor to their perceived behaviour regarding entrepreneurial interest. An overwhelming number of respondents (96.8%) agreed that the perception that starting a business was easy was a notable factor enhancing their entrepreneurial interest. Thus, this factor maintained a slightly closer mean value than the statement "if I tried to start a business, I would have a high probability of succeeding", while 3.2% of the engineering student disagreed that this factor was significant. 93.5% of respondents agreed that the statement "I have thought seriously about starting my own firm" was an important factor that could enhance interest, and 92.2% of respondents perceived that the idea that they could become self-employed after engineering programme in future was a notable perceived related factor responsible for enhancing entrepreneurial interest.

This shows that those students had some willingness to position themselves under their control behaviours regarding entrepreneurial interests. These results are supported by Jensen and Luthans (2000) who maintain that individuals with an internal locus of control were likely to face challenges and difficulties with a positive attitude, and they overcome those hindrances by seeking constructive solutions. Similarly, Hsiao *et al.* (2016) mention that perceived behavioural control has a positive, substantial control on entrepreneurship among managers of all levels.

Perceived behavioural control has less significance in predicting entrepreneurial interest in areas where uncertainty avoidance is high: persons who feel less capable of handling the uncertainty

of start-ups; even if they possess the necessary skills, have a lower entrepreneurial intention. Thus, perceived behavioural control would be a weak predictor of entrepreneurial interest in those areas than in areas of lower uncertainty avoidance (Liñán & Chen, 2009). Nevertheless, Liñán and Chen (2009) argue that persons with a high-risk propensity are probably able to anticipate experiencing less debilitating anxiety about an entrepreneurial career, perceive a healthier sense of control over outcome, judge the possibility of receiving positive rewards more likely, and hence possess higher perceived behavioural control.

Students who need entrepreneurial exposure have a higher score on perceived behavioural control. This shows that the greater the student's exposure to entrepreneurial courses, the greater will be their perceived behavioural control (Pihie and Akmaliah, 2009).

Basu and Virick (2008) note that prior experience of entrepreneurship education has a positive result on perceived behavioural control. Furthermore, students who have prior knowledge of entrepreneurship will have more confidence in their ability and thus higher entrepreneurial interest (Basu and Virick 2008). Similarly, Saeed *et al.* (2015) contend that entrepreneurial interest is higher in those who have high self-confidence, which represents the perceived behavioural control. This clarified the need, desire and process that require the confidence of engineering students who can actualise entrepreneurship.

5.5. PERSONALITY TRAITS BEHAVIOUR CONTROL TOWARD ENTREPRENEURIAL EDUCATION ON ENGINEERING STUDENTS' INTERESTS IN BECOMING ENTREPRENEURS

Most researchers point out reasons why individuals have a higher level of entrepreneurial interest than others: the career choice approach. Denault *et al.* (2019); Sheldon *et al.* (2019) and Bird, (1988) claim that students are attracted to careers that match their personality traits. Choosing to become an entrepreneur is similar to making a professional choice to engage in entrepreneurial activities. Most research focuses on the relationship between entrepreneurial interest and personal-level variables focus on individuals' personality and psychology factors (Liñán and Fayolle 2015). This result is consistent with previous studies, which found that entrepreneurial interest is positively related to openness to experience (Zhao *et al.*, 2005; Miao *et al.*, 2017). Similarly, the agreeableness condition combines two configurations that lead to a high level of entrepreneurial interest for students and one configuration that leads to a high level of entrepreneurial interest for employees. Thus, allow level of agreeableness combines with other

conditions to achieve a high level of entrepreneurial interest for students or employees, in line with the findings of previous studies (Schmitt- Rodermund, 2004;Zhao *et al.*, 2005).

A high level of agreeableness contradicts the general expectation of the entrepreneurial personality (low score on agreeableness). However, agreeableness was found to be one of the major big five predictors of entrepreneurial success in a study by Leutner *et al.* (2014). Regarding emotional stability, the findings are similar. It is notable that in the student sample which included a high level of emotional stability. This confirms the findings of other studies (Zhao *et al.*, 2005). On the other hand, engineering students with a low level of emotional stability can possess a high degree of entrepreneurial interest when that level of emotional stability is combined with other factors. These findings are in agreement with several studies which show no significant differences for a low level of emotional stability (high in neuroticism) between entrepreneurs and non-entrepreneurs (Antoncic *et al.*, 2015).

In summary, engineering students' way of thinking avoids the issues intrinsic to a one-size-fits-all approach and suggests that focusing on the joint and interdependent effects of various individual predictors is particularly conducive to understanding the development of entrepreneurial interest on the part of the engineering student. Even though the existence of the way of thinking towards entrepreneurship literature (Kraus *et al.*, 2018 and Stokes 2000), to the best of the authors' knowledge, the present research aims to provide a more holistic understanding of individuals with a high level of entrepreneurial interest, exploring them as being characterised by heterogeneous natures formed by individual characteristics.

5.6. THE IMPORTANCE OF THE ENTREPRENEURSHIP CURRICULUM

Table 4 presents the importance of a definite entrepreneurship curriculum that could enhance entrepreneurial interest of engineering students in becoming self-employed. A significant percentage of the respondents agreed that inviting guest speakers for official speeches is important in enhancing the entrepreneurial interest of the engineering students. Most of the respondents also agreed that group discussion on business-related courses is significant. Mentorship in business-related the projects was identified as another key factor that could enhance the entrepreneurial curriculum so as to increase the entrepreneurial interest of the engineering students. Moreover, research projects on business-related courses, support for internship, business planning ideas and training works are considered as important methods to improve the entrepreneurship curriculum.

The study's findings show that engineering students being motivated to learn entrepreneurship courses, as well as social learning, were seen as key features of trans-disciplinary knowledge alliances and they play a crucial role in establishing the conditions for a successful and innovative development that will drive curricula (Wing, 2019). The importance of the teaching method, involving facilitation and provision of environments for group learning processes in which different engineering students share their opinions in an open, supportive and trustful atmosphere is highlighted here (Cincera2018; Winkler *et al.*,2018 and Lazear, 2004).

The project team experienced a group education process involving the engineering students. The student group learning was interconnected in the collective learning process of the project team (Cincera, 2018; Neck and Greene, 2011; Ferrianiet *al.*,2009 and Midle and Silberzahn, 2008). If the student team members relearning in the group, it will broaden the ability to support and maintain an appropriate learning environment for its members (Wildemeersch, 2019; Bouncken and Reuschl, 2018; Winkler *et al.*,2018 and Neck &Greene, 2011). Therefore, even the members who did not report changes in their action theories were still impacted by the promoted culture of dialogue considered as desirable by the group. Thus, the learning process in the engineering students' team was initiated with the interest were good to design new programme focusing on promoting a new way of thinking in society during and after studying in order to become self-employed, which may have a deep symbolic meaning (Chou, 2018; Koukios *et al.*, 2018; Angeli *et al.*, 2016).

Mentors thus play a central role (Trivedi2016) by influencing attitudes and providing knowledge for affective education (Goswami *et al.*, 2018) enabling engineering students to be innovative in their approach and sending them out to companies as entrepreneurial agents (Huq and Gilbert, 2017).

Le Roux and Nagel, (2018) point out ways in which engineering students can motivate their entrepreneurial interest: group discussion, individual written reports, individual presentations, group projects, guest speakers, formal lectures, action learning, seminars, video recordings, and web-based learning. According to Lee *et al.* (2016), most popular teaching methods in entrepreneurship education consists of creation of business plans, case studies and lectures. However, Naong, (2019) and Ruswanti (2016) recommend a different approach, arguing that there are many ways to offer entrepreneurship education, depending on the objectives of such education. If the objective of the education is to increase the understanding of what entrepreneurship is about, the most effective way to accomplish the objective is to provide

information through public channels such as media, seminars, or lectures. These methods are effective in terms of sending the relevant information to a broader population in a relatively short time period. If the objective is to equip students with entrepreneurial skills, which are applicable directly to work, the best way is to provide education and training that enables students to be directly involved in the entrepreneurial process, for example by letting them take part in industrial training. Lastly, if the objective of the education is to prepare students to act as entrepreneurs, the most effective technique is to facilitate experiments by trying entrepreneurship out in a controlled environment, for example through business simulation or role-playing (Ahmad *et al.*, 2018).

5.7. THE ESSENTIALS OF THE ENTREPRENEURSHIP CURRICULUM

This section presents the perceptions of the respondents regarding the essentials of the entrepreneurship curriculum. Respondents were requested to indicate the extent to which each of the identified essentials could enhance their entrepreneurial interest. The majority of respondents indicated that extracurricular activities related to entrepreneurship are a very essential factor in determining the entrepreneurship curriculum to select. However, a minority of respondents indicated that these had little influence in determining their entrepreneurial interest. Moreover, mentorship in business-related projects, inviting guest speakers for official speeches, watching videos and recordings related to entrepreneurship, bilateral learning and supporting internship could also enhance the entrepreneurship curriculum.

The engineering curriculum consists of a list of courses and activities for the lecturers and the general objectives of the programme. Ementa (2018) sees the curriculum in engineering education as the whole of those experiences, skills, knowledge, and activities scientifically designed to educate the engineering students for gainful employment in any chosen occupation or cluster of occupations. This denotes that the aim of the engineering education curriculum is to develop manipulative skills for employment and or producing job makers and not job seekers. Products of engineering education depend largely on the type of the curriculum of the engineering institutions. Hence, the engineering education curriculum should be developed based on the needs of the society which it is to serve. It is essential that the curriculum be updated or reviewed in order to update manipulative skills, knowledge, attitudes and values as well as keeping up with developments in science and technology and their application to realistically prepare the students for real-world workplaces in the industry (Wordu *et al.*, 2018).

What is consequently obvious is that the engineering education curriculum should essentially be geared towards development of specific skills necessary for attainment of engineering students' empowerment to become self-employed. Consequently, for engineering students to attain expertise and self-sustenance, the curriculum of education engineering should be reviewed to meet the current and future challenges of the youth, as well as the needs of national development. According to Micozzi, and Micozzi (2015), has an essential part to play and it must be the centre of the competences essential to perform effectively. Whereas as well provide effective work experience for lecturers within educational institutions if their learning is to be relevant.

It is generally agreed that traditional methods are ineffective in encouraging entrepreneurial attributes. Such methods do not prepare students to become active entrepreneurial participants. These methods prepare a student to work for an entrepreneur, but not to become one. The existing problems in teaching methods confirm Kirby's (2004) comments that most entrepreneurship educators still relate their courses with new business creation (educate for), they actually end up teaching about entrepreneurship. However, while it is essential that courses in entrepreneurship be instituted, such courses should also be practically-oriented. Traditional methods are useful only to give engineering students the commercial underpinnings of their entrepreneurial actions. Engaging in something practical and having an opportunity to question, investigate, converse, and discuss with real-world entrepreneurs gives both knowledge and skills and also engenders motivating attitudes. From a practical point of view, however, most of the supported active/action-based teaching methods are costly and may not align to the conventional engineering system of teaching (Mwasalwiba, 2010).

5.8. THE ENTREPRENEURSHIP CURRICULUM AS A COMPULSORY FACET OF EDUCATING ENGINEERS

In according to all tables for the compulsoriness entrepreneurship curriculum that presents the perceptions of engineering student that could enhance their entrepreneurial interest in becoming self-employed after graduation were found moderates. Respondents were required to indicate the extent to which each of the identified factors had an influence in becoming self. A significant number of respondents ranked site visitation were ranked as a compulsory factor that could enhance the entrepreneurship curriculum. Moreover, class practicals in business-related courses, inviting guest speakers for seminars, and preparation for risk-bearing all have their roles to play, too. In addition, supporting internships, training workshops and business planning ideas were identified to have a large potential to improve the entrepreneurship curriculum. All these could

enhance with same mean value, although less significant than one another, considering the standard deviation of different factors in the design curriculum.

The survey shows that engineering students tended to take a comprehensive approach to delivering entrepreneurship education, which means that instead of sticking to one and only one approach, they would adopt a variety of teaching methods in order to achieve strategic targets. 80% of the engineering departments engaging in entrepreneurship education held workshops and internships for their students. 58% of them let their engineering students learn through competition and case study. Mentoring was introduced by 71% of the engineering departments. A total of 75% percent of the engineering departments have used the project learning method.

Fulgence (2015) supports the findings of the entrepreneurship training programme offered in Tanzania. All engineering departments providing entrepreneurship education strongly agreed that their programmes aimed at helping engineering students understand the business world. Khairutdinov *et al.* (2018) argue that entrepreneurship education is “a way to describe economic development which will to strategize approached used in creating job opportunities”. Most of the engineering students’ respondents said that these programmes were closer to reality; very often they allowed students to witness and/or be part in the whole process of running a business, from the selection of products, setting price and marketing to the calculation of profit and loss. He regarded it as a good teaching approach. The increasing demand for entrepreneurship education globally is well recognised (Posselt *et al.*, 2019; Daneshjoovash and Hosseini, 2019; Finkle, 2007).

Preparing a business plan produces an impression of formality and conviction often compulsory before an engineering student’s creation of a new business will be taken seriously. Business planning is the first step toward an unambiguous process widely known as entrepreneurship, but unlike the activity of entrepreneurship, it focuses primarily on ideas as opposed to actions (Honig, 2004). A well-crafted business plan is one of the most compulsory communication tools for an entrepreneur, and provides a sense of legitimacy to the business and the founders. The lack of a good business plan is often perceived as a lack of interest or commitment on the part of the entrepreneur(s). Many entrepreneurs learn the hard way that the preparation of a well-crafted business plan can be an overwhelming task. A well-written plan is concise, yet comprehensive, and requires a multitude of decisions about all aspects of new business creation, from exploiting the opportunity to acquiring resources and building the top management team. Constructing a realistic business plan requires a profound understanding of the business model, the product, the

competitive landscape, and the prospective financial model. However, understanding the business is not enough: a business plan must also be credible, a factor which will be essential to engineering students (Bottoms, 2019; Kerzner, 2019; Reich and Benbasat, 2000; Kolenko, 1996).

5.9. THE NEED FOR THE ENTREPRENEURSHIP CURRICULUM

This presents the opinions of the respondents on needs-related factors responsible for increasing the entrepreneurial interest of the engineering students. A significant percentage of the respondents agreed that an emphasis on risk-bearings needed to improve the entrepreneurship curriculum. Inviting guest speakers for official speeches, extracurricular activities related to entrepreneurship, group discussion on business-related courses and the respondents identified all support for internship with high percentage as another key guideline to improve the entrepreneurship curriculum. Moreover, mentorship in business-related projects, site visitation and entrepreneurship tutors were as important aspects of improving the entrepreneurship curriculum.

This study shows that engineering students has practical skills as need to a very high extent for businesses towards enhancing their entrepreneurial success. This is in line with the finding of Binuomote and Okoli (2015) who reveal that engineering students need practical skills training for entrepreneurial development. It is not surprising that engineering graduates need all the practical skills listed, because the technical expertise related to an entrepreneur's area of business interest is very significant for business success. According to Mshelia and Abdulrahman, (2018); Ezenwafor, and Olaniyi, (2018) and Kola et al. (2019) having job-specific knowledge and practices that are needed to perform the required organizational role is very desirable. Therefore, engineering graduates should endeavour to attain mastery of the technical aspect of the business in order to understand the secret of success in business. Also, having specific knowledge and techniques in a definite area of business could serve as a guarantee for successful performance. This is in agreement with the report of Akarahu and Baba (2011) that there is no significance difference in the mean ratings of respondents on the technical competency required for successful entrepreneurial business practice. Thus the design of the entrepreneurship curriculum needs to be inclusive and affective. It should facilitate a learning community, where engineering students are able to observe the world through a different lens and create opportunities; and include serious games, design-based thinking and reflective practice, businesses as course work, role-play and simulations (Murray *et al.*, 2018; Neck &Greene, 2011; Fayolle &Gailly, 2008; Pittaway & Cope, 2007a &b).Daniel (2016) points out that there is a need to create the type of enabling environment that is conducive to encouraging engineering students' entrepreneurial thinking and behaviours.

The engineering student that engages in entrepreneurship education would represent a key component of the entrepreneurial ecosystem (Cohen, 2006; Isenberg, 2010 & 2011). As a result, the concept of the engineering universities' entrepreneurial curriculum supported this study (Mosey & Kirkham, 2019; Hofer & Baur, 2018 and Ali *et al.*, 2012). In similar terms, university support for entrepreneurial ecosystems and the creation of an entrepreneurial regional culture has been the subject of analysis in prior research (Feldman, 2001; Pitelis, 2012; Olokundun, 2018). A related concept of high importance with regard to entrepreneurial ecosystems is stakeholder theory (Wadhwa 2010). Engineering students could foremost employ in a business context that affects business activities at end creates more job and social-economic growth.

In the previous literature, teaching methods are divided into two groups, which are termed "traditional methods" (comprising normal lectures) and "innovative methods" (which are more action-based). Bennett (2006) states that there is a need for the instructor to facilitate learning, but not to control and apply a method that enhances engineering students' self-discovery. The example lectures, group discussions and case studies. These are actually the same methods used in other business-related courses, which, according to Bennett (2006), are passive and less effective in helping to produce entrepreneurial characteristics.

5.10. MOTIVATIONAL FACTORS

Table 5.13 shows the ranking results for each motivational factor (e.g. intrinsic rewards, extrinsic rewards, independence/autonomy, family background and change management) and the opinions of the respondents on personality-related factors responsible for increasing their entrepreneurial interest. Enjoyment of the excitement of entrepreneurial activity ranked as the first priority in the intrinsic rewards motivational factor. Increasing of personal income opportunity was also ranked as having major significance under the extrinsic rewards motivational factor. The appeal of being one's own boss was the most significant factor under the independence motivational factor. To develop new ideas, innovations and initiatives had the highest ranking in the change management (adopting changes) motivational factor. In addition, building a business to pass on was notable as the highest-ranking factor in the family background section. Hence, 10 motivational factors, consisting of two intrinsic rewards, two extrinsic rewards, two independences/autonomy, family background and change management were recorded to have high levels of motivational factors that could enhance entrepreneurial interest. These ten motivational factors are: 'to be free from corporate organisation' (IR1), 'to increase my personal income' (ER1), 'to gain public recognition' (IR2), 'to control my own destiny' (IAR1), 'to secure a future for family members' (FBR1), 'to obtain self-employment' (IAR2), 'to take up the family

business' (FBR2), 'to acquire personal wealth' (ER2), 'to recognise opportunities 'and 'to exploit opportunities' (CMR1 and 2).

The research is intended to examine the perceptions of engineering students on entrepreneurship, on the motivational factors behind starting up and sustaining a new venture. Overall, the respondents to this study have a positive perception towards entrepreneurship and are extremely motivated to be engaged in entrepreneurship. The majority of the respondents was from engineering departments and could apply their engineering skills to manage businesses. This coheres with a study by Zahariah *et al.* (2010) who argue that half of Malaysian business students surveyed had an interest in being entrepreneurs.

The real motivational factors that could enhance the engineering students' entrepreneurial interests are similar to Moy *et al.* (2001). The engineering students are motivated to start a new business due to intrinsic rewards, extrinsic rewards and the independence/autonomy of becoming entrepreneurs. The findings are similar to the entrepreneurs in the US and Russia (Zhuplev, 1998). This is also consistent with Liang and Dunn's study (2007) who argue that personal and financial triggers are significant triggers to start up a business venture. For this reason, it can be acceptable by the fact that the engineering graduates are looking for a better way of life and more freedom. Nevertheless, they are left with competition and lack of working funds when faced with the challenge of starting a new business. This supported the result of Moy *et al.* (2001), who established that students from Hong Kong and Thailand encountered the same barriers to starting up a new business. The necessity for the support of government in promoting entrepreneurship was rated fairly high and this finding is in agreement with Fogel's (2001) findings, which show that high taxation and lack of availability of long-term financing hinders the effort to promote entrepreneurship (Moy, *et al.*, 2001; Ooi, 2008; Phan, *et al.*, 2002; Shandu *et al.*, 2011). This finding is consistent with However, surprisingly, working experiences were found to have no significant effect on entrepreneurial motivation in starting up a new business.

