ENTREPRENEURIAL INTENTIONS AND START-UP REALITIES: THE CASE OF INDUSTRIAL DESIGN STUDENTS IN SOUTH AFRICA

by

ALTHEA ELIZABETH MVULA
(50785346)

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SUPERVISOR: DR D. VISSER

CO- SUPERVISOR: PROF J.W. STRYDOM

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DECLARATION

I declare that the thesis **Entrepreneurial intentions and start-up realities: The case of industrial design students in South Africa** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

_____ _____

Signature Date

Ms Althea Elizabeth Mvula

DEDICATION

This thesis is dedicated to my son, Elmo De Witt for inspiring me and motivating me to study. Thank you for your support, love, belief and encouragement. Thank you for reading, editing and formatting my work. Thank you for being an excellent sounding board. Thank you for your understanding and support throughout my study. You inspire me to become a better person.

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ABSTRACT

Industrial design is recognised for the value-oriented benefits it offers to businesses. Industrial design ensures that new products are more efficient, usable, convenient and safe to use within the evolving business environment. One of the important factors for the continuous achievement of high product quality and general economic growth and stability in countries such as West Germany, Korea and Japan is their sound industrial design base.

Industrial design programmes can be instrumental to ignite an entrepreneurial and innovation spirit to assist in curbing the high unemployment rate and very low levels of entrepreneurial intentions in South Africa. The core of tertiary industrial design students has unique capabilities that can assist the South African economy to stimulate manufacturing, job creation and economic growth.

The purpose of this study was to investigate the entrepreneurial intentions among industrial design students enrolled for the programme in Three-Dimensional Design, at Universities of Technology in South Africa. In addition, this study investigates the relationship between entrepreneurial intentions and actual business formation by graduates of the programme. Studies have been carried out in South Africa on entrepreneurial intentions, but not on the formation, occurrence and implementation of entrepreneurial intentions amongst industrial design students, specifically.

To test the links between business education and entrepreneurial intentions, a research model based on Ajzen's (1985) Theory of Planned Behaviour was adopted and tested using quantitative empirical data collected from students in industrial design at two Universities of Technology. Quantitative data were collected from a sample of 161 participants using a validated self-administered questionnaire. IBM SPSS and STATA were used to conduct descriptive statistics, Chi-square tests, factor analysis, reliability and structural equation modelling on the primary quantitative data. The empirical evidence partially supports the effectiveness of the Theory of Planned Behaviour in predicting entrepreneurial intentions. Although perceived social norms and self-efficacy is positively related

to entrepreneurial intentions, results failed to reach statistical significance. However, personal attitude was found to mediate the relationship between these variables and entrepreneurial intention. Whilst business education is positively related to self-efficacy, entrepreneurial knowledge is positively related to higher levels of personal attitude and self-efficacy.

The transformation of entrepreneurial intentions into actual business start-ups were investigated using qualitative empirical data collected from past graduates of the Three-Dimensional Design programme. Qualitative data were collected from a sample of 22 graduates through structured interviews. ATLAS.ti version 7.5.9 was used to analyse the qualitative data. The researcher provided evidence that there is a relationship between entrepreneurial intentions and the actual start-up of a business, as 45.5 per cent of graduates started businesses. Furthermore, business education positively influenced the actual start-up of businesses. However, graduates experienced many challenges to business start-up, with implications for the teaching of business subjects and for policy makers.

Key terms

Entrepreneurship, Entrepreneurial Intention, Entrepreneurship Education, Business Education, Business Management, Business Start-ups, Personal Attitude; Three-Dimensional Design, University Students, Industrial Design Students and Graduates

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LIST OF ABBREVIATIONS

AEG	Allgemeine Elektricitäts-Gesellschaft Aktiengesellschaft
AIC	Akaike's information criterion
APPS	Computer application
ASEE	American Society for Engineering Education
ATM	Automated Teller Machine
BA	Bachelor of Arts
BE	Business education
BIC	Bayesian information criterion
BSc	Bachelor of Science
B Tech	Baccalaureus Technologiae
CD	Coefficient of determination
CEO	Chief Executive Officer
CeSTII	Centre for Science, Technology and Innovation Indicators
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CNC	Computer Numeric Control
CoID	Council of Industrial Design
CPUT	Cape Peninsula University of Technology
DEFSA	Design Education Forum of Southern Africa
DESIS	Design for Social Innovation and Sustainability
DST	Department of Science and Technology
DTI	Department of Trade and Industry
DUNE	Development Unit for New Enterprise
EC	European Commission
EI	Entrepreneurship Intention
EIQ	Entrepreneurship Intention Questionnaire
EK	Entrepreneurial knowledge
ENACTUS	Entrepreneurial Action Us
ERSA	European Regional Science Association
EU	European Union
FADA	Faculty of Art, Design and Architecture
FDI	Foreign Direct Investment