This finding supports a study by Kristiansen and Indarti (2004). The majority of respondents were studying engineering at university, although some of them have small amounts of previous working experience, less than a year. Hence, working experiences might not be a significant factor when starting up a new business. However, in the absence of available data, the prevailing assumption remains in place. Additionally, those who are the first born in family show a higher interest towards entrepreneurship, motivation and capability to start a new business, when compared to those who are born later. This is in support of the study by Ooi (2008). This may be

due to the fact that, in many cultures, the firstborn, particularly if male, is expected to financially assist parents and other family members.

5.11. FINDINGS OF QUANTITATIVE DATA

The table indicates major quantitative findings in the research that could enhance the undergraduates' entrepreneurial education toward sustainability of employment in South African and worldwide.

Table 5:1 Summary of findings of quantitative data

S/N	CONCEPTS	Issues addressed	Findings (major)
1.0	- To identify the extent of the entrepreneurial interest of engineering students	-The extent of the entrepreneurial interest of engineering students	<p>They would rather become an entrepreneur than become a salary-earner</p> <p>They would prefer to start their own business rather than become unemployed</p> <p>The students had been appointed to be leaders in a business</p> <p>The students know someone who didn't have a degree, yet become self-employed</p> <p>The students will make every effort to manage their own business</p>
2.0	- To identify the factors that could enhance the entrepreneurial interest of engineering students	1. Attitude-based behavioural factors	<p>To control what they did and not be controlled by someone else</p> <p>The students would like to start their own businesses if they possessed the opportunity and resources</p> <p>They do not need to worry about managing risk to start a business</p> <p>Being an entrepreneur is more satisfying to these students</p> <p>Undertaking entrepreneurship courses will offer them good opportunities in terms of their careers</p> <p>The students see entrepreneurship courses as practical and affordable to them</p>
		2. Knowledge-based behavioural factors	<p>1. The ability to apply their academic backgrounds to start a business</p> <p>2. The ability to understand the nature of business</p>

			<p>3. They can determine the number of workers that are needed to start up a business</p> <p>4. To provide solutions to problems identified</p> <p>5. The students can use their academic knowledge to manage the risk involved</p>
		3. Perceived behavioural factors	<p>If they try to start a business, they will have a high probability of succeeding</p> <p>To start up a business would be easy to them</p> <p>They have given serious thought to starting their own businesses</p> <p>They could become self-employed after completing their engineering programme</p>
		4. Personality Traits factors	<p>The students would like to create businesses</p> <p>The students can detect an opportunity</p> <p>The students are able to address stakeholder interests in a business-related plan</p> <p>The students are able to understand the values that could create more innovations</p> <p>The students believe that every time they failed a task, they could reflect on why they had failed so that they could learn how to do it better in the future</p>
3.0	1. To identify the appropriate entrepreneurial curriculum that will enhance engineering students' knowledge regarding being self-employed	-The important/ essential and compulsory on the entrepreneurship curriculum content	<p>Inviting guest speakers for official speeches</p> <p>Group discussions in business-related courses</p> <p>Mentorship in business-related projects</p> <p>Projects in business-related courses</p> <p>Support for internship</p> <p>Business planning ideas</p> <p>Extracurricular activities related to entrepreneurship</p> <p>Practical experience</p> <p>Entrepreneurship tutors</p> <p>Training workshops</p> <p>Site visitation</p> <p>Risk-bearing</p>
		-The needs of the entrepreneurship curriculum content	<p>Risk-bearing</p> <p>Inviting guest speakers for official speeches</p> <p>Extracurricular activities related to entrepreneurship</p> <p>Group discussion in business-related courses</p> <p>Support for internship</p> <p>Mentorship in business-related projects</p> <p>Site visitation</p> <p>Entrepreneurships tutor</p>
4.0	-To recommend the modalities that could motivate the entrepreneurial interest of engineering	Intrinsic Rewards	<p>To meet the challenge</p> <p>To prove I can do it</p> <p>To obtain personal growth</p> <p>To gain public recognition</p> <p>To be free from corporate organisation</p>

students regarding becoming self-employed	Extrinsic Rewards	To increase my personal income To increase my income opportunity To acquire personal wealth
	Independence/Autonomy	To be my own boss To obtain self-employment To acquire personal security To allow for early retirement To maintain my personal freedom To control my own destiny
	Family Background	To build a business to pass on To secure a future for family members To take up the family business
	Change Management (adopting changes)	To develop new ideas, innovations and initiatives To respond to change To recognise opportunities To exploit opportunities

5.12. ACHIEVING THE OBJECTIVES OF THE STUDY

The first objective of this study concerned examining the extent of the entrepreneurial interest of engineering students. In achieving the objective, the data collected were analysed and the major findings centred on: students would rather become an entrepreneur than to become salary earners. They would like to start their own businesses rather than become unemployed, most of them had been appointed leader in a business, most of them knew someone who did not have a degree, yet become self-employed, and most of them claimed that they would make every effort to manage their own business, as presented on entrepreneurial interest analysis.

The findings from the study indicate that the majority of the respondents had a positive attitude towards entrepreneurial interest. The majority of the students were very satisfied to control what they did, and not be controlled by someone else. They also reported that, given the opportunity and resources, they would like to start businesses. These were all important factors responsible for enhancing entrepreneurial interest. They would venture into self-employment. This reveals that availability or lack of resources to venture into self-employment affects a student’s attitude regarding entrepreneurial interest positively or negatively. Students indicated that they did not need to worry about managing risk to start a business and that to be an entrepreneur was more satisfying. The study found that entrepreneurial education had a strong positive effect on personal attitudes regarding entrepreneurial interest.

The second objective of this study was to evaluate the factors that could enhance the entrepreneurial interest of engineering students. In achieving the objective, the data collected was

analysed and the major findings centred on attitude-based behavioural factors, knowledge-based behavioural factors, perceived behavioural factors and personality traits factors. The findings indicate that students preferred to be able to control what they did and not be controlled by someone else, they stated that they would like to start their own businesses, given the opportunity and resources, they expressed a lack of concern about managing risk when starting a business and perceived being an entrepreneur as more satisfying. They felt that taking entrepreneurship courses would offer them good opportunities in terms of their careers and most of the students saw entrepreneurship courses as practical and affordable to them.

The finding shows that engineering students have the entrepreneurial knowledge to apply academic backgrounds to starting a business that could boost their understanding of the nature of business. Similarly, most engineering students felt they could use their academic knowledge to manage the risk involved and to provide solutions to problems identified during the course of starting a business.

Additionally, perceived behavioural factors were also influenced their entrepreneurial interest: the perceived that there was a high probability of success if they tried to start a business, and that it would be relatively easy to do so.

They had given serious thought to starting their own businesses and felt that they could become self-employed after graduation.

In conclusion, the findings show that most of the students would like to create businesses, and could detect an opportunity to do so if one arose. Their attitude to task failure was to reflect on why they failed so that they could learn how to do better in the future and could address stakeholder interests in business-related plans.

The third objective of this study was to ascertain the appropriate entrepreneurial curriculum that will enhance engineering student's knowledge towards being self-employed. In achieving this objective, the data collected were analysed and the major findings were centred on the important, essential, compulsory, and needs on the entrepreneurship curriculum content.

The findings in Table 4 show the major entrepreneurial curriculum factors that enhance engineering student's knowledge towards being self-employed. These factors are Inviting guest speakers for official speeches, group discussion on business-related courses and mentorship in business-related projects Similarly, the projects on business-related courses, support for internship, business planning ideas and training works, extracurricular activities related to

entrepreneurship and practical experience are notable factors that enhances their interest. In addition, entrepreneurship tutors, training workshops, site visitation, risk-bearing and site visitation were all significant factors in achieving engineering students' entrepreneurial education toward becoming self- employed.

Other major findings also show that there are needs to improve the entrepreneurship curriculum content in the area of risk-bearing, inviting guest speakers for official speeches. In addition, in extracurricular activities related to entrepreneurship, group discussion on business-related courses, support for internship, mentorship in business-related projects, site visitation and entrepreneurship tutor in order to enhance the engineering students' entrepreneurial interest in becoming self-employed during and after studying.

Objective four of this study is to recommend the modalities that could motivate the entrepreneurial interest of engineering students regarding becoming self-employed. The objective was achieved through the identified factors that are responsible for enhancing their entrepreneurial interest, which include intrinsic rewards, extrinsic rewards, independence/autonomy, family background and change management (adopting changes).

The findings show that, in terms of intrinsic rewards, engineering students were able to meet the challenge, prove they can start up a business, and want to obtain personal growth, gain public recognition and to be free from corporate organisation. Similarly, with regard to extrinsic rewards, the engineering students wanted to increase their personal income, to increase their income opportunities and to acquire personal wealth.

The findings show that with regard to independence/autonomy, engineering students were motivated by the thought of becoming their own boss, obtaining self-employment, acquiring personal security, maintaining their personal freedom and controlling their own destiny. Moreover, family background motivated the engineering students, as they were ready to build a business to pass on, to secure a future for family members and to take up the family business. Thus, change management (adopting changes) includes developing new ideas, innovations and initiatives, to respond to change, to recognise opportunities and to exploit opportunities.

5.13. COMPARATIVE MODALITIES USED IN PLOTTING THE GRAPHS UOT (A), TU (B) AND A+B

- To obtain appropriate significance between the characteristics of UoT, TU and combined universities opinions on the data collected, the UoT factors were analysed and ranked.
- The UoT factors were used in plotting against B and a combination of A+B in all the graphs in order to obtain reliable graphs.
- The UoT group of factors were ranked in descending order. However, the TU and A+B are ranked, but not in descending or ascending order.
- ***The comparison/relationship for this research is on the UoT and the TU.***

5.14. THE COMPARATIVE ANALYSIS OF THE ENTREPRENEURIAL INTEREST (ENTREPI) OF STUDENTS OF THE UNIVERSITY OF TECHNOLOGY (A) AND THE TRADITIONAL UNIVERSITY (B) AND COMBINATION A+B

Table 5:2 shows the entrepreneurial interest the university A against B and A+B

ENTREPRENEURIAL INTEREST
I feel happy and proud if one of my family members is self-employed
I know of someone without a degree who became self-employed
I would rather become an entrepreneur than become a salary-earner
I would like to start my own business rather than become unemployed
I can take advantage of market conditions when running a business
I was appointed to be a leader in a business
I feel bad when I see graduates from reputable universities unable to secure a job
I would prefer a salaried job due to bad experiences of people I know who have owned a business
My gender will have a negative effect on starting a business
I feel motivated every time I see someone is doing better in business
My family background does not allow for financial support to start my own business
I would like to be the manager of someone else's business

I would like to get a salaried job due to family resistance to me starting a business
I do not want to become an intrapreneur in someone else's business
I will make every effort to manage my own business
I would like to learn about business-related courses in the engineering field
I do not have the finances to start my own business
I have the necessary communication skills to become self-employed

Table 5:3 shows the abbreviation comparison the entrepreneurial interest of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A- B
	MV	Ranking		%		M V	%		
ENTRPI 1	3.59	1	3.74	96.7	1	3.62	87.3	2	0.12
ENTRPI 2	3.46	2	3.70	95.9	2	3.31	59.7	13	0.39
ENTRPI 3	3.43	3	3.62	91.6	3	3.60	86.2	3	0.02
ENTRPI 4	3.36	4	3.56	90.8	4	3.26	57.0	16	0.3
ENTRPI 5	3.35	5	3.54	86.7	5	3.27	58.8	15	0.27
ENTRPI 6	3.35	6	3.49	80.4	6	3.43	69.6	8	0.06
ENTRPI 7	3.33	7	3.46	76.3	7	3.31	58.9	14	0.15
ENTRPI 8	3.31	8	3.40	70.5	8	3.32	61.6	12	0.08
ENTRPI 9	3.30	9	3.39	68.2	9	3.38	68.4	9	0.01
ENTRPI10	3.28	10	3.38	66.4	10	3.68	89.2	1	0.3
ENTRPI 11	3.27	11	3.37	63.8	11	3.33	63.0	11	0.04
ENTRPI 12	3.27	12	3.35	60.1	12	3.10	54.1	18	0.25
ENTRPI 13	3.26	13	3.33	59.3	13	3.36	65.4	10	0.03
ENTRPI 14	3.25	14	3.29	57.2	14	3.45	71.4	7	0.16
ENTRPI 15	3.24	15	3.28	55.7	15	3.50	75.8	5	0.22
ENTRPI 16	3.21	16	3.24	53.8	16	3.24	55.6	17	0.0
ENTRPI 17	3.19	17	3.20	51.9	17	3.49	72.1	6	0.29
ENTRPI 18	3.10	18	3.15	50.6	18	3.55	78.7	4	0.4

The comparative of the Entrepreneurial Interest Of University A, B and A+B

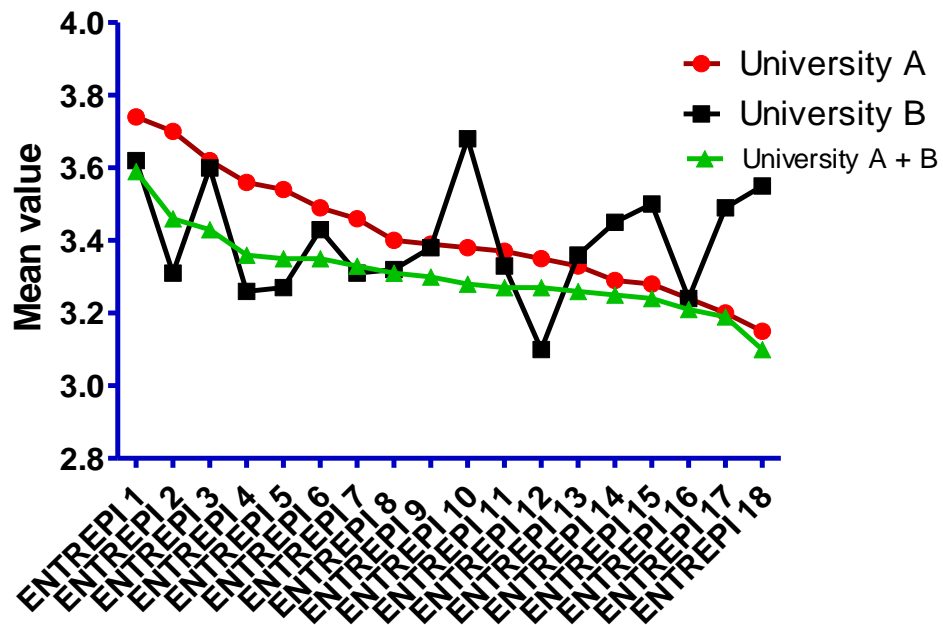


Figure 5:1 shows comparison of the entrepreneurial interest of the engineering students of University A, B and A+B

The findings of the study analysis provide important new insights into the determinants of engineering students' entrepreneurial interest. Students' interests (and preferences) to become self-employed differ substantively between the University of Technology and the Traditional University. Self-employment preferences and interests are, on average, much higher among students in the University of Technology than the Traditional University, with values of 3.74, 3.70 and 3.62, compared to 3.68, 3.62 and 3.60 respectively. Moreover, it can be assumed that generally student entrepreneurial interest needs more attention as indicated when combined both universities in the ANOVA test graph using the mean values. Bzdok, *et al.* (2018) explain that when P-value is greater than ($P > 0.05$), there is no significant difference. The result of the analysis from the Two-Way ANOVA test indicates that there are no significant differences in the entrepreneurial factor ($P < 0.001$). There is no significant difference between the students of the two universities. Moreover, students in TU expect, on average, more support from their personal networks to deal with the challenges of been self-employed than students in UoT. By contrast, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is plausible in the behaviours between UoT and the TU.

5.15.1. The Comparison Analysis of the Enhancement factors of the University of Technology (A) and the Traditional University (B) and Combination of A+B

The critical factors that could enhance the entrepreneurial interest on the engineering students compared below in the University of Technology and Traditional University and a combination of the both universities.

Table 5:4 shows the critical factors that could enhance the entrepreneurial interest of university A, against B and A+B

ATTITUDE FACTORS
I would rather be a CEO than secure a job after graduation.
An entrepreneurship course will offer me good opportunities in terms of my career
I like to control what I do and not be controlled by someone else
I do not need to worry about managing risk
To own a company as an entrepreneur is more attractive for me
Being an entrepreneur is more satisfying for me
Entrepreneurship courses are practical and affordable to me
If I had the opportunity and resources, I would like to start a business
If I start my business, I will certainly be successful
Entrepreneurial courses aren't necessary since there are established companies
I would rather be a job-seeker than to be a CEO, due to high risk involved after graduation
KNOWLEDGE BEHAVIOUR FACTORS
I have the ability to apply my academic background to start up a business
I have the ability to understand what measures to take to grow a business.
I have the ability to process raw materials into finished goods for profit-making
I have the ability to determine appropriate locations for a successful business
I can use my academic knowledge to manage risk
I have the ability to understand the nature of business
I have the ability to provide solutions to identified problems.
I have the ability to identify business operational problems
I can determine the amount of work needed to start up my business
I do not have the necessary business knowledge to start up a business
PERCEIVED BEHAVIOURS
I know how to develop an entrepreneurial project
To start a business would be easy for me.
To maintain a business would be easy for me
If I tried to start a business, I would have a high probability of succeeding
I have thought seriously about starting my own firm

I could become self-employed after my engineering programme in future
To start my own firm would probably be the best way for me to take advantage of my business-related education
I have the ability to anticipate technical developments by interpreting surrounding social trends
My ability to cope with failure can be improved through education in school
Creative thinking skills can be acquired through entrepreneurship learning
I find myself being curious about a lot of things and people I encounter in life

Table 5:5 shows comparison of the personality traits of the engineering students of University A, B and A+B

PERSONALITY TRAITS
I like to create business
When I read about a new innovation, I try to understand the value that it will create
I am confident of my skills and abilities to start a business.
I extend to use new opportunity to rebrand my product
I will start my own business if I detect an opportunity.
I have leadership skills that are needed to be an entrepreneur.
Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future
I am confident of my skills and abilities to start a business.
I have the mental maturity to be an entrepreneur.
I'm able to identify potential stakeholders for a new product or service
I am able to address stakeholder interests in a business plan

Table 5:6 shows abbreviations comparison of the attitude-based behaviour of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A-B
	MV	Ranking		%		M V	%		
ABTENT1	3.40	1	3.75	98.6	1	3.57	72.6	4	0.17
ABTENT 2	3.34	2	3.71	96.7	2	3.59	81.1	3	0.10
ABTENT 3	3.31	3	3.63	94.5	3	3.50	70.2	5	0.12
ABTENT 4	3.30	4	3.56	93.2	4	3.42	67.0	6	0.14
ABTENT 5	3.25	5	3.54	90.4	5	3.40	62.4	7	0.14
ABTENT 6	3.24	6	3.49	89.3	6	3.64	87.3	1	0.15
ABTENT 7	3.23	7	3.46	86.8	7	3.35	57.6	9	0.11
ABTENT 8	3.20	8	3.40	84.9	8	3.34	61.8	10	0.06
ABTENT 9	3.19	9	3.39	80.1	9	3.61	83.3	2	0.25
ABTENT 10	3.18	10	3.38	50.5	10	3.37	60.4	8	0.01
ABTENT 11	3.12	11	3.37	48.8	11	3.32	45.3	11	0.05

Comparison of Attitude Behaviour Factors

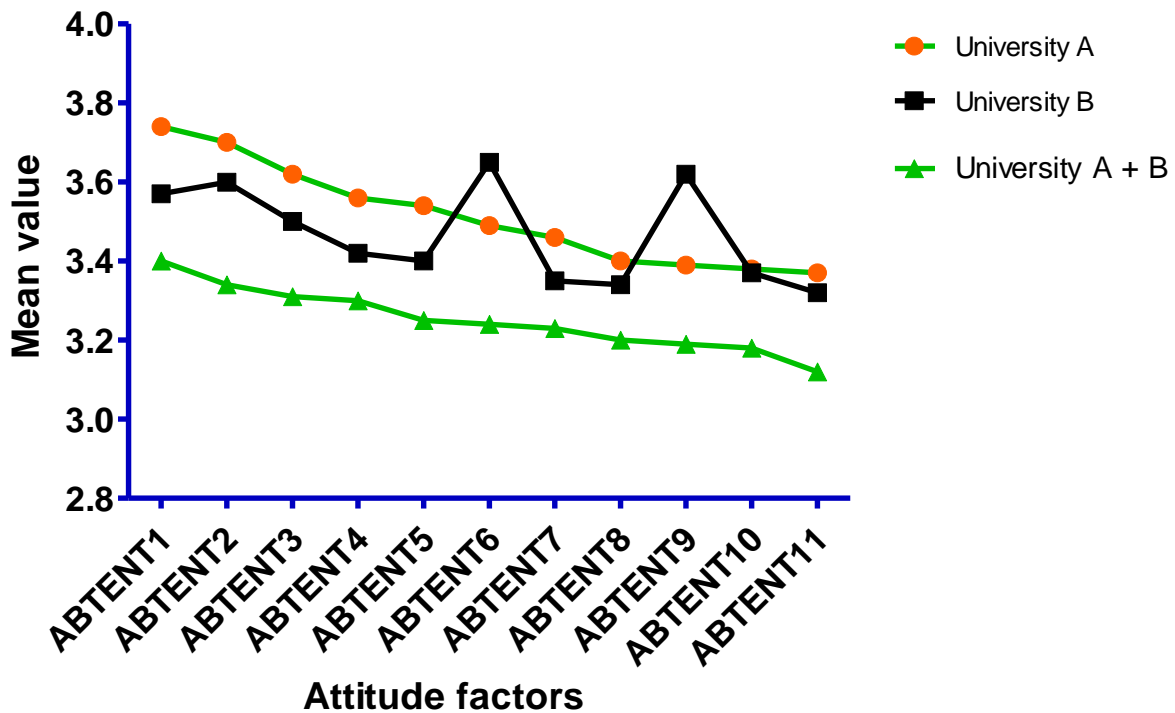


Figure 5:2 shows comparison of the attitude factors of the engineering students of University A, B and A+B

The above information represents the comparison of the students' attitudes towards their behaviour regarding becoming self-employed. The students' interests (and preferences) to become self-employed were found to differ between the University of Technology and the Traditional University. Self-employment preferences and interest are, on average, much higher among students in the University of Technology than The Traditional University, with mean value 3.75, 3.71 and 3.63 than 3.64, 3.61 and 3.59 respectively. However, it can be assumed that generally student Attitude-based behaviours could impact the entrepreneurial interest as such more attention is needed. Looking at the combination of both universities in the ANOVA test graph using the mean values. The Two-Way ANOVA test indeed confirms the level of differences. Bzdok, *et al.* (2018) explain that when P-value is greater than ($P > 0.05$) there is no significant difference. The result of the analysis from the Two-Way ANOVA test indicate that there are no significant differences in the attitude factor ($P > 0.05$).

Furthermore, students in TUs expect, on average, more support to deal with the challenges/causes affecting them in becoming self-employed than students in UoTs. By

comparison, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is reasonable to expect.

Table 5:7 shows abbreviation comparison of the knowledge-based behavioural factors of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV= A-B
	MV	Ranking		%		M V	%		
KBEI 1	3.44	1	3.80	94.5	1	3.48	76.8	4	0.32
KBEI 2	3.40	2	3.79	93.7	2	3.69	80.3	3	0.10
KBEI 3	3.39	3	3.70	90.4	3	3.50	70.2	5	0.20
KBEI 4	3.30	4	3.66	88.3	4	3.42	67.0	6	0.24
KBEI 5	3.29	5	3.62	85.6	5	3.40	62.4	7	0.22
KBEI 6	3.26	6	3.60	84.3	6	3.65	87.3	1	0.05
KBEI 7	3.21	7	3.41	80.5	7	3.35	57.6	19	0.06
KBEI 8	3.12	8	3.33	78.1	8	3.34	61.8	8	0.01
KBEI 9	3.10	9	3.18	75.9	9	3.62	83.3	2	0.44
KBEI 10	3.09	10	3.12	71,8	10	3.37	60.4	9	0.25

The Comparative of the Knowledge behavioral factor of University A, B and A+B

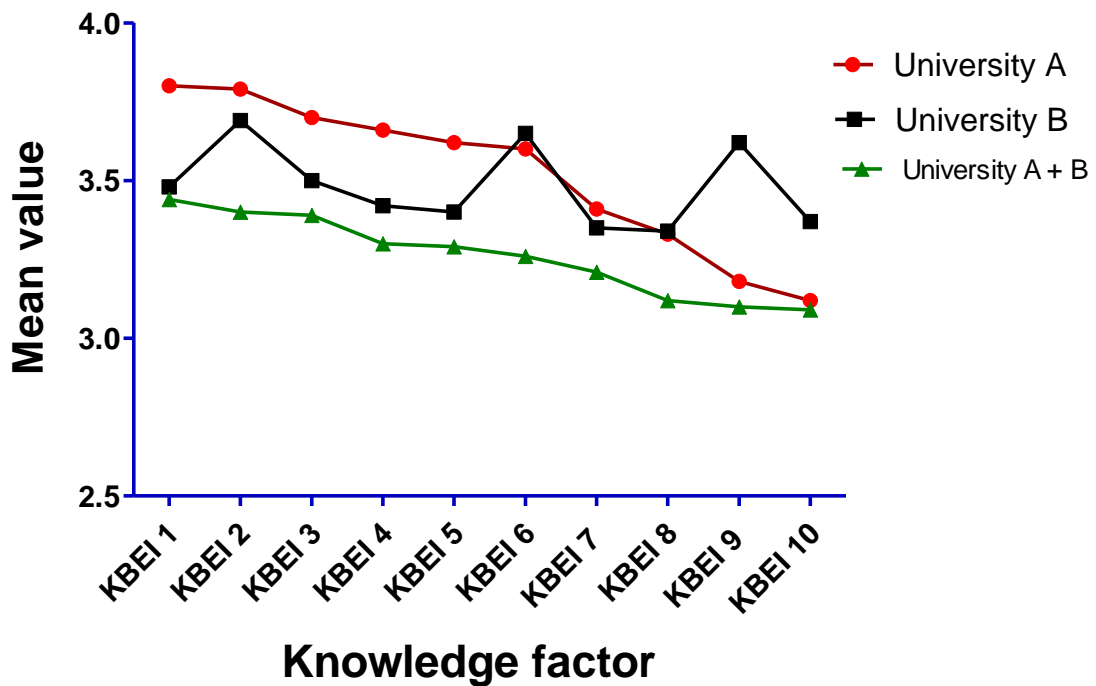


Figure 5:3 shows a comparison of the knowledge-based behavioural factors of the engineering students of University A, B and A+B

The above information represents the comparison of the students' knowledge towards behaviours involving becoming self-employed. The students' entrepreneurial interests (and preferences) to become self-employed were found to differ substantively between the University of Technology and The Traditional University. Knowledge-based factor preferences and interests are much higher among students in the University of Technology than those in the Traditional University, with mean values of 3.80, 3.79 and 3.70, compared to 3.69, 3.65 and 3.62 respectively. Therefore, the ANOVA test graph shows that student knowledge needs to enhance so that engineering students will be motivated to entrepreneurial education. The Two-Way ANOVA test indeed confirms the level of differences. Bzdok, *et al.*(2018) point out, however, that when P-value is greater than ($P > 0.05$), there is no significant difference. The result of the analysis from the Two-Way ANOVA test indicate that there are no significant differences in the knowledge-based factor ($P > 0.05$). Moreover, students in the TU anticipate more support to deal with the challenges of self-employment than is the case for students in the UoT. By comparison, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is reasonable in the behaviours between UoT and that.

Table 5:8 shows abbreviation comparison of the perceived behaviours factors of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV= A-B
	MV	Ranking	MV	%		M V	%		
PBEI 1	3.66	1	3.80	98.2	1	3.64	86.5	1	0.16
PBEI 2	3.60	2	3.75	97.5	2	3.40	71.5	6	0.35
PBEI 3	3.38	3	3.72	95.7	3	3.55	78.4	4	0.17
PBEI 4	3.35	4	3.70	93.6	4	3.60	84.9	2	0.10
PBEI 5	3.33	5	3.66	91.9	5	3.33	70.0	7	0.33
PBEI 6	3.24	6	3.64	90.3	6	3.28	68.0	8	0.36
PBEI 7	3.23	7	3.55	87.8	7	3.08	57.6	11	0.47
PBEI 8	3.16	8	3.50	85.1	8	3.50	74.7	5	0.00
PBEI 9	3.14	9	3.43	80.4	9	3.23	63.6	9	0.20
PBEI 10	3.10	10	3.32	76.2	10	3.59	81.5	3	0.27
PBEI 11	3.05	11	3.20	73.9	11	3.15	60.9	10	0.05

The Comparative of the Perceived Behavioral factor of University A, B and A+B

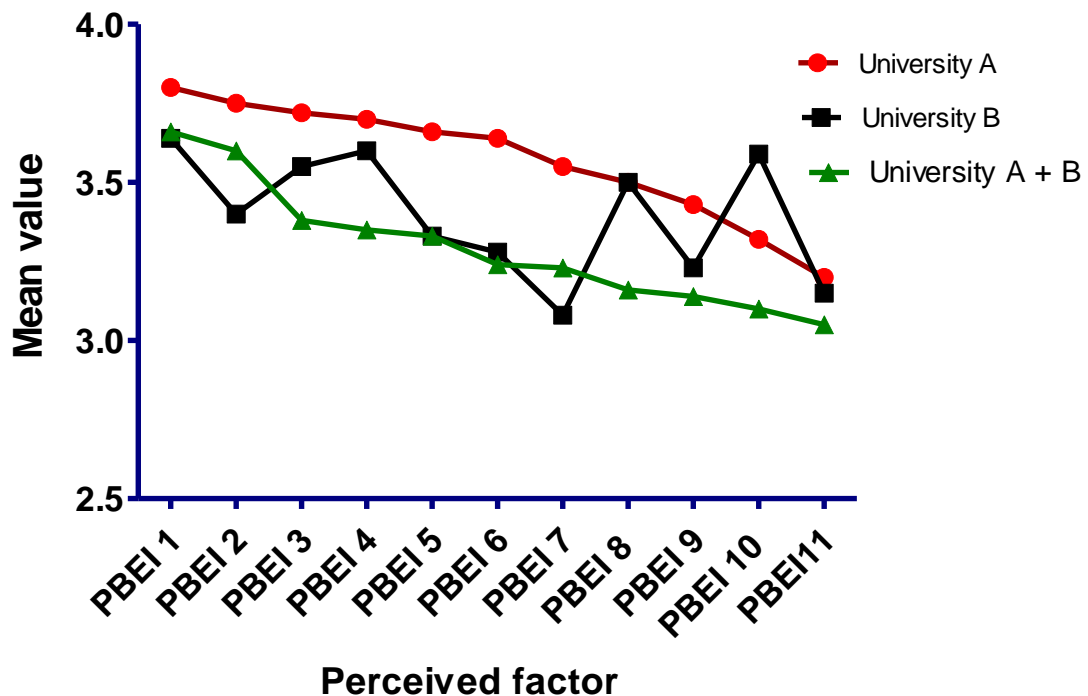


Figure 5:4 shows comparison of the perceived behavioural factors of the engineering students of University A, B and A+B

The above information represents the comparison of the students' perceived factors regarding their behaviour regarding becoming an entrepreneur. The students' entrepreneurial interests (and choices) to become entrepreneurs were found to vary significantly between the University of Technology and the Traditional University. Perceived factor preferences and interest are much higher among students in the University of Technology than the Traditional University with mean values of 3.80, 3.75, 3.72 and 3.70 compared to 3.64, 3.60, 3.59 and 3.55 respectively. Similarly, the ANOVA test graphs shows that student perceived behavioural needs to boost so that engineering students could interested in the entrepreneurial education. Also, the Two-Way ANOVA test indeed confirms the level of differences. Whitley and Ball (2002) confirm that when P-value is greater than ($P > 0.05$) there is no significant difference. The result of the analysis from the Two-Way ANOVA test showed that there are no significant differences in the perceived factor ($P > 0.05$). Moreover, students in the TU anticipate more support in dealing with the challenges of

self-employment than is the case for students in the UoT. By comparison, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is rational in the behaviours between the UoT and the TU.

Table 5:9 shows abbreviation comparison of the personality trait factors of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A-B
	MV	Ranking		%		M V	%		
PTEI 1	3.65	1	3.74	96.2	1	3.62	75.6	4	0.12
PTEI 2	3.62	2	3.70	95.7	2	3.45	60.4	10	0.25
PTEI 3	3.57	3	3.67	93.9	3	3.56	68.3	7	0.11
PTEI 4	3.50	4	3.65	90.1	4	3.68	83.6	2	0.03
PTEI 5	3.40	5	3.60	89.5	5	3.70	84.7	1	0.10
PTEI 6	3.34	6	3.55	84.3	6	3.66	80.4	3	0.11
PTEI 7	3.22	7	3.49	80.7	7	3.35	59.5	11	0.14
PTEI 8	3.12	8	3.44	77.5	8	3.50	66.2	8	0.06
PTEI 9	3.11	9	3.42	74.2	9	3.59	70.9	6	0.17
PTEI 10	3.10	10	3.40	70.4	10	3.60	74.8	5	0.20
PTEI 11	3.08	11	3.39	67.8	11	3.49	62.1	9	0.10

The Comparison of the Personality trait factors

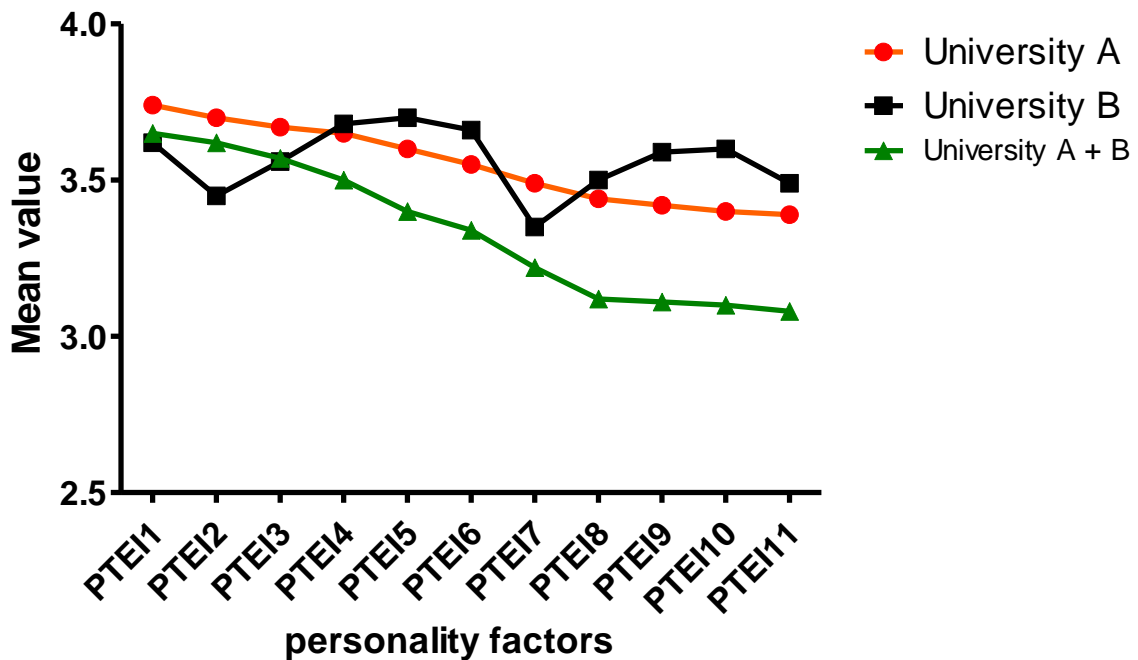


Figure 5:5 shows a comparison of the personality trait Factors of the engineering students of University A, B and A+B

The above information represents the comparison of the students' personality factors in respect of their behaviour regarding becoming self-employed. The students' entrepreneurial interests (and choices) to become self-employed were found to differ considerably between the University of Technology and the Traditional University. The students' personality factor choices and interests are much higher among students in the University of Technology than the Traditional University, with mean values of 3.74, 3.70, 3.65 and 3.60 compared to 3.70, 3.68, 3.66 and 3.62 respectively. The ANOVA test graphs in the above shows that student personality traits required attention to enhance the engineering students' interest in entrepreneurial education in order to become self-employed. The Two-Way ANOVA test indeed ascertains the level of difference. Whitley and Ball (2002) confirm that when P-value is greater than ($P > 0.05$) there is no significant difference. The result of the analysis from the Two-Way ANOVA test showed that there are no significant differences in the personality factor ($P > 0.05$). Nevertheless, students in TU are predicted to need more support in dealing with the challenges of self-employment than is the case for students in the UoT. By comparison, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is coherent in the behaviours between the UoT and the TU.

5.15 Level of the enhancement factors between the University of Technology (A) and Traditional University (B)

The major findings are centred on level attitude behaviour, knowledge behaviours, perceived behaviours, and personality behaviours regarding engineering students' entrepreneurial interest. Firstly, the Mean values of all the individual student interest are compared, after which the mean values of the categorised factors are compared with a Two-Way ANOVA test, Using the combination of the Tables 5.7 – 5.10 to present the MV obtained for each factor and their MV differences. The Two-Way ANOVA test is used to evaluate whether there is a statistically significant difference in the responses from both universities regarding the level of students' enhancement in a categorised factor (combined factors) is presented in Table 5.7- 5.10 and Figure 5.2- 5.5

It is evident from Table 5.7- 5.11 that the MS differences between attitude behaviour, knowledge behaviours, perceived behaviours, and personality behaviours are founded to enhance the entrepreneurial interest of the students in starting a business. However, the University of Technology students are more motivated than those in the Traditional University. The Two-Way ANOVA test (Table 5.7- 5.10 and Figure 5.2-5.5) indeed ascertained the level of differences.

Vovk and Wang (2018) explain that when P-value is greater than ($P > 0.05$), there is no significant difference. The result of the analysis from the Two-Way ANOVA test established that there are no significant differences between the enhancement factors ($P > 0.05$).

Table 5:10 5.7-5.11: Two-way anova test for the level of the engineering students' entrepreneurial enhancement factors

Level of Entrepreneurial	University A	University B	Df	P value	Sum of squares	Mean square	Sig.
Attitude factor	3,516	3,465	0.0518	$P > 0.05$	0,1043	0.0348	No
Knowledge factors	3,521	3,482	0.0390	$P > 0.05$	0,0850	0.0850	No
Perceived factors	3,570	3,395	0.1745	$P > 0.05$	0,0741	0.0247	No
Personality factors	3,550	3,564	0.0136	$P > 0.05$	2,043	0.0262	No

Attitude toward entrepreneurial interest

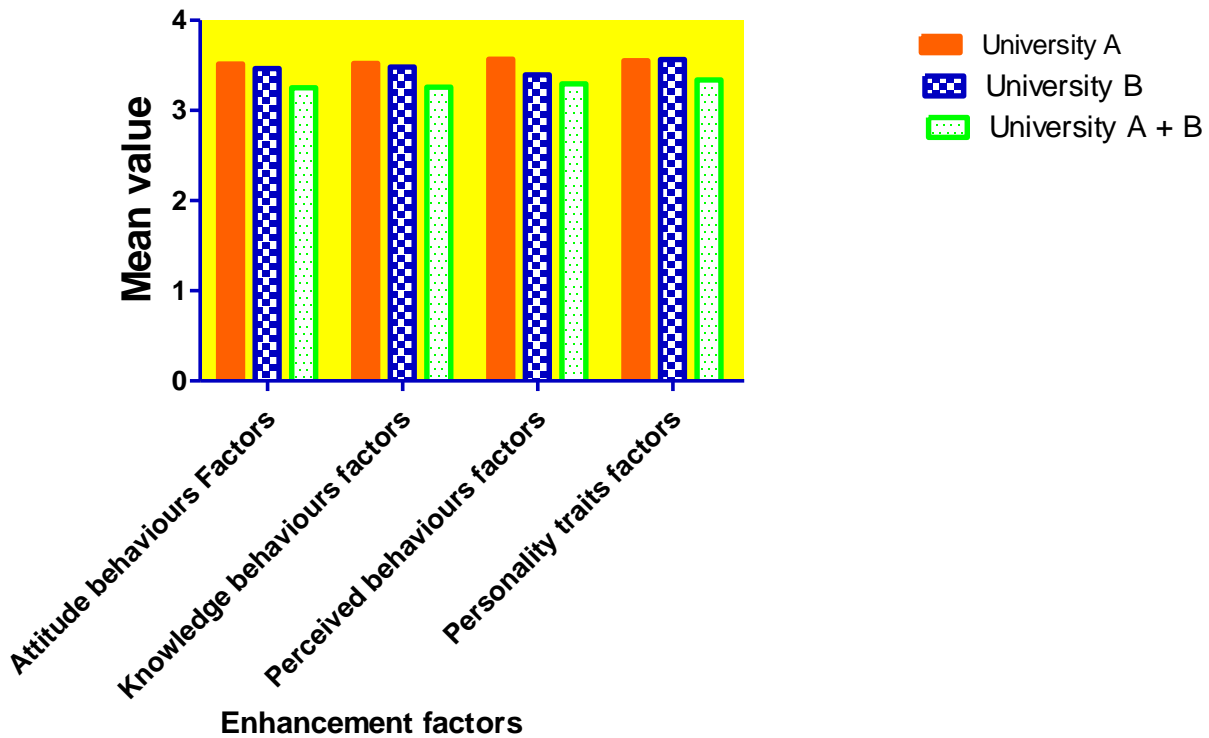


Figure 5:6 shows a comparison of the entrepreneurial enhancements of the engineering students of University A, B and A+B

5.16 CONTENTS OF ENTREPRENEURSHIP CURRICULUM OF UNIVERSITY OF TECHNOLOGY A AND TRADITIONAL UNIVERSITY B

The content of the entrepreneurship curriculum of the engineering students in the University of Technology and the Traditional University and a combination of both universities were compared.