FEDCI	Forum of Entrepreneurship Development Centres at Higher Education Institutions
FET	Further Education and Training
GBATA	Global Business and Technology Association
GCIS	Department of Government Communication and Information Systems
GDP	Gross Domestic Product
GE	General Electric
GEM	Global Entrepreneurship Monitor
GFI	Goodness of Fit Index
HSRC	Human Sciences Research Council
IATED	International Association of Technology, Education and Development
IBM SPSS	IBM Statistical Package for the Social Sciences
ICSID	International Council of Societies of Industrial Design
IDA	International Design Alliance
IDSA	Industrial Designers Society of America
IED	Instituto Europeo di Design
IEEE	Institute of Electrical and Electronic Engineers
IID	Institute of Interior Design Professions
INSEAD	INSEAD, The Business School of the World
INTI	INTI International Universities and Colleges
IP	Intellectual Property
IPAP	Industrial Policy Action Plan
ISBE	Institute for Small Business and Entrepreneurship
ISPIM	International Society for Professional Innovation Management
IT	Information Technology
ITEEM	Institut Technologique Européen d'Entrepreneuriat et de Management
KMO	Kaiser-Meyer-Olkin
LR	Likelihood-ratio
MIT	Maharashtra Institute of Technology
MIT	Massachusetts Institute of Technology
M Tech	Master Technologiae
NAD	Network of African Designers

NASAD	National Association of Schools of Art and Design
NBD	New Business Development
NDP	National Development Plan
NPC	National Planning Commission
NYDA	National Youth Development Agency
NZIDC	New Zealand Industrial Design Council
OECD	Organisation for Economic Co-operation and Development
PA	Personal Attitude
PBC	Perceived Behavioural Control
PCA	Principal Component Analysis
PCB	Printed Circuit Board
PLS	Partial Least Squares
PSN	Perceived Social Norms
RDP	Reconstruction and Development Programme
R&D	Research and Development
RMSEA	Root Mean Square Error of Approximation
SABS	South African Bureau of Standards
SAHO	South African History Online
SARB	South African Reserve Bank
SAWEN	South African Women Entrepreneurs' Network
SBA	Small Business Administration
SE	Self-efficacy
SEDA	Small Enterprise Development Agency
SEE	Shapero and Sokol's Model of the Entrepreneurial Event
SEED	Supporting Entrepreneurs for Environment and Development
SEGD	Society for Experiential Graphic Design
SEM	Structural Equation Modelling
SME	Small and Medium Enterprise
SN	Social Norms
SPEED	Student Placements for Entrepreneurs in Education
TDD	Three-Dimensional Design
TIA	Technology Innovation Agency
TLI	Tucker-Lewis Index
TPB	Theory of Planned Behaviour

TUT	Tshwane University of Technology
TWR	Technikon Witwatersrand
UCA	University for the Creative Arts
UJ	University of Johannesburg
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNISA	University of South Africa
USA	United States of America
USC	University of Southern California
VAT	Value-Added Tax
WDC	World Design Capital
WDO	World Design Organisation
WEF	World Economic Forum
WESGRO	Western Cape Destination Marketing, Investment and Trade Promotion Agency
WIDD	World Industrial Design Day
WIPO	World Intellectual Property Organisation
R	SA Rand
$	United States Dollars
£	Pound Sterling

CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

This thesis, entitled “Entrepreneurial intentions and start-up realities: The case of industrial design students in South Africa” investigated business education in the context of Universities of Technology and its effects on entrepreneurial activity following graduation. In this chapter, the general outline of the study is provided. This chapter presents the background and rationale for the study, and the aim and significance of the study. Thereafter, the identified research gap, the problem statement, research questions, research objectives and research hypotheses are presented, and the research model used to answer the research questions is described. This chapter provides a brief description of the research methodology rationale to collect the empirical data used to test the research model and to answer the research questions. The potential contribution of the study is described. Lastly, the ethical considerations and a layout of the chapters are provided.

1.2 RESEARCH BACKGROUND

In this section, the economy and the role of entrepreneurship, entrepreneurial intentions, and entrepreneurship and industrial design will be discussed.