Table 5:11 shows the important of the content teaching design/curriculum of university A against B and A+B

IMPORTANT
Risk-bearing
Support for internship
Entrepreneurship tutors
Training workshops
Practical experience
Inviting guest speakers for official speeches
Mentorship in business-related projects
Extracurricular activities related to entrepreneurship
Site visitation
Class practical on business-related courses
Research projects on business-related courses
Watching videos and recordings related to entrepreneurship.
Process-oriented learning
Bilateral learning
My lecturer provides group discussion on business-related courses
Group discussion on business-related courses
Business planning ideas
Inviting guest speakers for seminars

5.17 FINDINGS OF QUANTITATIVE DATA

Table 5:12 shows a comparison of the entrepreneurship curriculum importance of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV= A-B
	MV	Ranking	MV	%		M V	%		
CECI 1	3.70	1	3.80	98.3	1	3.24	53.4	16	0.56
CECI 2	3.67	2	3.77	96.7	2	3.60	84.6	2	0.17
CECI 3	3.55	3	3.75	94.9	3	3.33	59.9	11	0.44
CECI 4	3.50	4	3.73	91.5	4	3.36	66.6	9	0.37
CECI 5	3.43	5	3.70	90.3	5	3.22	51.9	17	0.48
CECI 6	3.40	6	3.68	89.2	6	3.48	75.9	5	0.20
CECI 7	3.37	7	3.64	87.7	7	3.63	86.8	1	0.01
CECI 8	3.36	8	3.60	85.9	8	3.49	77.4	4	0.11
CECI 9	3.35	9	3.57	83.4	9	3.31	57.7	12	0.26
CECI 10	3.35	10	3.55	81.2	10	3.35	62.3	10	0.20
CECI 11	3.31	11	3.49	80.3	11	3.37	69.4	8	0.12
CECI 12	3.30	12	3.44	78.8	12	3.17	50.2	18	0.27
CECI 13	3.29	13	3.41	77.1	13	3.45	73.1	6	0.04

CECI 14	3.28	14	3.40	73.0	14	3.28	60.2	15	0.12
CECI 15	3.25	15	3.39	70.6	15	3.30	55.6	13	0.09
CECI 16	3.24	16	3.36	68.5	16	3.40	71.3	7	0.04
CECI 17	3.22	17	3.33	66.2	17	3.55	80.5	3	0.22
CECI 18	3.17	18	3.29	63.9	18	3.29	54.9	14	0.0

The content of Entrepreneurship Curricula Important University A, B and A+B

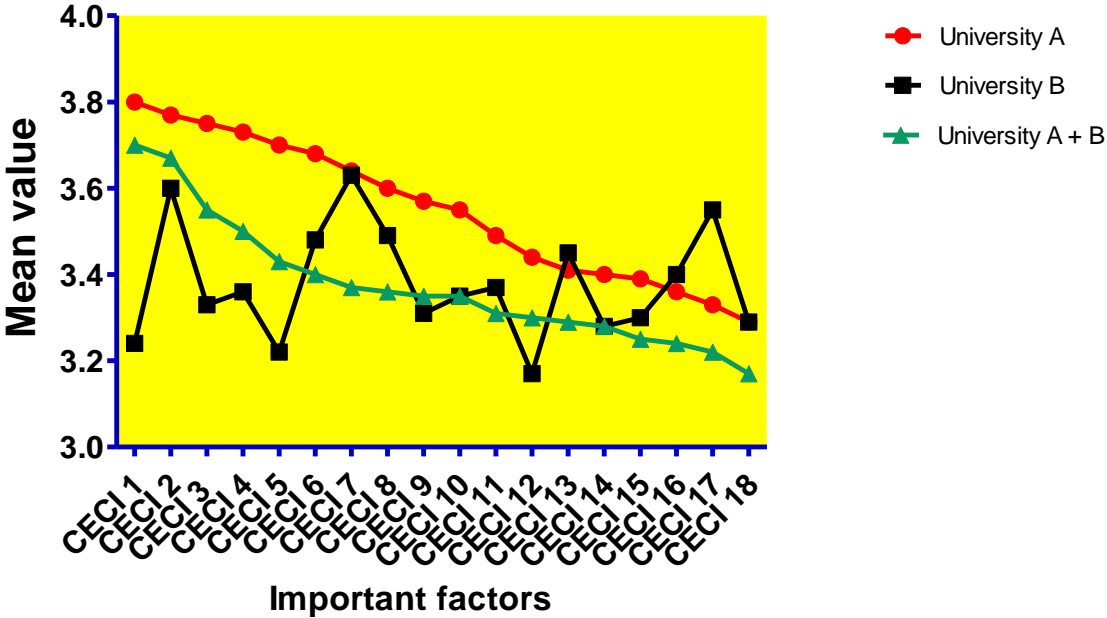


Figure 5:7 shows comparison of the entrepreneurship curriculum important of the engineering students of University A, B and A+B

The above information represents the comparison of the students' entrepreneurship curriculum important towards their behaviour regarding becoming an entrepreneur. The students' entrepreneurship curriculums important (and preferences) to become entrepreneurs were found to differ between the University of Technology and the Traditional University. Curriculum important preferences and interest are higher among students in the University of Technology than the Traditional University, with mean values of 3.80, 3.77, 3.75, 3.73 and 3.70 compared to 3.63, 3.60, 3.55, 3.49 and 3.48 respectively. The Two-Way ANOVA test indeed confirms the level of differences. However, Whitley and Ball (2002) established that when P-value is greater than ($P > 0.05$) there is no significant difference. The result of the study from the Two-Way ANOVA test ascertained that there are no significant differences in the curriculum importance ($P < 0.001$).

However, students in TU were predicted to have more support in dealing with the challenges of self-employment than is the case for students in the UoT. By comparison, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is rational in the behaviours between the UoT and the TU.

Table 5:13 shows the essential of the content teaching design/ curriculum of the university A against A and A+B

ESSENTIAL
Support for internship
Business planning ideas
Risk-bearing.
Process-oriented learning.
Bilateral learning.
Extracurricular activities related to entrepreneurship
Mentorship in business-related projects
Group discussion on business-related courses
Practical experience.
Entrepreneurship tutors
Training workshops.
Watching videos and recordings related to entrepreneurship.
Site visitation.
My lecturer provides group discussion on business-related courses
Class practical on business-related courses
Research projects on business-related courses
Inviting guest speakers for official speeches
Inviting guest speakers for seminars

Table 5:14 Shows abbreviation comparison of the entrepreneurship curriculum essentials of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A-B
	MV	Ranking		%		M V	%		
ECCE 1	3.56	1	3.83	97.5	1	3.28	57.4	10	0.55
ECCE 2	3.54	2	3.80	96.4	2	2.94	56.3	16	0.86
ECCE 3	3.53	3	3.77	94.4	3	2.89	54.6	17	0.88
ECCE 4	3.50	4	3.74	92.3	4	3.30	72.8	8	0.44
ECCE 5	3.48	5	3.70	90.1	5	3.29	70.3	9	0.41
ECCE 6	3.40	6	3.68	89.2	6	3.35	78.5	6	0.33
ECCE 7	3.38	7	3.64	87.9	7	3.40	82.6	4	3.40

ECCE 8	3.37	8	3.65	85.3	8	3.42	85.1	3	0.38
ECCE 9	3.36	9	3.63	83.3	9	3.27	67.1	12	0.36
ECCE 10	3.31	10	3.60	82.1	10	3.45	86.5	2	0.15
ECCE 11	3.29	11	3.57	80.6	11	3.22	66.6	13	0.35
ECCE 12	3.28	12	2.55	79.2	12	3.33	76.4	7	0.78
ECCE 13	3.28	13	3.57	77.4	13	3.20	63.3	14	0.37
ECCE 14	3.28	14	3.54	75.9	14	3.28	69.2	11	0.28
ECCE 15	3.27	15	3.55	72.3	15	3.18	60.8	15	0.37
ECCE 16	3.26	16	3.51	70.7	16	3.37	80.8	5	0.14
ECCE 17	3.24	17	3.50	69.6	17	3.59	88.6	1	0.09
ECCE 18	3.21	18	3.30	68.5	18	2.80	51.3	18	0.50

The Content of Entrepreneurship Cirrcula Essential of University A, B and A+B

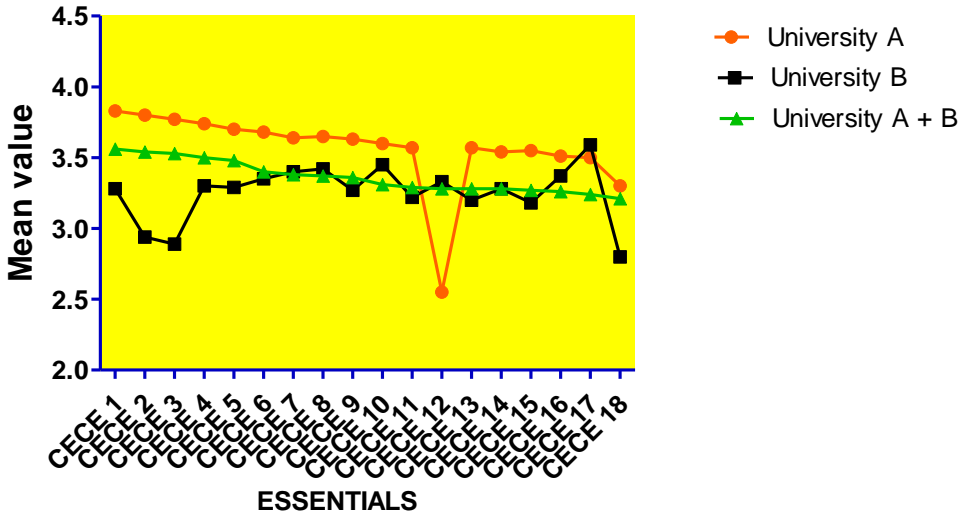


Figure 5:8 shows a comparison of the entrepreneurship curriculum essentials of the engineering students of University A, B and A+B

The above information represents the comparison of the students' entrepreneurship curriculum essentials with respect to their behaviour regarding becoming self-employed. The students' entrepreneurship curriculum essentials (and choices) to become self-employed were found to differ between the University of Technology and the Traditional University. Curriculum essential choices and interests are much higher among students in the University of Technology than the

Traditional University, with mean values of 3.83, 3.80, 3.77, 3.74, 3.70 and 3.68 compared to 3.59, 3.42, 3.40, 3.37 and 3.30 respectively. The Two-Way ANOVA test indeed confirms the level of differences. Although, Whitley and Ball (2002) established that when P-value is greater than ($P > 0.05$) there is slight significant difference. The result of the study from the Two-Way ANOVA test ascertained that there are significant differences in the curriculum importance ($P < 0.001$). However, students in TU expect to have more entrepreneurship curriculum supports that will enhance their interest towards becoming self-employed than students in UoT. By comparison, the differences between the two samples with respect to students' average entrepreneurial interests are rather small, which is balanced their behaviours between the UoT and the TU.

Table 5:15 Shows the compulsory of the content teaching design/ curriculum of the university A against B and A+B

COMPULSORY
Practical experience.
Entrepreneurship tutors
Training workshops.
Site visitation.
Inviting guest speakers for official speeches
Mentorship in business-related projects
Extracurricular activities related to entrepreneurship
Research projects on business-related courses
Support for internship
Business planning ideas
Risk-bearing.
Watching videos and recordings related to entrepreneurship.
Process-oriented learning.
Bilateral learning.
My lecturer provides group discussion on business-related courses
Group discussion on business-related courses
Class practical on business-related courses
Inviting guest speakers for seminars

Table 5:16 Shows abbreviation comparison of the entrepreneurship curriculum compulsoriness of the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A-B
	MV	Ranking	MV	%		M V	%		
ECCC 1	3.67	1	3.84	97.4	1	3.28	71.9	11	0.56
ECCC 2	3.65	2	3.81	96.2	2	3.36	77.8	6	0.45
ECCC 3	3.63	3	3.80	93.5	3	3.31	75.0	8	0.49
ECCC 4	3.50	4	3.78	92.1	4	3.30	73.1	9	0.48
ECCC 5	3.40	5	3.75	90.3	5	3.49	85.6	1	0.29

ECCC 6	3.39	6	3.73	89.0	6	3.39	80.7	4	0.34
ECCC 7	3.38	7	3.70	86.3	7	3.37	79.3	5	0.33
ECCC 8	3.37	8	3.67	84.6	8	3.10	57.8	18	0.57
ECCC 9	3.32	9	3.64	82.1	9	3.29	68.6	10	0.35
ECCC 10	3.28	10	3.61	80.5	10	3.43	83.5	2	0.18
ECCC 11	3.27	11	3.60	80.1	11	3.40	82.6	3	0.20
ECCC 12	3.26	12	3.57	79.4	12	3.32	76.2	7	0.25
ECCC 13	3.25	13	3.55	76.5	13	3.27	70.0	12	0.28
ECCC 14	3.25	14	3.50	75.2	14	3.14	64.7	16	0.36
ECCC 15	3.23	15	3.48	73.0	15	3.21	66.0	13	0.27
ECCC 16	3.21	16	3.44	71.9	16	3.15	62.9	15	0.29
ECCC 17	3.19	17	3.41	70.3	17	3.11	60.5	17	0.30
ECCC 18	3.18	18	3.37	68.5	18	3.16	56.3	14	0.21

The Content of Entrepreneurship Cirrcula Compulsoriness of Universit A, B and A+B

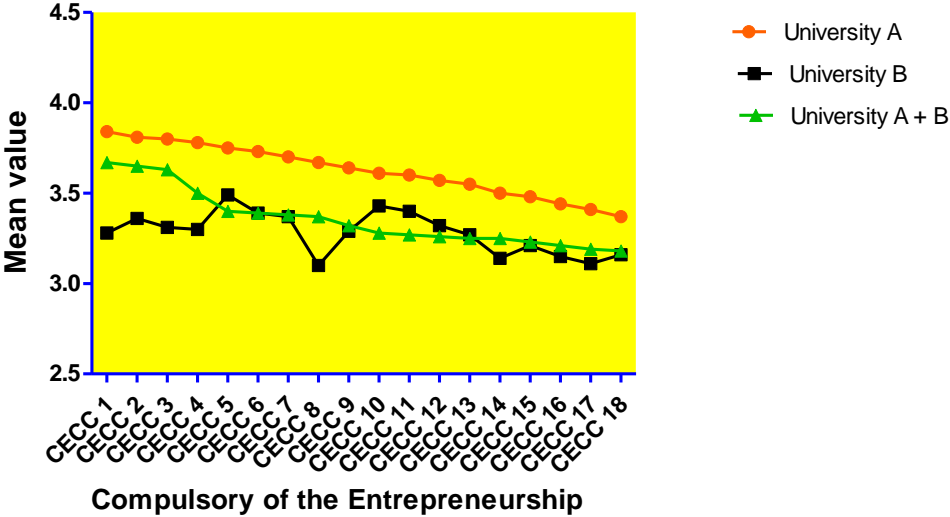


Figure 5:9 shows comparison of the entrepreneurship curriculum compulsoriness of the engineering students of University A, B and A+B

The above information represents the comparison of the students’ entrepreneurship curriculum compulsoriness towards their behaviour regarding becoming an entrepreneur. The students’ entrepreneurship curriculums compulsoriness (and preference) to become entrepreneur was found considerably between the University of Technology and the Traditional University. Nevertheless, curriculum compulsoriness preference and interest are higher among students in the University of Technology than the Traditional University with mean values of 3.84, 3.81, 3.80, 3.78, 3.75, 3.73, and 3.70 compared to 3.49, 3.43, 3.40, 3.39 and 3.37 respectively. The Two-Way ANOVA test indeed confirms the level of differences. Moreover, Bzdok, *et al.*(2018) ascertained that when P-value is greater than ($P>0.05$) there is significant difference. The result of the study from the Two-Way ANOVA test ascertained that there are significant differences in

the curriculum compulsoriness($P < 0.001$). Conversely, students in TU expect to have more entrepreneurship curriculum supports that will enhance their interest towards becoming entrepreneur than students in UoT. By contrast, the differences between the two samples with regards to students' entrepreneurial interests are rather small, which is reasonable toward their behaviours between the UoT and the TU.

Table 5:17 Shows the needs of the content teaching design/ curriculum of the university A against B and A+B

NEEDED
Inviting guest speakers for official speeches
Inviting guest speakers for seminars
Support for internship.
Business planning ideas
Risk-bearing.
Mentorship in business-related projects
Extracurricular activities related to entrepreneurship
Practical experience.
Entrepreneurship tutors
Training workshops.
Site visitation.
Process-oriented learning.
Bilateral learning.
My lecturer provides group discussion on business-related courses
Group discussion on business-related courses
Class practical on business-related courses
Research projects on business-related courses
Watching videos and recordings related to entrepreneurship.

Table 5:18 Shows abbreviation comparison of the entrepreneurship curriculum needed for the engineering students of university A, B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A-B
	MV	Ranking	MV	%		M V	%		
ECCN 1	3.69	1	4.00	97.5	1	3.62	83.2	3	0.38
ECCN 2	3.67	2	3.90	96.4	2	3.25	70.5	12	0.65
ECCN 3	3.64	3	3.88	96.0	3	3.64	81.8	2	0.24
ECCN 4	3.60	4	3.82	94.6	4	3.26	66.2	11	0.56
ECCN 5	3.58	5	3.80	93.1	5	3.33	74.9	8	0.47
ECCN 6	3.55	6	3.77	91.4	6	3.38	77.3	6	0.39
ECCN 7	3.50	7	3.76	90.8	7	3.67	85.4	1	0.09
ECCN 8	3.42	8	3.73	89.5	8	3.37	76.3	7	0.36
ECCN 9	3.39	9	3.66	88.8	9	3.30	72.0	9	0.36
ECCN 10	3.37	10	3.61	86.4	10	3.40	79.4	5	0.21
ECCN 11	3.33	11	3.60	84.3	11	3.50	80.6	4	0.10
ECCN 12	3.30	12	3.58	82.8	12	3.08	55.8	18	0.50
ECCN 13	3.27	13	3.55	81.5	13	3.16	60.4	15	0.39

ECCN 14	3.26	14	3.50	79.5	14	3.19	62.9	14	0.31
ECCN 15	3.21	15	3.49	77.9	15	3.12	59.1	16	0.37
ECCN 16	3.16	16	3.44	75.8	16	3.27	68.3	10	0.17
ECCN 17	3.09	17	3.41	72.4	17	3.21	64.9	13	0.20
ECCN 18	3.08	18	3.40	70.6	18	3.09	57.5	17	0.31

The Content of Entrepreneurship Cirrcula Needs of University A, B and A+B

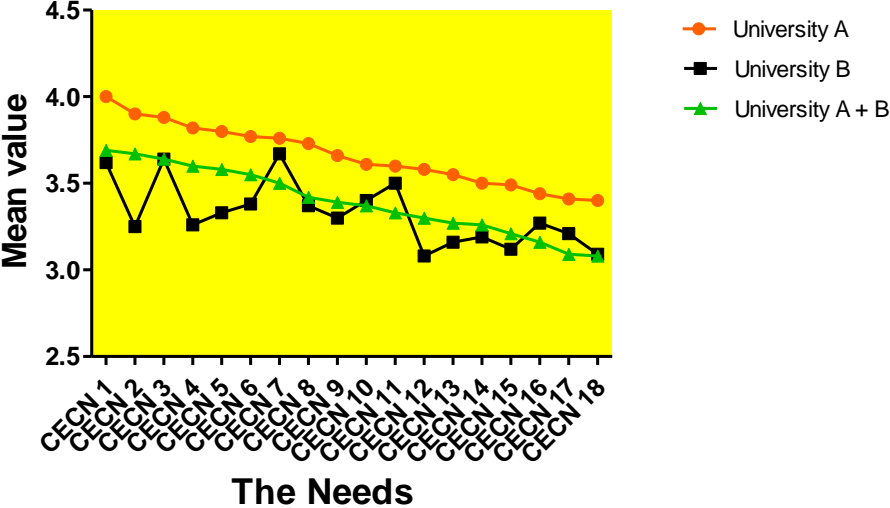


Figure 5:10 shows comparison of the entrepreneurship curriculum needs of the engineering students of University A, B and A+B

The above information represents the comparison of the students’ entrepreneurship curriculum needs towards their behaviour regarding becoming self-employed. The students’ entrepreneurship curriculums need (and preferences) to become self-employed were found significantly between the University of Technology and the Traditional University. However, curriculum needs preference and interest are higher among students in the University of Technology than the Traditional University with mean values of 4.00, 3.90, 3.88, 3.82, 3.80, 3.77, 3.76, and 3.73 compared to 3.67, 3.64, 3.62, 3.50 and 3.40 respectively. The Two-Way ANOVA test indeed confirms the level of differences. Additionally, Bzdok, *et al.*(2018) ascertained that when P-value is greater than ($P > 0.05$) there is significant difference. The result of the study from the Two-Way ANOVA test established that there are slightly significant differences in the curriculum needs($P < 0.001$). Therefore, students in TU expect to needed more entrepreneurship curriculum supports that will enhance their interest towards becoming self-employed than students in UoT. By contrast, the differences between the two samples with regards to students’ entrepreneurial interests are rather small, which is rational toward their behaviours between the UoT and the TU.

5.18 Level of the comparison on the entrepreneurship curriculum factors on the University of Technology (A) and Traditional University (B) and Combination of both Universities

The major findings are centred on level of important, essential, compulsoriness, needs for the entrepreneurship curriculum on the engineering students. Firstly, the Mean values of all the individual interest are compared after which the Mean values of the categorised methods are compared with a Two-Way ANOVA test. Table 5.12-20 presents the MV obtained for each and every method and their MV differences. The Two-Way ANOVA test used to evaluate whether there is a statistical significant difference in the responses from both universities regarding the level of curriculum of the categorised methods (combined methods) is presented in Table 5.12-20 and Figure 5.6-10.

It is evident from Table 5.12-19 that the MS differences between important, essential, compulsoriness, needs for the entrepreneurship curriculum on the engineering students are highly motivated in terms of curriculum to start up a business. Although, the University of Technology are more motivated than the Traditional University. The Two-Way ANOVA test (Table 5.12-20 and Figure 5.6-10) indeed confirms the level of differences. Vovk and Wang, (2018) explained that when P-value is greater than ($P > 0.05$) there is no significant difference. Hence, results of the analysis from the Two-Way ANOVA test indicate that there are significant differences in the important ($P < 0.001$), essentials ($P < 0.001$), compulsoriness ($P < 0.001$), and needs ($P < 0.001$) for both universities.

Based on the research conducted, it is revealed that the University of Technology had a better entrepreneurship curriculum than the Traditional University. For example, the students at the TU revealed that engineering curriculums designed have risk-bearing, tutors, site visitation, inviting guest speakers, internship, training workshops and practical experience. Thus, TU entrepreneurship curriculum design needs more support in order to motivate their entrepreneurial interest towards becoming self-employed.

Table 5:19 5.6-9: two-way anova test for the level of the engineering students contents of entrepreneurship curriculum

Level Curriculum	University A	University B	Df	P value	Sum of squares	Mean square	Sig.
Important	3,550	3,379	-0,1711	$P < 0.001$	0,1753	0,0584	Yes
Essential	3,563	3,253	-0,3094	$P < 0.001$	3,028	3,028	Yes

Compulsoriness	3,625	3,282	-0,3428	P<0.001	0,1340	0,0447	Yes
Needs	3,661	3,324	-0,3367	P<0.001	4,512	0,0332	Yes

Comparative of the Content Entrepreneurship Curriculum of University A, B and A+B

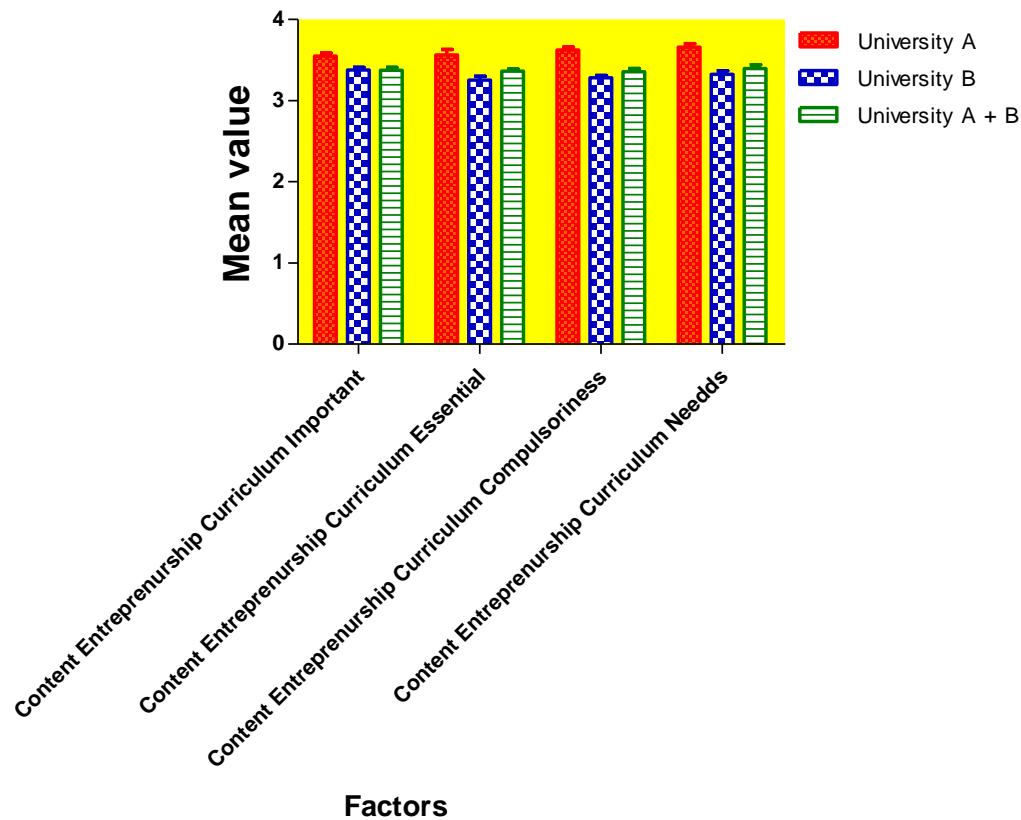


Figure 5:11 shows a comparison of the entrepreneurship curriculum designs of the engineering students of University A, B and A+B

Table 5:20 Shows the motivational factors of the university A against B and A+B

MOTIVATIONAL FACTORS	
Intrinsic Rewards	
To prove I can do it	
To enjoy the excitement	
To meet the challenge	
To gain public recognition	
To be free from corporate organisation	
To obtain personal growth	
Extrinsic Rewards	
To increase my income opportunity	
To increase my personal income	
To acquire personal wealth	
Independence/Autonomy	
To acquire personal security	
To maintain my personal freedom	
To obtain self-employment	
To control my own destiny	
To allow for early retirement	
To be my own boss	
Family Background	
To secure a future for family members	
To build a business to pass on	
To take up the family business	
Change Management (adopting changes)	
To develop new ideas, innovations and initiatives	
To respond to change	
To recognise opportunities	
To exploit opportunities	

Table 5:21 shows abbreviation comparison of the entrepreneurial motivational factors needed for the engineering students of university A, university B and A+B

Factors	University A+B		University A		Ranking	University B		Ranking	Gap MV =A-B
	MV	Ranking	MV	%		MV	%		
Intrinsic Rewards (IR)									
IR 1	3.59	1	3.70	45.2	1	3.28	74.1	4	0.42
IR 2	3.56	2	3.62	38.6	2	3.39	76.3	3	0.23
IR 3	3.52	3	3.56	43.0	3	3.46	78.7	2	0.10
IR 4	3.26	4	3.40	43.3	4	3.20	63.9	6	0.20
IR 5	3.18	5	3.38	35.3	5	3.56	80.4	1	0.18
IR 6	3.11	6	3.25	37.4	6	3.26	70.6	5	0.01
Extrinsic Rewards (ER)									
ER 1	3.55	1	3.62	46.7	1	3.40	76.4	2	0.22
ER 2	3.46	2	3.53	42.6	2	3.44	79.8	1	0.09
ER 3	3.31	3	3.45	32.9	3	3.36	73.7	3	0.09

Independent/ Autonomy (IAR)									
IAR 1	3.54	1	3.47	96.4	1	3.47	76.2	2	0.0
IAR 2	3.42	2	3.40	95.6	2	3.26	65.1	6	0.14
IAR 3	3.37	3	3.37	92.3	3	3.27	67.3	5	0.10
IAR 4	3.26	4	3.36	90.1	4	3.36	73.5	3	0.0
IAR 5	3.17	5	3.33	89.9	5	3.33	70.9	4	0.0
IAR 6	3.13	6	3.24	82.7	6	3.50	80.0	1	0.26
Family Background (FBR)									
FBR 1	3.51	1	3.76	89.6	1	3.66	77.4	1	0.29
FBR 2	3.41	2	3.46	85.9	2	3.36	75.2	2	0.10
FBR 3	3.34	3	3.43	80.2	3	3.20	65.1	3	0.23
Change Management (CMR)									
CMR 1	3.52	1	3.54	94.5	1	3.47	78.3	1	0.07
CMR 2	3.30	2	3.40	90.4	2	3.36	70.9	3	0.04
CMR 3	3.29	3	3.37	88.3	3	3.30	65.6	4	0.07
CMR 4	3.15	4	3.33	81.4	4	3.40	74.2	2	0.07

THE COMPARATIVE OF INTRINSIC REWARDS OF UNIVERSITY A,B and A+B

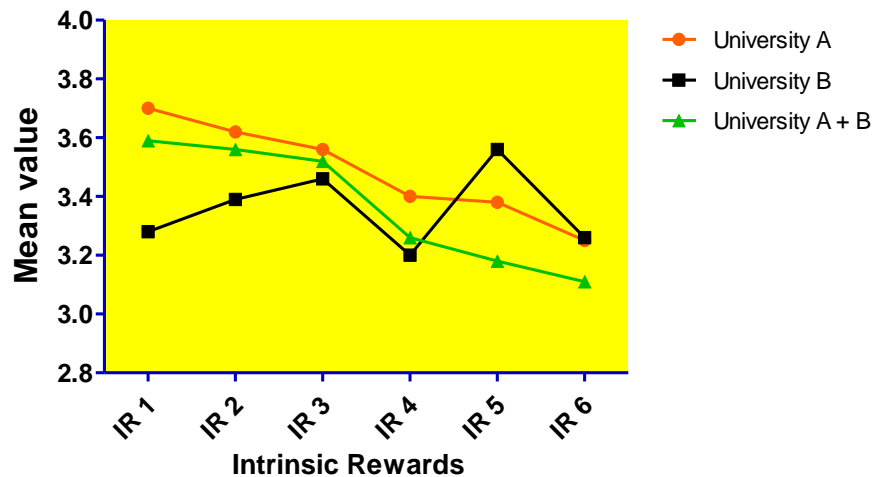


Figure 5:12 shows a comparison of the intrinsic rewards of the engineering students of University A, B and A+B

The above information represents the comparison of the students' entrepreneurship intrinsic reward towards their behaviour regarding becoming self-employed. The students' intrinsic rewards (and preference) in becoming an entrepreneur were found to differ considerably between the University of Technology and the Traditional University. Nevertheless, curriculum compulsoriness preference and interest are higher among students in the University of

Technology than the Traditional University, with mean values of 3.70, 3.62 and 3.56, compared to 3.56, 3.46 and 3.39 respectively. The Two-Way ANOVA test indeed confirms the level of differences. Moreover, Vovk and Wang, (2018) argue that when P-value is greater than ($P > 0.05$) there is significant difference. The result of the study from the Two-Way ANOVA test ascertained that there are significant differences in the intrinsic rewards ($P > 0.05$). Conversely, students in the TU expect to have more entrepreneurship intrinsic supports that will enhance their interest towards becoming self-employed than students in UoT. By contrast, the distinction between the two samples with regards to students' entrepreneurial interests is rather small, which is rational toward their behaviours between the UoT and the TU.

Comparative of the Extrinsic Rewards of University A, B and A+B

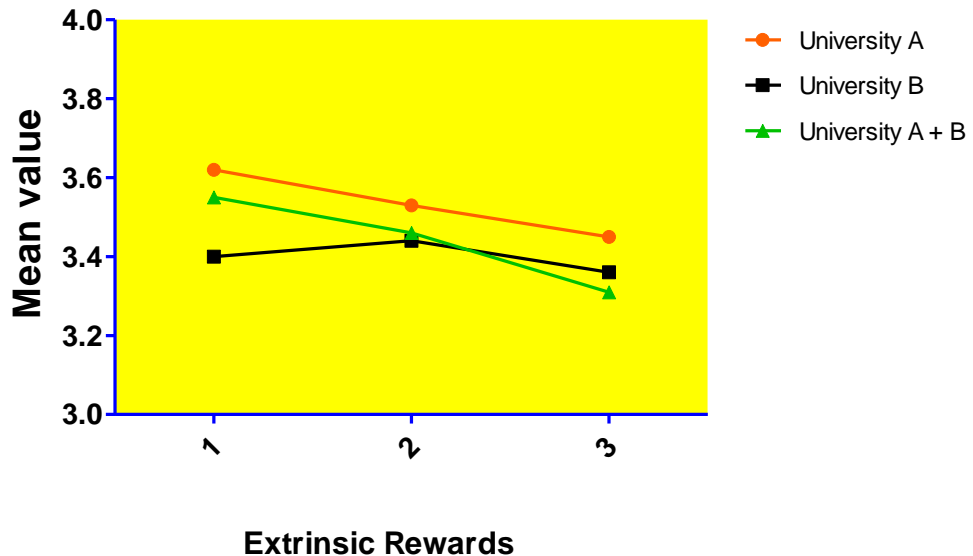


Figure 5:13 shows a comparison of extrinsic rewards of the engineering students of University A, B and A+B

The above information represents the comparison of the students' extrinsic reward with respect to their behaviour regarding becoming an entrepreneur. The students' extrinsic rewards (and preference) to become entrepreneurs were found to differ between the University of Technology and the Traditional University. However, curriculum compulsoriness preference and interest are both much higher among students in the University of Technology than the Traditional University, with mean values of 3.62, 3.53 and 3.45, compared to 3.44, 3.40 and 3.36 respectively. The Two-Way ANOVA test indeed proved the level of difference. Furthermore, Vovk and Wang, (2018)

argue that when P-value is greater than ($P > 0.05$) there is important difference. The result of the study from the Two-Way ANOVA test ascertained that there are important differences in the extrinsic rewards ($P > 0.05$). Equally, students in TU expect to have more extrinsic supports that will enhance their interest with respect to becoming an entrepreneur than students in the UoT. By contrast, the difference between the two samples with regards to students' entrepreneurial interests is rather small, which is consistent with their behaviours between the UoT and the TU.

Comparative of the Independent/Autonomy Rewards

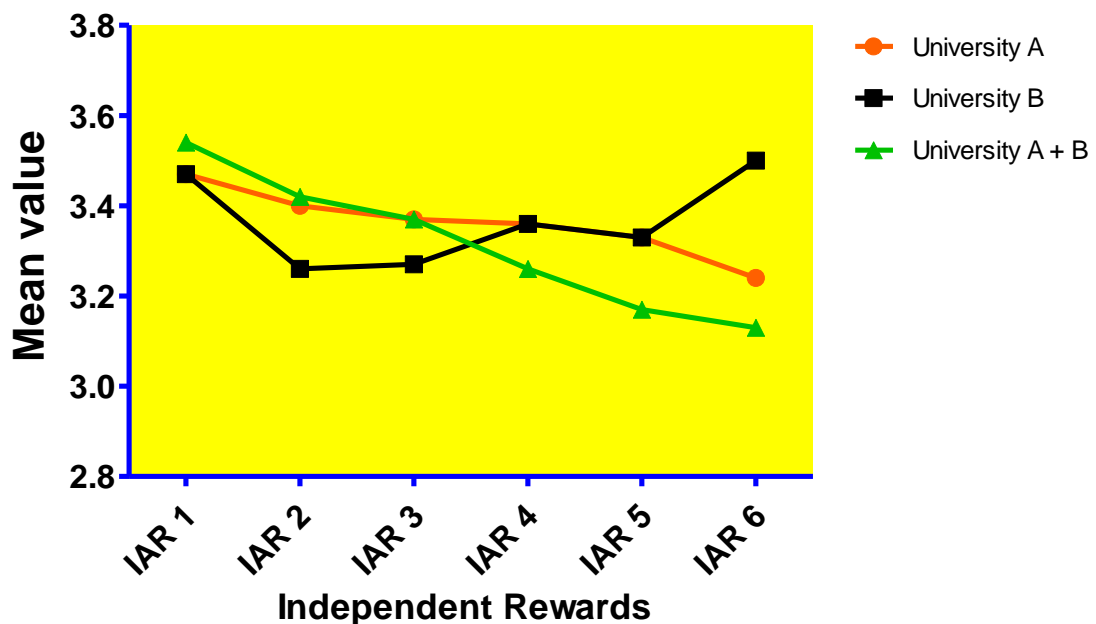


Figure 5:14 shows comparison of the independent rewards of the engineering students of University A, B and A+B

The above information represents the comparison of the students' independent rewards with respect to their behaviour regarding becoming self-employed. The students' independent rewards (and preference) to become independent rewards were found considerably between the University of Technology and the Traditional University. However, independent rewards, preference and interest are much higher among students in the University of Technology than the Traditional University, with mean values of 3.47, 3.40 and 3.37, compared to 3.50, 3.40 and 3.36 respectively. The Two-Way ANOVA test indeed established the level of differences. Additionally, Whitley and Ball (2002) assert that when P-value is greater than ($P > 0.05$) there is an important difference. The result of the study from the Two-Way ANOVA test indicates that there is no

significant difference in the independent rewards($P>0.05$). However, students in the TU expect to have more autonomy supports that will enhance their interest towards becoming self-employed than students in UoT. By contrast, the difference between the two samples with regards to students' entrepreneurial interests is rather small, which is reliable given the behaviours between the UoT and the TU.