1.2.1 The economy and role of entrepreneurship

Entrepreneurs play a fundamental part in the economic growth of a country by starting new businesses (Wilson, 2011:1; Roper, 2013:18). Globally, economic progress calculated in terms of changes in output, distribution and economic structure of a country, could be credited to the successful new businesses created by entrepreneurs (Nair, 2016:201).

The Gross Domestic Product (GDP) in South Africa decreased in the first quarter of 2017 to -0.6 per cent (%) but expanded to 2.0% in the third quarter of 2017

(South Africa. Department of Statistics, 2017a:9). Compounding the challenge of unemployment experienced in South Africa, the growth forecast for the South African economy is estimated at mere 1.9% for 2020 (South African Reserve Bank [SARB], 2017:69). The World Bank (2018:142) estimates the GDP growth lower at 0.8% for 2017, 1.1% for 2018, 1.7% for 2019 and 1.7% for 2020 for South Africa.

Unemployment increased from 27.1% in July to September 2016 to 27.7% for the period January to September 2017 for the population group 15-64 years in South Africa (South Africa. Department of Statistics, 2017c:21). The unemployment rate for the age group 15-24 (youth and young adults that are not employed, in training or education) was 52.1% and 33.5% for the age group 25-34 for the period July-September 2017 (South Africa. Department of Statistics, 2017c:25). Based on these figures, it is evident that the economic environment in South Africa is not conducive to job creation, resulting in a crisis for the unemployed youth and impact on the social cohesion of the country.

In the context of the high unemployment rate, Keat, Selvarajah and Meyer (2011:206) state that entrepreneurship is one of the best strategies to develop the economy and to create jobs. According to Nieman and Nieuwenhuizen (2010:3), entrepreneurial businesses in South Africa assist the country towards achieving economic growth. In this respect, it can be asserted that entrepreneurship and innovation can contribute towards the creation of jobs and economic growth. There are many opportunities for the creation of new business ventures in South Africa. For example, South Africa boasts mineral resources and reserves estimated at approximately $2.5 trillion, which is in the region of R32.36 trillion (South Africa. Department of Government Communication and Information Systems [GCIS], 2012:130). With beneficiation in the mining industry still an untapped opportunity, this could create an avenue for entrepreneurship opportunities for the industrial designer, according to the Department of Trade and Industry (DTI) (South Africa. DTI, 2016:131). The mining sector is just one industry – industrial design is present in every sector; for example telecommunication, technology and the auto industry (hybrid cars) (Ramirez, 2012a:2472; Ramirez, 2012b).

In South Africa, there are various programmes and forms of government support for entrepreneurs such as the DTI's South African Women Entrepreneurs' Network (SAWEN); and the Small Enterprise Development Agency (SEDA). Programmes specifically for young people are facilitated by the National Youth Development Agency (NYDA). The private sector also supports entrepreneurs, for example Business Partners, an unlisted public company that invests in small businesses (Nieman & Nieuwenhuizen, 2010:205).

In the next section, entrepreneurial intentions will be discussed.

1.2.2 Entrepreneurial intentions

Entrepreneurial intentions is defined as "the intention to start a new business" (Krueger & Brazeal, 1994:91; De Pillis & Reardon, 2007:383). Entrepreneurial intentions are described by the Global Entrepreneurship Monitor (GEM) as the "percentage of 18 to 64-year-old population (individuals involved in any stage of entrepreneurial activity excluded) who intend to start a business within three years" (Herrington, Kew & Mwanga 2017:18). This study will investigate whether students have entrepreneurial intentions in a technical programme such as industrial design, with subjects in business management/business studies as part of the National Diploma in the Three-Dimensional Design (TDD) programme. This study describes entrepreneurial intention as the intent that the TDD student possesses to start a business whilst studying, or after successful completion of the TDD programme.

The entrepreneurial intentions' average for the African region is 33.4%, according to the GEM Global Report for 2017, compared to 11.7% for South Africa (Singer, Herrington & Menipaz, 2018:90,104). Entrepreneurial intent declined in South Africa from 19.6% in 2010, to 15.4% in 2013 and 10.9% in 2015 and slightly increased to 11.7% in 2017 (Herrington & Kew, 2016:26; Singer, *et al*; 2018:90,104). Entrepreneurial intent in efficiency-driven economy's is on average 26% (Singer, *et al*; 2018:28). South Africa as an efficiency-driven economy lacks far behind with 11.7% (Singer, *et al*; 2018:90).

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A 2010 study conducted by Luiz and Mariotti (2011:10) of 609 university students in South Africa showed positive results towards entrepreneurship with more than 50% of the respondents intending to start their own businesses. However, the same study indicated that students perceived joining the corporate sector would be better for long term personal growth (Luiz & Mariotti, 2011:10).