Comparative of the Family Background Rewards

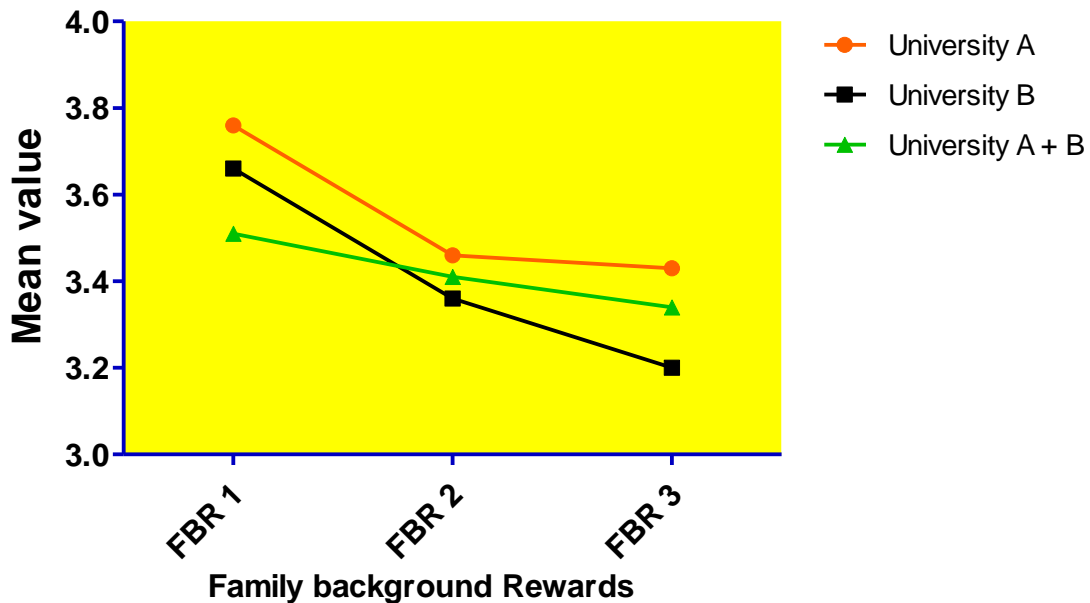


Figure 5:15 shows comparison of the family background of the engineering students of University A, B and A+B

The above information represents the comparison of the students' family background reward in relation to their behaviour regarding becoming an entrepreneur. The students' background rewards (and preference) to become independent rewards were considerably between the University of Technology and the Traditional University. However, family background rewards, preference and interest are higher among students in the University of Technology than the Traditional University with mean values of 3.76, 3.46 and 3.43, compared to 3.66, 3.33 and 3.20 respectively. The Two-Way ANOVA test certainly confirmed the level of differences. Moreover, Whitley and Ball (2002) assert that when P-value is greater than ($P>0.05$) there is significant difference. The result of the study from the Two-Way ANOVA test established that there are important differences in the family background rewards($P<0.001$). Likewise, students in Expect to

have more family background supports that will enhance their interest towards becoming self-employed than students in UoT. By contrast, the difference between the two samples with regards to students' entrepreneurial interests is rather small, which is expected, given the similarities between the UoT and the TU.

Comparative of the Change Management Rewards of the Univeristy A, B and A+B

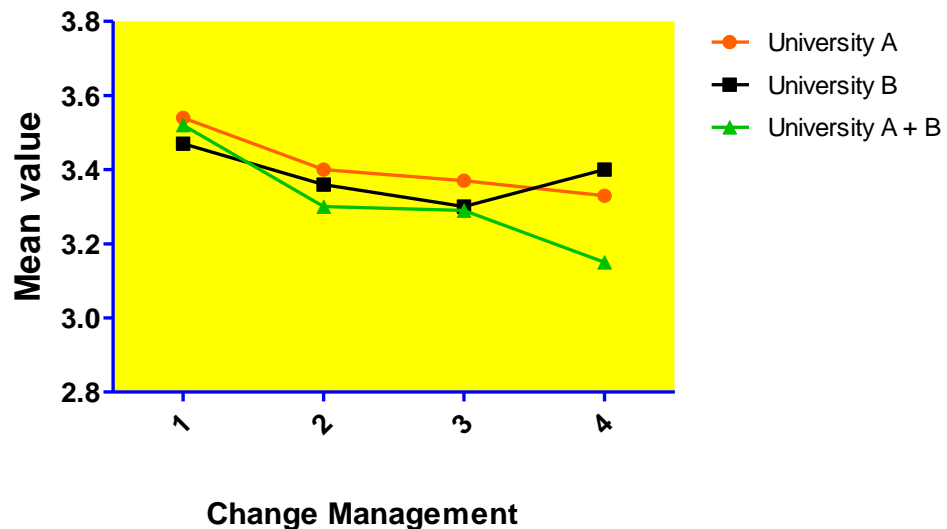


Figure 5:16 shows comparison of the change management of the engineering students of University A, B and A+B

The above information represents the comparison of the students' change management in respect of their behaviour regarding becoming an entrepreneur. The students' background rewards (and preference) to become change management were found significantly between the University of Technology and the Traditional University. However, family background rewards preference and interest are higher among students in the University of Technology than the Traditional University with mean values of 3.76, 3.46 and 3.43, compared to 3.66, 3.33 and 3.20 respectively. The Two-Way ANOVA test certainly confirmed the level of differences. Additionally, Whitley and Ball (2002) assert that when P-value is greater than ($P > 0.05$) there is significant difference. The result of the study from the Two-Way ANOVA test ascertained that there are significant differences in the change management rewards ($P > 0.05$). Similarly, students in TU expect to have more change management supports that will develop their interest in becoming self-employed than students in UoT. By difference between the two samples with regards to

students' entrepreneurial interests is slightly, which is accountable toward their behaviours between the UoT and the TU.

5.19 Level of provision of different motivational factors between the University of Technology and the Traditional University

The major findings are centred on the level of intrinsic rewards, extrinsic rewards, independent rewards, family background and change management on the degree of engineering students' entrepreneurial interest. Firstly, the mean values of all the individual interests are compared, after which the mean values of the categorised factors are compared with a Two-Way ANOVA test. Table 5.21 presents the MV obtained for each and every measure and their MV differences. The Two-Way ANOVA test used to examine whether there is a statistically significant difference in the responses from both universities regarding the level of provision of the categorised measures (combined measures) is presented in Table 5.21 and Figure 5.12– 16.

It is evident from Table 5.21 that the MS differences between intrinsic rewards, extrinsic rewards, independent rewards, family background and change management are highly motivated to start up a business. The students at the University of Technology are more motivated than the Traditional University, however. The Two-Way ANOVA test (Table 5.21 and Figure 5.12-16) indeed confirms the level of differences. Bzdok, et al. (2018) explained that when P-value is greater than ($P > 0.05$) there is no significant difference. The result of the analysis from the Two-Way ANOVA test indicates that there are no significant differences in all the motivational factors ($P > 0.05$).

Table 5:22 Two-Way ANOVA test for the level of the engineering students' entrepreneurial motivational factors

Motivational Rewards	University A	University B	D f	P value	Sum of squares	Mean square	Sign.
Intrinsic Rewards	3.485	3.358	-0.1267	$P > 0.05$	0.0430	0.0108	No
Extrinsic Rewards	3.533	3.400	-0.1333	$P > 0.05$	0.0731	0.0731	No
Independent/Autonomy	3.362	3.365	0.0033	$P > 0.05$	0.0755	0.0189	No
Family Background	3.550	3.407	-0.1433	$P > 0.05$	0.5497	0.0162	No
Change Management	3.410	3.383	-0.0275	$P > 0.05$	0.0434	0.0503	No

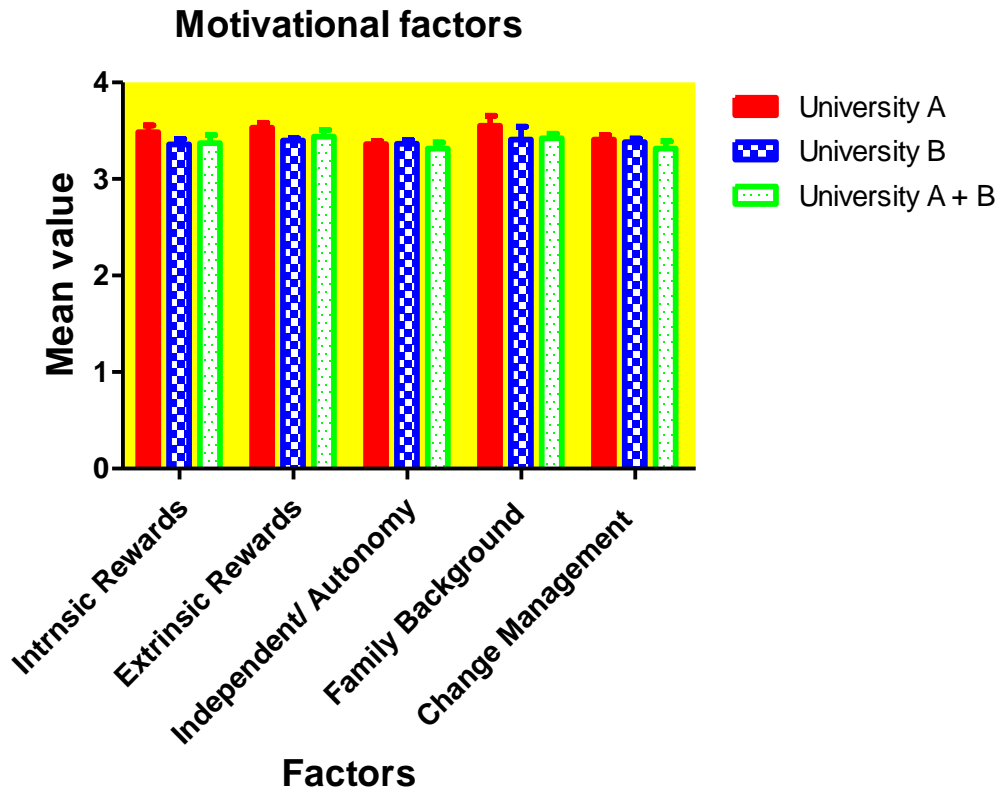


Figure 5:17 Two-Way ANOVA test for the level of the engineering students' Entrepreneurial motivational factors

5.20 VALIDITY ASSURANCE OF THE QUANTITATIVE RESEARCH RESULTS

This section was carried out to review the validity of the quantitative data realised by the questionnaires. Fundamentally, the validity assurance of research outcomes illustrated how applicable the realised results are in the field of study. Thomas and Magilvy (2011) affirm that the validity of research is the level to which the data obtained assessed accurately that which it intended to measure. To ensure that the research results are valid and reliable, the following steps are considered:

- a. **Research population:** The population sampled for this study included two Engineering and Built Environment Universities in Western Cape, South Africa. This population identified for achieving reliable results for this research.
- b. **Expected participants:** The students were mostly final years in the Engineering and Built Environment Universities in Western Cape, South Africa who are about to graduate.
- c. **Sampling technique:** The cluster sampling method was adopted for data collection in this study, as the use of cluster sampling redistributes the target population (with a high

concentration of engineering students) into smaller groups (clusters) from which samples are randomly selected for data collection and result generalisation.

- d. **Time:** Data collected within a reasonable time limit. Hence, for data collection, collation, analyses, and report.
- e. **Data collection instrument:** The most accurate data collection tool was adopted, and were enhanced through pilot studies to ascertain their adequacies for each phase of collection.
- f. **Exploratory/pilot study:** The exploratory study conducted to determine the reliability and accuracy of the data collection method to be adopted for the main study.
- g. **Cronbach's alpha co-efficiency analysis:** The Cronbach's alpha co-efficient analysis conducted to test the reliability of the quantitative research question in this study.
- h. **Interview sessions:** The interview sessions with the respondents recorded using a Mobicel Mini iPad Smart Recorder and analysed as known as the content analysis method.

5.21 VALIDATION OF FINDINGS

The qualitative collection stage adopted the construct validity technique. Construct validity is a technique adopted to ensure that the findings obtained in this research measure what the study claims to measure. The findings from the quantitative and objectives of the research study were framed into interview questions to confirm whether the quantitative results answered what they were intended to in regard to the research aim and objectives. The two Engineering and Built Environment Universities were selected for the interviews. The researcher scheduled appointments for each interview with the respondents to ensure efficient research time management. Six from one university and two from the other were interviewed (A and B). The interview session conducted with each interviewee started with an introduction of the research title and explanation of the purpose of the study. The interview was then recorded with a device and afterward transcribed. A copy of the interview questions can found in Appendix B

Table 5:23 Demographic of qualitative respondents

Respondents	Department	Level of study	Gender	Age
A	Civil Engineering	4	M	22
B	Construction Management and Quantity Surveying	5	M	33
C	Mechanical Engineering	5	F	26

5.21.1 Interview with respondent A

The first interview was conducted on May 29, 2019, at 11h00. The student had some experience with entrepreneurship, due to managing a small business. The male Civil Engineering student was undertaking level four (4) studies, and was 22 years old. The interview lasted for forty-one minutes, as the interviewee responded to each interview question with enthusiasm. The interview discussion was recorded using a 'Smart recorder app' installed on a MobiceliPad Mini. A copy of the interview outline can be found in Appendix B. The respondent stated the following:

The engineering student's interest was to become an entrepreneur rather than becoming a salary-earner. He was concerned about unemployment. Thus, would create new jobs and increases economic growth.

Attitude-based behavioural factors played a significant role in enhancing the student's entrepreneurial interest, especially the desire to control what he does and not be controlled by someone else. If they had the opportunity and resources, they would like to start up their own business.

Knowledge-based behavioural factors played very important role in enhancing the student's entrepreneurial interest, mainly in the ability to apply their academic background to start up a business. In addition to that, it enabled the student to provide solutions to problems identified during the course of opening a business.

Perceived behavioural factors was another variable that influenced entrepreneurial interest of the student, as the student perceived that if he tried to start a business, he would surely succeed. He further stated that starting up a business would be easy.

Personality trait factors were relevant, in that the student believed that every time he failed a task, he could reflect on why he failed so that he could learn how to do it better in the future. Similarly, the student reported having the ability to take advantage of opportunities if they arose.

The important/essential and compulsory on the entrepreneurship curriculum content is believed by the student could be enhanced through: inviting guest speakers for official speeches, mentorship in business-related projects, support for internship, entrepreneurship, training workshops, site visitations and risk-bearing.

The entrepreneurship curriculum content needs to address the engineering student's entrepreneurial on the risk-bearing to start up a business, inviting guest speakers for official

speeches, extracurricular activities related to entrepreneurship, and entrepreneurship tutors who would motivate their interest.

Where intrinsic rewards were concerned, the student believed that entrepreneurship would enhance their interest through meeting up challenges, gaining public recognition and being free from corporate organisation. The student also identified extrinsic motivations: namely increased income opportunity and acquiring personal wealth.

Independence/Autonomy: the engineering student perceived that being his own boss, obtaining self-employment, acquiring personal security, and allowing for early retirement could motivate his entrepreneurial interest.

Family Background factors included building a business to pass on, and securing a future for family members business. In addition, change management (adopting changes) factors believed to motivate the engineering students' entrepreneurial interest were: to develop new ideas, innovations and initiatives, to respond to change, and to exploit opportunities.

5.21.2 Interview with respondent B

The first interview was conducted on May 30, 2019, at 12h00. The student had entrepreneurship experience in that he owned a small business. The male Construction Management and Quantity Surveying student was undertaking level five (5) of his studies and was 33years old. The interview lasted for forty-one minutes, as the interviewee responded to each interview question with enthusiasm. The interview discussion was recorded using a 'Smart recorder app' installed on a Mobicel iPad Mini. A copy of the interview outline can be found in Appendix B. The respondent stated the following:

The student wanted to start his own business rather than become unemployed after his graduation.

Attitude-based behavioural factors played a noteworthy role in maintaining his entrepreneurial interest, especially if he was exposed to the right opportunities and resources. He felt that taking an entrepreneurship course would offer good career opportunities.

Knowledge-based behavioural factors played a very important role in enhancing the student's entrepreneurial interest towards providing solutions to problems identified during the course of opening a business.

Perceived behavioural factors also played a role, as the student perceived that starting a business would be easy.

Where personality trait factors were concerned, the student believed that he was capable of detecting any opportunity the moment it arose.

The important/ essential and compulsory on the entrepreneurship curriculum content is believed by the student could enhance through: entrepreneurship tutors, training workshops, site visitation, and risk-bearing all played a part in strengthening the student's entrepreneurial interest.

The entrepreneurship curriculum content needs to address the engineering student entrepreneurial on the extracurricular activities that related to entrepreneurship, site visitation and entrepreneurship tutor that would motivate their interest.

In terms of intrinsic rewards, the student believed that entrepreneurship would enhance their interest through gaining public recognition and being free from corporate organisation. Similarly, extrinsic rewards were to increase their income opportunity and acquire personal wealth.

When it came to Independence/autonomy, the student perceived that to obtain self-employment, to acquire personal security, to allow for early retirement and to maintain his personal freedom would enhance his entrepreneurial interest.

Family background factors included building a business to pass on, securing a future for family members and taking up the family business. In addition, change management (adopting changes) factors believed to motivate the engineering students' entrepreneurial interest were developing new ideas and recognising new opportunities.

5.21.3 Interview with respondent C

The first interview was conducted on June 04th, 2019, at 12h00. The student had entrepreneurship experience in that she was managing a small business. The female Mechanical Engineering student was undertaking level five (5) studies and was 26years old. The interview lasted for forty-one minutes, as the interviewee responded to each interview question with enthusiasm. The interview discussion was recorded using a 'Smart recorder app' installed on a Mobicel iPad Mini. A copy of the interview outline can be found in Appendix B. The respondent stated the following:

The student's preference was to start her own business rather than become unemployed after graduation. Moreover, the student revealed that she had been appointed as a leader in companies before.

Attitude-based behavioural factors were significant, in that she wished to control her own activities, rather than have them be controlled by someone else. She was of the opinion that taking a course in entrepreneurship would offer her good career opportunities. Similarly, the student saw entrepreneurship courses as a practical and affordable route to starting a business.

Knowledge-based behavioural factors were important in boosting entrepreneurial interest, especially the application of academic background in order to start a business. Moreover, the student believed that entrepreneurial courses could enhance her knowledge of the nature of business.

Perceived behavioural factors also played a role, as the student believed that to start up a business would be easy for her. Moreover, she believed she would become self-employed after graduating from her engineering programme.

Where personality trait factors were concerned, the student believed that every time she failed a task, she could reflect on why she failed so that she could learn to do better in the future. Similarly, the student was able to address stakeholder interests in business-related plans. She further stated that she would like to create a business in the future.

The important/ essential and compulsory on the entrepreneurship curriculum content is believed by the student could be enhanced through: inviting guest speakers for official speeches, support for internship, business planning ideas, training workshops, site visitation, and risk-bearing all played a part in strengthening the student's entrepreneurial interest.

The entrepreneurship curriculum content should need to address the engineering student entrepreneurial on the risk-bearing to start up a business, support for internship, mentorship in business-related projects and site visitation that would motivate their interest.

In terms of intrinsic rewards, the student assumed that entrepreneurship would boost her interest through obtaining personal growth and being free from corporate organisation. Similarly, extrinsic rewards played a part, in that she was interested in increasing her personal income and acquiring personal wealth.

Independence/autonomy factors included obtaining self-employment and acquiring personal security.

Family background factors included securing a future for family members and taking up the family business. Additionally, change management (adopting changes) played a part in the form of developing new ideas, innovations and initiatives, and exploiting opportunities mentioned.

5.22 SUMMARIES OF QUALITATIVE INTERVIEWS

The table indicates major qualitative findings in the research that could enhance the undergraduates' entrepreneurial education toward sustainability of employment in South African and worldwide.

Table 5:26 Summaries of qualitative interviews

Factors	Respondent A	Respondent B	Respondent C
The extent of the entrepreneurial interest of engineering students	To create new jobs and increases economic growth Worried about being unemployed.	To bring new competitive innovations into the economic system To become an entrepreneur rather than becoming a salary earner.	To start own business rather than become unemployed after graduation. Had been appointed as leader in business-related companies.
Attitude-based behavioural factors	To control what he does and not be controlled by someone else. If he had the opportunity and resources, he would like to start up his own business.	If he had the opportunity and resources, he would like to start up his own business. Taking a course in entrepreneurship would offer good career opportunities.	To control what she does and not be controlled by someone else. Taking a course in entrepreneurship would offer good career opportunities. Entrepreneurship courses seen as a practical and affordable route to self-employment.
Knowledge-based behavioural factors	The ability to apply academic background to start up a business. To provide solutions to problems identified during the course of opening a business.	Providing solutions to problems identified during the course of opening a business.	To apply academic background in order to start a business. To provide solutions to problems identified during the course of opening a business.
Perceived behavioural factors	If he tried to start a business, he would surely succeed. To start up a business would be easy.	To start up a business would be easy.	To start up a business would be easy for her. To would become self-employed.
Personality Traits factors	Every time he failed a task, he could reflect on why he failed so that he could learn how to do better in the future. The student was able to detect an opportunity the moment it arose.	To detect any opportunity, the moment it arose.	Every time she failed a task, she was able to reflect on why she failed so that she could learn how to do better in the future. The student was able to address stakeholder interests in business-

			related plans. To create a business in the future.
The important/ essential and compulsory on the entrepreneurship curriculum content	Inviting guest speakers for official speeches, mentorship in business-related projects, support for internships, entrepreneurship, training workshops, site visitation, risk-bearing.	Entrepreneurship tutors, training workshops, site visitation, risk-bearing.	Inviting guest speakers for official speeches, support for internships, business planning ideas, training workshops, site visitation, risk-bearing.
The needs of the entrepreneurship curriculum.	Risk-bearing to start up a business, inviting guest speakers for official speeches, extracurricular activities related to entrepreneurship, and entrepreneurship tutors	Extracurricular activities related to entrepreneurship, site visitation, entrepreneurship tutors.	Risk-bearing to start up a business, support for internship, mentorship in business-related projects and site visitation.
Intrinsic Rewards	Meeting challenges, Gaining public recognition and being free from corporate organisation.	Gaining public recognition. Being free from corporate organisation.	Obtaining personal growth and being free from corporate organisation.
Extrinsic Rewards	Increasing their income opportunity. To acquire personal wealth.	Increasing their income opportunity. To acquire personal wealth.	Increasing their personal income. To acquire personal wealth.
Independence/Autonomy	To be his own boss. To obtain self-employment. To acquire personal security. To allow for early retirement	To obtain self-employment. To acquire personal security. To allow for early retirement. To maintain my personal freedom	To obtain self-employment. To acquire personal security.
Family Background	Building a business to pass on. To secure a future for family members business.	Building a business to pass on. To secure a future for family members. To take up the family business	Securing future for family members. To take up the family business.
Change Management (adopting changes)	To develop new ideas. Innovations and initiatives. To respond to change. To exploit opportunities.	To develop new ideas. To recognise opportunities.	To develop new ideas. Innovations and initiatives. To exploit opportunities.

5.23 OPERATIONAL FRAMEWORK OF THE RESEARCH STUDY

This operational framework is recommended and developed by the researcher to enhance undergraduate engineering entrepreneurial education toward sustainable employment in South Africa

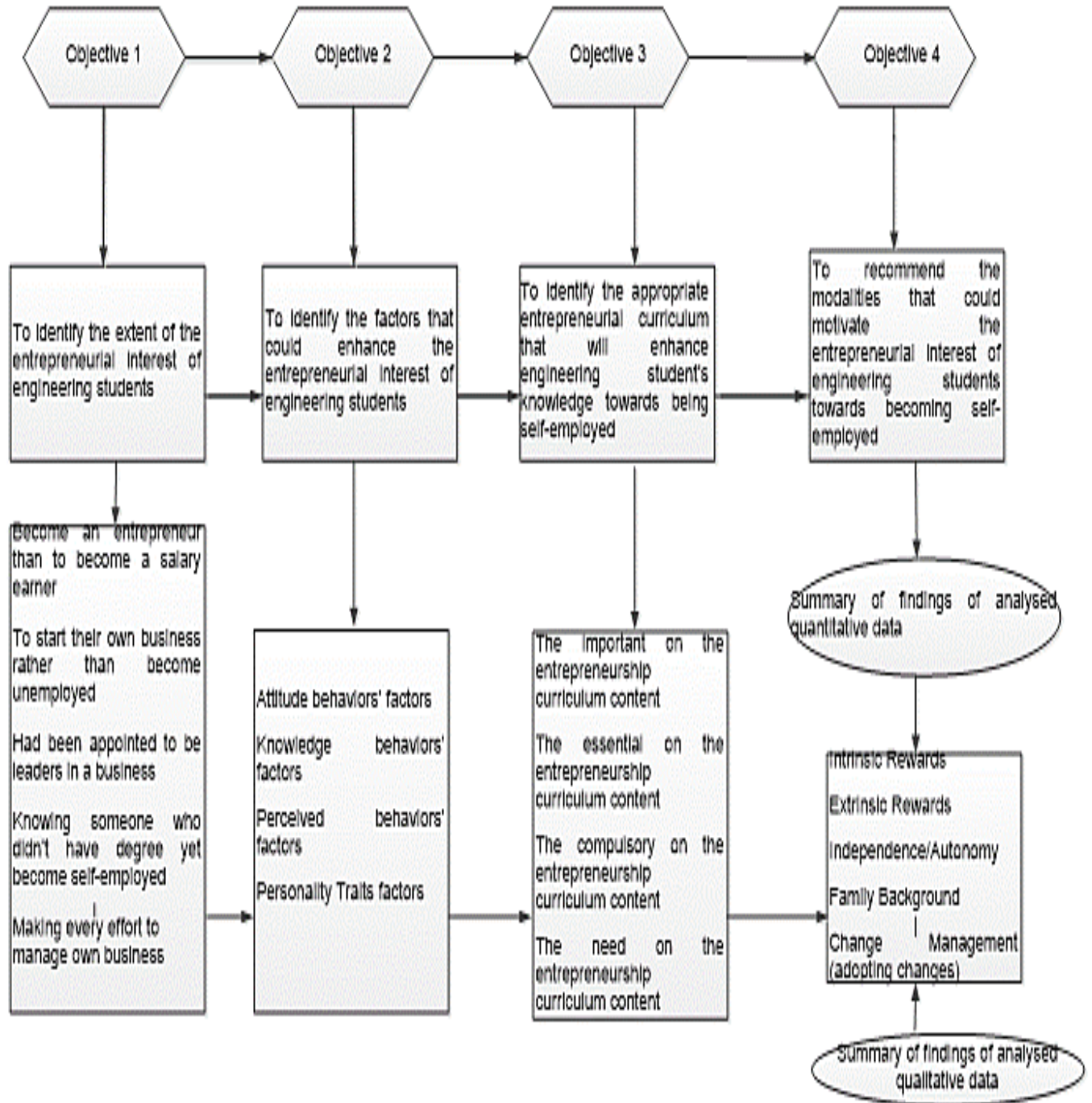


Figure 5:18 Operational framework to enhance engineering undergraduates' entrepreneurial education towards sustainability of employment

5.24 SUMMARY OF THE STUDY

This section presents summaries of the findings, conclusions, recommendations and suggestions for further research. The data collected were analysed using the Statistical Package for Social Sciences (SPSS) software, version 25. Descriptive statistics were used in the study. The survey questions were scaled and tested for reliability using Cronbach's alpha co-efficient. The average Cronbach's alpha coefficient for the questions was 0.8, indicating that the questions are reliable. The focus of this research was to determine the role of entrepreneurship education in developing engineering students' entrepreneurial interest among the engineering Universities in South Africa.

The purpose of this study was to establish the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment in South Africa. This was guided by the following research questions; to what extent are the entrepreneurial interests of engineering students in South Africa? What are the factors that enhance the entrepreneurial interest of engineering students in South Africa; what are the appropriate entrepreneurial curriculums that will enhance engineering student' skills with the aim of being self-employed in South Africa? And lastly, what are the modalities that could motivate the entrepreneurial interest of engineering students towards becoming self-employed? The study is significant to the South Africa government with regard to policy, the public who are interested in entrepreneurship and academicians as reference for further research.

A descriptive research design was used to gather data from students at the university through the questionnaires handed out. The data analysed was used to understand the influence of the study on the target population. The selected target population of this study consisted of Engineering and Built Environment students in the University of Cape and Cape Peninsula University of Technology in Western Cape. A sample size of 522 respondents participated in the study, recording a 75% response rate. The data analysed consisted of both open-ended and closed-ended questions and the results were presented in means, percentages, and frequencies in the form of graphs and tables. The study findings established the extent of the entrepreneurial interest of engineering students, the factors that will enhance the entrepreneurial interest of engineering students, the appropriate entrepreneurial curriculum that will enhance engineering students' knowledge/skills towards being self-employed, and modalities that could motivate the

entrepreneurial interest of engineering students towards becoming self-employed were notable to enhance the engineering students' interests in becoming self-employed in the South Africa.

CHAPTER SIX:

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

The data derived from the quantitative and qualitative survey on this – ‘engineering undergraduate’s entrepreneurial education aimed at sustainability of employment in Western Cape, South Africa’ – were analysed and discussed. Conclusions and recommendations were made based on the obtained results. This study aimed to investigate the critical factors that will enhance the entrepreneurial interest of engineering undergraduates in regard to sustainable employment in the Western Cape, South Africa. The objectives of this study were as follows:

1. To identify the extent of the entrepreneurial interest of engineering students in South Africa.
2. To identify the factors that could enhance the entrepreneurial interest of engineering students in South Africa.
3. To identify the appropriate entrepreneurial curriculum that will enhance engineering students’ knowledge towards being self-employed in South Africa.
4. To recommend the modalities that could motivate the entrepreneurial interest of engineering students towards becoming self-employed.

6.2 SUMMARY

Based on the literature reviewed and findings obtained through mixed method for this research data collections were listed below.

Table 6:1 presents the summary of research outcomes

S/N	Concept	Reference	Page
1	Research method	Figure 3.2	57
2	Summary findings of quantitative study	Table 5.1	122 - 124
3	Summary findings of qualitative study	Table 5.26	163-164
4	Operational framework for the study	Figure 5.18	165

6.3 CONCLUSION

The study aimed to investigate the critical factors that will enhance the entrepreneurial interest of engineering undergraduates with regard to sustainable employment in the Western Cape, South Africa.

This study contributes to applied research on the critical factors that will enhance entrepreneurship education research. The extensive literature review of entrepreneurship education enhanced studies analysed the current literature, the positive picture of influence of entrepreneurship education that initially existed and provided explanations for the extremely positive studies and the recent negative studies. The literature review pointed to many promising research gaps that were followed up in this study and tested. First, new variants of entrepreneurship education programmes were tested; second, research gaps in the areas of factors that could enhance the entrepreneurial interest of engineering students and the appropriate entrepreneurial curriculum that will enhance engineering students' knowledge regarding being self-employed, the link between entrepreneurial intention and self-employment, were filled. While the entrepreneurship education programmes modalities that could motivate the entrepreneurial interest of engineering students regarding becoming self-employed tested proved to have significant which will help to further improve future entrepreneurship education studies.

The findings of this research have shown that entrepreneurship education is the mostly significant to engaged the engineering student towards becoming self-employed in Western Cape, South Africa. However, most engineering universities were using general teaching and technical teaching. The general teaching stream allows students to finish their engineering programme (while being taught traditional subjects such as engineering mathematics, and engineering management), then graduate and look for a job; while the technical teaching stream, on the other hand, involves students in enterprise-related subjects such as commercial techniques, technical tools of communication and mechanical engineering. Therefore, entrepreneurship education is not included in the curriculum, although lecturers' participants from a business school believe that technical and commercial skills include some entrepreneurship and business-related notions.

However, engineering students expressed a need to study entrepreneurship education as a course in the engineering departments, some to become entrepreneurs later on and others just to acquire some knowledge about entrepreneurship, thus confirming the opinion of Zamberi Ahmad (2013), who theorises that entrepreneurship education assists engineering students in acquiring skills to start and manage their own business.

The findings have also shown that there is a need for entrepreneurship education. About 75 percent of students think they do have the necessary skills to start a business. Studying entrepreneurship will develop their skills and encourage them to become entrepreneurs, since the majority want to become entrepreneurs and many think it is necessary to study entrepreneurship. The findings reveal that with no training for entrepreneurship, tutors or lecturers, it will be difficult to implement entrepreneurship education. The findings reflect the contention that without lecturers training in entrepreneurship, entrepreneurship education is non-existent (Seikkula-Leino *et al.*, 2010), as lecturers are the ones transmitting the information. Training in entrepreneurship education for tutors/lecturers will hence indicate the beginning of entrepreneurship education in engineering universities in South Africa.

According to the engineering students, the curriculum was not designed for entrepreneurship and business studies. Therefore, entrepreneurship is to be taught in engineering universities. Thus, there is a need to redesign the curriculum in order to enhance entrepreneurship education with respect to sustainability of employment in South Africa.

6.4 LIMITATIONS

This study is conducted in the Western Cape Province of South Africa. The collection of data was carried out among Engineering and Built Environment students in the universities, and was a challenging task as a result of the busy schedules of the respondents, who complained of tight time schedules on school assignments, tests, and examinations. Due to time constraints, a significant number of the questionnaires were returned incomplete and therefore discarded by the researcher. The findings of the study are only applicable to Build and Engineering Environments in the Western Cape. The findings cannot be generalised.

6.5 CONCLUSION AND RECOMMENDATIONS

The study ascertained the extent of entrepreneurial interest of the engineering students with respect to becoming self-employed. Most of the students would rather become an entrepreneur than become a salary-earner, and this was identified as the most significant factor. However, students were committed to becoming entrepreneurs and ready to do anything to become entrepreneurs.

Rodrigues, Dinis, Do Paco, Ferreira and Raposo (2012) portray the view that entrepreneurial interest is established on more realistic perceptions of reality; it is reasonable to think that the training can act as a filter; those who are attracted by entrepreneurial business models are more

committed to becoming entrepreneurs and to learn what is required to be successful (Oosterbeek *et al.* 2010).

Successful entrepreneurs who have become successful impact positively on some students' interests in becoming entrepreneurs. Similarly, Kojo Oseifuah, (2010) maintain that role model and financial supports form a significant part of the students' entrepreneurial development. Moreover, engineering students will be motivated when referred to successful entrepreneurs, who will show that they are able to achieve the same success if they start up a business. These role models comprise family members, parents, businesspeople and other entrepreneurs.

This reveals that availability of resources to start businesses will influence the students with regard to becoming self-employed, as these factors affect students' attitude towards entrepreneurial interests positively. 86.3% of students indicated that they believed they did not need to worry about managing risk to start a business, and 83.6% expressed the belief that being an entrepreneur is more satisfying. The study found out that entrepreneurial education had a strong positive effect on personal attitudes and behavioural interests. There is attitude behaviour specifically as the ability to recognise opportunities and the ability to take calculated risk-bearing (Nybakk and Hansen 2008). Nybakk and Hansen (2008) maintain that people with entrepreneurial attitudes are more likely to start up new businesses. This required that risk-takers are more likely to start new business project and risk-bearing attitudes affected the selection of the engineering student into entrepreneurial interest (Antonites & Wordsworth 2009). According to Pretorius *et al.* (2005) education programmes contain the best knowledge and skills (content) about entrepreneurship and venture start-ups; there is no assurance that individuals will act entrepreneurially unless their mind-set, readiness to take risks, confidence, attitude, and behaviour have been impacted. Researchers have shown that the influences of the practitioners were found to be stronger than personal attitudes towards entrepreneurial interests in some studies (Rengiah, 2016). Another very significant factor is the fact that entrepreneurial competencies and attitudes can only be acquired or built through practical learning experiences in real life (Man, 2019 and Haskins, 2018).

According to Binuomote and Okoli (2015) engineering students need practical skills training for entrepreneurial development. It is not surprising that engineering graduates needed all the practical skills listed because the technical know-how relevant to an entrepreneur's area of business interest is very significant for business success. According to Uzoka (2007), having job-specific knowledge and techniques required to perform one's organisational role is vital.

Therefore, engineering graduates should strive to attain mastery of the practical aspect of the business so as to understand the secret of success in pursuing business. Moreover, having specific knowledge and practical skills in a specific area of business could serve as a guarantee for effective performance. Akarahu and Baba (2011) broadly agrees with this notion, arguing that there is no significance difference in the mean ratings of respondents with respect to the technical competency required for successful business entrepreneurial.

Perceived behavioural control has less significance in predicting entrepreneurial interest in areas where uncertainty avoidance is high, or among persons who feel less capable of handling the uncertainty of start-ups; even after possessing the necessary skills have a lower entrepreneurial intention. Thus, perceived behavioural control would be a weak predictor of entrepreneurial interest in those areas than in areas of lower uncertainty avoidance (Liñán & Chen, 2009). Nevertheless, Liñán & Chen (2009) contend that persons with a high-risk propensity are probably able to anticipate experiencing less debilitating anxiety about an entrepreneurial career, perceive a healthier sense of control over outcomes, judge the possibility of receiving positive rewards more highly, and hence possess higher perceived. Basu and Virick (2008) note that prior experience with entrepreneurship education has a positive result on perceived behavioural control. Furthermore, students who have prior knowledge in entrepreneurship will have more confidence in their ability and thus heightened entrepreneurial interest (Basu and Virick 2008). Similarly, Souitaris, Zerbinati and Allaham (2007) posit that entrepreneurial interests for students in general are most likely to have high self-confidence, which represents the perceived behavioural control. This clarified the need; desire and process that needs the confidence of engineering students that can do this actualise entrepreneurship.

The findings of the study show that engineering students are motivated to learn entrepreneurship courses as well as social learning can be agreed as key features of trans disciplinary knowledge alliances and play a crucial role in establishing the conditions for a successful and innovative development that will drive curricula. (Daneshjovash and Hosseini, 2019; Finkle, 2007). The teaching method enhances the students through facilitation and provision of enabling environments to students during learning processes, in which different engineering students share their opinions in an open, supportive and trustful atmosphere (Mshelia and Abdulrahman, 2018; Ezenwafor and Olaniyi, 2018).

The project team experienced a group education process on the engineering students as well as on the social level. Student learning and group learning have been interconnected in the collective

learning process of the project team (Micozzi and Micozzi, 2015; Neck and Greene, 2011). Remarkably the student team member who was learning, it was also the whole group that was broadening its ability to support and maintain an appropriate learning environment for its members (Kirby, 2004 and Wildemeersch, 2009). Therefore, even the members who did not report changes in their action theories still have been impacted by the promoted culture of dialogue considered as desirable by the group. Thus, the learning process in the engineering students' team was initiated with the interest were good to design a new programme focusing on promoting a new way of thinking in society during and after studying in order to become self-employed, which may have a deep symbolic meaning (Murray *et al.*, 2018; Neck and Greene, 2011; Fayolle and Gailly, 2008; Pittaway and Cope, 2007)

An engineering curriculum consists of the list of courses and activities for the lecturers and the general objectives of the programme. Gaius-Okeh (2019) and Ogwo (2018) states that a curriculum in engineering education can be seen as the whole of those experiences, skills, knowledge and activities scientifically designed to educate the engineering students for gainful employment in any chosen occupation or cluster of occupations. This connotes that the aim of an engineering education curriculum is to develop manipulative skills for employment and/or producing job-makers and not job-seekers. Products of engineering education depend largely on the type of curriculum at our engineering institutions. Hence, the engineering education curriculum should be developed based on the essentials of the society which it is to serve. It is essential to update and review curricular regularly in order update manipulate skills, knowledge, attitudes and values, as well as keeping pace with the developments in science and technology and their applications, to motivate a realistic work setting in the industry (Kirby, 2004).

Preparing a business plan produces an impression of formality and conviction often compulsory before an engineering student's creation of a new business will be taken seriously. Business planning is the first step toward an unambiguous process widely known as entrepreneurship, but unlike the activity of entrepreneurship, it focuses primarily on ideas as opposed to actions (Honig, 2004). A well-crafted business plan is one of the most vital communication tools for an entrepreneur and provides a sense of legitimacy to the business and the founders. The lack of a good business plan may be perceived as a lack of interest or commitment on the part of the entrepreneur(s). Many entrepreneurs learn that the preparation of a well-crafted business plan can be an overwhelming task. A well-written plan is concise, yet comprehensive, and requires a multitude of decisions about all aspects of new business creation, from exploiting the opportunity to acquiring resources and building the top management team. Constructing a realistic business

plan requires a profound understanding of the business model, the product, the competitive landscape, and the prospective financial model. However, understanding the business is not enough: a business plan must also be credible, which is compulsory to engineering students (Wing, 2019).

This requires entrepreneurship curricula to be inclusive and affective. Thus, a curriculum should facilitate a learning community, where engineering students are able to observe the world through a different lens and create opportunities; and include serious games, design-based thinking and reflective practice, businesses as coursework, role-play and simulations (Neck and Greene, 2011). Ruswanti (2016) points out the need to create the type of environment that could be conducive to encouraging engineering students' entrepreneurial thinking and behaving. The engineering student who engages in entrepreneurship education would represent a key component of the entrepreneurial ecosystem (Isenberg, 2010 and 2011). As a result, the concept of the engineering universities designing an entrepreneurial curriculum supports this study (Bouncken and Reuschl, 2018 & Cheng 2012). In similar terms, university support for entrepreneurial ecosystems and the creation of an entrepreneurial regional culture has been the subject of analysis in prior research (Khairutdinov *et al.*, 2018; Coduras *et al.*, 2008; Pitelis, 2012; Suresh and Ramraj, 2012; Clarysse *et al.*, 2014). A related concept of high importance with regard to entrepreneurial ecosystems is stakeholder theory. Engineering students are primarily employed in a business context, defined as those groups and individuals who can affect or be affected by business activities (Freeman 2010).

In the previous literature, teaching methods are divided into two groups, which are termed "traditional methods" (comprising normal lectures) and "innovative methods" (which are more action-based). Bennett (2006) states that there is a need for the instructor to facilitate learning, but not to control and apply a method that enhances engineering students' self-discovery. The example lectures, group discussions and case studies. These are actually the same methods used in other business-related courses, which according to Bennett (2006) are passive and less effective in persuading students to adopt entrepreneurial characteristics. Hence, there is a need to include teaching methods in the engineering curriculum that will enhance entrepreneurial interest of students.

The engineering students could be significantly motivated to start a new business due to intrinsic rewards, extrinsic rewards and the independence/autonomy of becoming entrepreneurs. The findings are similar to the entrepreneurs in the US and Russia (Zhuplev, 1998). This is also

consistent with Liang and Dunn's study (2007) who argue that personal and financial triggers are significant triggers to start up a business venture. For this reason, it can be acceptable by the fact that the engineering graduates are looking for a better way of life and more freedom. Nevertheless, they are left with competition and lack of working funds when faced with the challenge of starting a new business. This supported the result of Moy et al. (2001), who established that students from Hong Kong and Thailand encountered the same barriers to starting up a new business. The necessity for the support of government in promoting entrepreneurship was rated fairly high and this finding is in agreement with Fogel's (2001) findings, which show that high taxation and lack of availability of long-term financing hinders the effort to promote entrepreneurship (Moy *et al.*, 2001; Ooi, 2008; Phan *et al.*, 2002; Shandu *et al.*, 2014). This finding is consistent with However, surprisingly, working experiences were found to have no significant effect on entrepreneurial motivation in starting up a new business.

According to the data collected, entrepreneurship programmes have an impact on students' entrepreneurial interest and attributes. Additionally, the educational systems need to be oriented to the importance and value of entrepreneurship in order to encourage a business culture. This should include new methods of assessment, teaching, and a practicality component integrated during course or content delivery without further delay.

Inclusion, tradition universities, needs to encourage self-confidence in engineering student entrepreneurial interest by designing and enhancing the entrepreneurship programmes structure. Therefore, educational institutions should organise more entrepreneurial-related activities including, for instance, inviting guest speakers, risk-bearing, entrepreneurship tutorials, site visitations, support for internship, mentorship, training workshops, affording students opportunities for visiting established entrepreneurship ventures. All these are critical and could strongly motivate engineering students' entrepreneurial interest. Similarly, high rate of unemployed youths in the society is a pressing issue facing the world today. Alongside the increase of factors supporting the role of entrepreneurship, governments have continued in supporting youths to become entrepreneurs. To that end, educational institutions have started implementing education programmes associated with entrepreneurship education, including business planning, business concepts, collaboration with practitioners and networking. It is believed when such programmes are established in all the engineering HEIs that the entrepreneurial education curriculum will stimulate the entrepreneurial interest and attributes in students to achieve self-reliance and self-employment. Moreover, researchers hope that this study will provide the universities and students in South Africa with useful knowledge to

understand how one's personal behaviour and teaching curriculum design will have an effect on one's interest in becoming entrepreneur.

6.6 RECOMMENDATIONS FOR FURTHER RESEARCH

This study investigates the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment in South Africa. The study was carried out only on two universities in Western Cape, South Africa, and this means that the results of this study are skewed to the perceptions, beliefs and culture of the university. It is suggested that such a study be carried out in other universities to increase the statistical relevance of the study and more reliable results. It is recommended that future studies include the engineering postgraduate students as respondents.

Secondly, further studies can be carried out on other factors that affect entrepreneurial interest, apart from the factors that have been examined in this study.

Thirdly, future research could look at inferential statistics to determine relationships and comparisons between the different engineering schools within South Africa. Finally, future research should suggest an entrepreneurship-related curriculum in all the engineering schools in South Africa.

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APPENDICES

APPENDIX A – SURVEY QUESTIONNAIRE



Dear Sir/Madam,

RE: PARTICIPATION IN A SURVEY

You are cordially invited to participate in this research survey which aims to investigate the critical factors that will enhance the entrepreneurial interest of engineering undergraduate students in pursuing sustainable employment. This study is primarily undertaken for academic purposes for a Master’s Degree in Construction at Cape Peninsula University of Technology.

Please read all questions carefully and provide answers as honest as you can. The survey takes about 20 minutes to complete. Please indicate your response by a tick (√) or (X) in the appropriate column per item

All information provided in this study will be kept strictly **CONFIDENTIAL** and will be solely used for academic purposes. You give your consent to participate by signing this declaration to participant.

Your participation in this research is voluntary. While you may agree to participate, there will be no penalty should you decide to withdraw from the study.

Declaration by participant: By signing below,

I name (optional) (.....)agree to take part in this study and is aware that no compensation will be provided for participating.

Signature.....

Date.....

Kindly complete the survey and return to:

Ndukuba Samuel

E-mail: ndusam4christ@yahoo.com

Mobile: +27 (0) 630 642242

Thanks for your cooperation and readiness to assist.

SECTION A: INDIVIDUAL INFORMATION

Please kindly indicate your response by a tick (√) or (X) in the appropriate column per item

Please indicate the department you are enrolled in

Chemical Engineering	
Civil Engineering	
Clothing & Textile Technology	
Construction Management & Quantity Surveying	
Electrical, Electronic and Computer Engineering	
Industrial & Systems Engineering	
Mechanical Engineering	

If 'other's, please specify.....

Please indicate the level of study

First year	
Second year	

Third year	
Fourth year (bachelor's degree)	
Fourth year (Bachelor Hons)	

Please indicate your gender

Male	
Female	
Other	

Kindly indicate your age group

11-15 years	16 – 20 years	21 – 25 years	26 – 30 years	31 -35 years	36years and over

Kindly indicate your race

Black	White	Coloured	Indian	Chinese	Other

SECTION B: THE EXTENT OF ENTREPRENEURIAL INTEREST OF STUDENTS

2. Kindly indicate the level of your compulsory regarding entrepreneurial interest. Rank on a 4 – point Likert scale **Where: 1 = Very Compulsory, 2 = Compulsory, 3 = Slightly Compulsory. 4 = Not Compulsory**

N/O	ENTREPRENEURIAL INTEREST	1	2	3	4
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1	I would rather become an entrepreneur than become a salary earner	1	2	3	4
2	I would like to start my own business rather than become unemployed	1	2	3	4
3	I would like to get a salaried job due to family resistance to me starting a business	1	2	3	4
4	I would rather get a salary job due to the bad experience of others in owning a business	1	2	3	4
5	I will make every effort to manage my own business	1	2	3	4
6	I would like to learn about business-related courses in the engineering field	1	2	3	4
7	I can take advantage of market conditions when running a business	1	2	3	4
8	I would like to be the manager of someone else's business	1	2	3	4
9	I do not want to become an intrapreneur in someone else's business	1	2	3	4
10	I do not have the finances to start my own business	1	2	3	4
11	My family background does not support me financially to start up my own business	1	2	3	4
12	My gender will have a negative effect on starting a business	1	2	3	4
13	I feel motivated every time I see someone is doing better in business	1	2	3	4
14	I have the necessary communication skills to become self-employed	1	2	3	4
15	I feel happy and proud if one of my family members is self-employed	1	2	3	4
16	I know of someone who didn't have a degree yet become self-employed	1	2	3	4
17	I feel bad when I see graduates from reputable universities unable to secure a job	1	2	3	4
18	I was appointed to be a leader in a business	1	2	3	4

SECTION C: FACTORS THAT ENHANCE ENTREPRENEURIAL INTEREST

C1. Kindly rate the following attitude behaviours that could enhance your entrepreneurial interest. Rank on a 4 – point Likert scale **Where: 1 = Very Satisfied, 2 = Satisfied, 3 = Dissatisfied, 4 = Very Dissatisfied**

N/S	ATTITUDE-BASED BEHAVIOURS REGARDING ENTREPRENEURIAL INTEREST	1	2	3	4
1	I would rather be a CEO than secure a job after graduation.	1	2	3	4
2	To own a company as an entrepreneur is more attractive for me	1	2	3	4

3	If I had the opportunity and resources, I would like to start a business	1	2	3	4
4	Being an entrepreneur is more satisfying for me	1	2	3	4
5.	If I start my business, I will certainly be successful	1	2	3	4
6	I do not need to worry about managing risk	1	2	3	4
7	I would rather be a job-seeker than to be a CEO, due to high risk involved	1	2	3	4
8	An entrepreneurship course will offer me good opportunities in terms of my career	1	2	3	4
9	Entrepreneurial courses aren't necessary since there are established companies	1	2	3	4
10	Entrepreneurship courses are practical and affordable to me	1	2	3	4
11	I like to control what I do and not be controlled by someone else	1	2	3	4

C2. Kindly rate your knowledge behaviours that could enhance on your entrepreneurial interest. Rank on a 4 – point Likert scale **Where: 1 = Very Poor, 2 = Poor, 3 = Good, 4 = Very Good**

	KNOWLEDGE-BASED BEHAVIOURAL FACTORS INFLUENCING ENTREPRENEURIAL INTEREST	1	2	3	4
1	I have the ability to understand the nature of business	1	2	3	4
2	I have the ability to apply an academic background to start up a business	1	2	3	4
3	I have the ability to understand what measures to take to grow a business.	1	2	3	4
4	I have the ability to determine an appropriate location for a good business	1	2	3	4
5	I have the ability to process raw materials into finished goods for profit-making	1	2	3	4
6.	I can determine the number of works needed to start up my business	1	2	3	4
7.	I have the ability to identify business operational problems	1	2	3	4
8	Ability to provide a solution to problems identified	1	2	3	4
9	I can use my academic knowledge to manage risk	1	2	3	4
10	I do not have knowledge of any related business courses to start up a business		1	2	3

C3 Kindly rate the following perceived behaviours that could affect your entrepreneurial interest. Rank on a 4 – point Likert scale **Where: Strongly Disagree=1, Disagree=2, Agree=3, Strongly Agree=4**

1	To start a business would be easy for me	1	2	3	4
2	To maintain a business would be easy for me	1	2	3	4
3.	I know how to develop an entrepreneurial project	1	2	3	4
4	If I tried to start a business, I would have a high probability of succeeding	1	2	3	4
5	I could become self-employed after my engineering programme in future	1	2	3	4
6	To start my own firm would probably be the best way for me to take advantage of my business-related education	1	2	3	4
7	I have thought seriously about starting my own firm	1	2	3	4
8	I have the ability to anticipate technical developments by interpreting surrounding social trends	1	2	3	4
9	The ability to cope with failure can be improved through education in school	1	2	3	4
10	Creative thinking skills can be acquired through entrepreneurship learning	1	2	3	4
11	I find myself being curious about a lot of things and people I encounter in life	1	2	3	4

C4 Kindly rate the following personality traits could enhance your entrepreneurial interest. Rank on a 4 – point Likert scale **Where: Strongly Disagree=1, Disagree=2, Agree=3, Strongly Agree=4**

N/S	PERSONALITY TRAITS REGARDING ENTREPRENEURIAL INTEREST	1	2	3	4
1	I like to create business	1	2	3	4
2	I extend to use new opportunity to rebrand my product	1	2	3	4
3	I will start my own business if I detect an opportunity	1	2	3	4

4	I have leadership skills that are needed to be an entrepreneur.	1	2	3	4
5	I am confident in my skills and abilities to start a business.	1	2	3	4
6	I have the mental maturity to be an entrepreneur.	1	2	3	4
7	I'm able to identify potential stakeholders for a new product or service	1	2	3	4
8	I am able to address stakeholder interests in a business plan	1	2	3	4
9	I want to become a good engineer as well as a successful entrepreneur	1	2	3	4
10	When I read about a new innovation, I try to understand the value that it will create	1	2	3	4
11	Every time I fail a task, I reflect on why I failed so that I can learn how to do better in the future	1	2	3	4

SECTION D. THE CONTENTS OF ENTREPRENEURSHIP CURRICULUM

D1 Kindly indicate how important the following entrepreneurship curriculum will enhance your entrepreneurial interest. Rank on 4 – point Likert **Where: 1 = Very Important 2 =Important, 3 = Slightly Important. 4 = Not Important.**

S/N	TEACHING-LEARNING METHODS	1	2	3	4
1	Inviting guest speakers for an official speech	1	2	3	4
2	Mentorship in business-related projects	1	2	3	4
3	Extracurricular activities related to entrepreneurship	1	2	3	4
4	Watching videos and recordings related to entrepreneurship	1	2	3	4
5	Process-oriented learning	1	2	3	4
6	Bilateral learning	1	2	3	4
7	My lecturer provides group discussion on business-related courses	1	2	3	4
8	Group discussion on business-related courses	1	2	3	4
9.	Practical experience	1	2	3	4
10	Entrepreneurship tutors	1	2	3	4
11	Training workshops	1	2	3	4
12	Site visitation	1	2	3	4
13	Class practicals on business-related courses	1	2	3	4
14	Research projects on business-related courses	1	2	3	4

15	Support for internship	1	2	3	4
16	Business planning ideas	1	2	3	4
17	Risk-bearing	1	2	3	4
18	Inviting guest speakers for seminars	1	2	3	4

D2 Kindly indicate how essential the following entrepreneurship curriculum will enhance your entrepreneurial interest. Rank on 4 – point Likert **Where: 1 = Very Essential, 2 = Essential, 3 = Slightly Essential. 4 = Not Essential**

N/S	TEACHING-LEARNING METHODS	1	2	3	4
1	Inviting guest speakers for an official speech	1	2	3	4
2	Mentorship in business-related projects	1	2	3	4
3	Extracurricular activities related to entrepreneurship	1	2	3	4
4	Watching videos and recordings related to entrepreneurship	1	2	3	4
5	Process-oriented learning	1	2	3	4
6	Bilateral learning	1	2	3	4
7	My lecturer provides group discussion on business-related courses	1	2	3	4
8	Group discussion on business-related courses	1	2	3	4
9.	Practical experience	1	2	3	4
10	Entrepreneurship tutors	1	2	3	4
11	Training workshops	1	2	3	4
12	Site visitation	1	2	3	4
13	Class practicals on business-related courses	1	2	3	4
14	Research projects on business-related courses	1	2	3	4
15	Support for internship	1	2	3	4
16	Business planning ideas	1	2	3	4
17	Risk-bearing	1	2	3	4
18	Inviting guest speakers for seminars	1	2	3	4

D3 Kindly indicate how compulsory the following entrepreneurship curriculum will enhance your entrepreneurial interest. Rank on 4 – point Likert **Where: 1 = Very Compulsory, 2 = Compulsory, 3 = Slightly Compulsory. 4 = Not Compulsory**

N/S	TEACHING-LEARNING METHODS	1	2	3	4
1	Inviting guest speakers for an official speech	1	2	3	4
2	Mentorship in business-related projects	1	2	3	4
3	Extracurricular activities related to entrepreneurship	1	2	3	4
4	Watching videos and recordings related to entrepreneurship.	1	2	3	4
5	Process-oriented learning	1	2	3	4
6	Bilateral learning	1	2	3	4
7	My lecturer provides group discussion on business-related courses	1	2	3	4
8	Group discussion on business-related courses	1	2	3	4
9.	Practical experience	1	2	3	4
10	Entrepreneurship tutors	1	2	3	4
11	Training workshops.	1	2	3	4
12	Site visitation	1	2	3	4
13	Class practicals on business-related courses	1	2	3	4
14	Research projects on business-related courses	1	2	3	4
15	Support for internship	1	2	3	4
16	Business planning ideas	1	2	3	4
17	Risk-bearing	1	2	3	4
18	Inviting guest speakers for seminars	1	2	3	4

D4 Kindly indicate how the following entrepreneurship curriculum needed could enhance your entrepreneurial interest. Rank on 4 – point Likert **Where: 1 = Mostly Needed, 2 = Very Needed, 3 = Needed. 4 = Not Needed**

N/S	TEACHING-LEARNING METHODS	1	2	3	4
1	Inviting guest speakers for an official speech	1	2	3	4
2	Mentorship in business-related projects	1	2	3	4
3	Extracurricular activities related to entrepreneurship	1	2	3	4
4	Watching videos and recordings related to entrepreneurship.	1	2	3	4
5	Process-oriented learning.	1	2	3	4
6	Bilateral learning	1	2	3	4

7	My lecturer provides group discussion on business-related courses	1	2	3	4
8	Group discussion on business-related courses	1	2	3	4
9.	Practical experience	1	2	3	4
10	Entrepreneurship tutors	1	2	3	4
11	Training workshops	1	2	3	4
12	Site visitation	1	2	3	4
13	Class practicals on business-related courses	1	2	3	4
14	Research projects on business-related courses	1	2	3	4
15	Support for internship	1	2	3	4
16	Business planning ideas	1	2	3	4
17	Risk-bearing	1	2	3	4
18	Inviting guest speakers for seminars	1	2	3	4

SECTION E: MODALITIES TO MOTIVATE ENTREPRENEURIAL INTEREST OF ENGINEERING STUDENTS

Kindly Confirm the level at which you agree with the following under listed statements that could motivate your entrepreneurial interest. Rank on a 4 – point Likert scale **Where: 1 = Very Satisfied, 2 = Satisfied, 3 = Dissatisfied, 4 = Very Dissatisfied**

NO	MOTIVATIONAL FACTORS	1	2	3	4
	Intrinsic Rewards	1	2	3	4
1	To enjoy the excitement	1	2	3	4
2	To meet the challenge	1	2	3	4
3	To prove I can do it	1	2	3	4
4	To obtain personal growth	1	2	3	4
5	To gain public recognition	1	2	3	4
6	To be free from corporate organisation	1	2	3	4
	Extrinsic Rewards	1	2	3	4
1	To increase my personal income	1	2	3	4
2	To increase my income opportunity	1	2	3	4
3	To acquire personal wealth	1	2	3	4

	Independence/Autonomy	1	2	3	4
1	To be my own boss	1	2	3	4
2	To obtain self-employment	1	2	3	4
3	To acquire personal security	1	2	3	4
4	To allow for early retirement	1	2	3	4
5	To maintain my personal freedom	1	2	3	4
6	To control my own destiny	1	2	3	4
	Family Background	1	2	3	4
1	To build a business to pass on	1	2	3	4
2	To secure a future for family members	1	2	3	4
3	To take up the family business	1	2	3	4
	Change Management (adopting changes)	1	2	3	4
1	To develop new ideas, innovations and initiatives	1	2	3	4
2	To respond to change	1	2	3	4
3	To recognise opportunities	1	2	3	4
4	To exploit opportunities	1	2	3	4

APPENDIX B: INTERVIEW QUESTIONS



Do you think entrepreneurial education will enhance your in becoming self-employed? Please explain.

Do you think entrepreneurial education could affect your attitude, knowledge, perception and personality in relation toward in becoming self-employed? Please explain.

Do you think that entrepreneurial curriculum prepare the engineering undergraduate to start their own business? Please explain.

What are the modalities that you think that could motivate the entrepreneurial interest of engineering students towards becoming self-employed?

Do you have any other comments?

I.