1.2.3 Entrepreneurship and industrial design

It was Krueger and Brazeal (1994:91) who commented that “before there can be entrepreneurship, there must be the potential for entrepreneurship”. Similarly, there has to be an opportunity for entrepreneurship (Gird & Bagraim, 2008:71). As stated by Hewitt and Van Der Bank (2011:4), entrepreneurs are pioneers of free enterprises who build businesses, using innovation and creativity, from initial ideas into larger businesses. Soriano and Huarng (2013:1964) support the above statement and further mention that innovation is the one business action that directly relates to economic growth.

A study in South Africa by the International Design Alliance (IDA) world design survey in 2008 found that 76% of industrial designers worked in businesses with less than 20 employees (SABS [South African Bureau of Standards] Design Institute, 2008:53). Industrial designers contribute to all industries, for example energy, entertainment and banking (Smit, 2010). They also play a part in providing creative solutions to alleviate poverty by designing products that offer solutions for hunger, education, clean drinking water, malaria and other problems the world is facing (Ramirez, 2010:1). Industrial design students that graduate from tertiary institutions with this qualification (National Diploma in TDD), can play a positive role in attaining a solution for the domestic low economic growth and the high levels of unemployment. It is therefore important to study entrepreneurial intentions of the TDD students as an indication for potential entrepreneurial activity.

The challenges within the economic context in South Africa mean that it is incumbent upon universities to explore ways of optimising entrepreneurship to facilitate and create a thriving economy. Fayolle and Redford (2014:1) point out

that it is important for universities to become more entrepreneurial oriented to help students to develop their entrepreneurial actions. However, universities are inherently very bureaucratic by nature and being entrepreneurial do not come natural to them. More specifically, Universities of Technology by the nature of their vision and mission statements are more geared to entertain entrepreneurial intentions as a study area. They should evaluate their curriculums for the inclusion of business subjects to be relevant to ensure improved synchronisation, and to include entrepreneurship education.

1.3 AIM AND SIGNIFICANCE OF THE STUDY

The South African economy goes through a daunting period, buffeted by both global and domestic challenges. Increasing levels of unemployment (particularly youth unemployment), coupled with low economic growth and the precarious nature of job creation contribute to the endemic levels of poverty and inequality in the country. The decades long support through cash flows from the commodities sector is over, and the changing nature of work and future industries result in rising levels of uncertainty globally and in South Africa. This unsettled reality calls for imaginative and bold action in respect of options for economic development using entrepreneurship, which is regarded as a tool that can help solve these problems. Small and medium businesses have long been a strong pillar of the economy. Various official strategies such as the transformational Reconstruction and Development Programme (RDP) have placed these businesses at the centre of South Africa's future, especially with regard to job creation (South African History Online [SAHO], 2017:13).

However, South Africa has a very low rate of entrepreneurial intent. According to the GEM Global Report for 2017, the entrepreneurial intention in the African region was commonly 33.4%, whilst only 11.7% of South African adults had entrepreneurial intentions (Singer, *et al*; 2018:90,104). Entrepreneurial intent is perceived as the best predictor of actual entrepreneurial behaviour.

The purpose of this study is to investigate the entrepreneurial intentions of industrial design students, to look at the start-up realities, and to evaluate the role

of business education at two identified Universities of Technology (Cape Peninsula University of Technology [CPUT] and Tshwane University of Technology [TUT]), where industrial design programmes are presented. For the purpose of this study, the researcher equates business education (business management/business studies) and entrepreneurship education as part of the same solution. Further, for the purpose of this study, the terms Three-Dimensional Design and industrial design will be interchangeably, used. Three-Dimensional Design students were selected, as they have high levels of technical skills that naturally lend itself to the development of sustainable businesses in terms of products and services. These students are therefore ideal subjects to assess the links between business management/business studies, entrepreneurial intentions and the implementation of entrepreneurial knowledge in technical skilled students.

1.4 THE IDENTIFIED RESEARCH GAP

The value of entrepreneurship education in other subject disciplines (engineering, sciences and arts) is not yet widely acknowledged by universities. Entrepreneurship education is also observed by many universities as an “add-on” to business education (Vanevenhoven & Drago, 2015:119).

The programme (TDD) was selected because the business subject (business management/business studies) incorporates business (and entrepreneurship) education that are strategic elements in entrepreneurial intent development. Literature on entrepreneurship in relation to students, particularly industrial design students, is limited. Therefore, the study contributes to the literature by theorising and empirically testing how the curriculum incorporating non-traditional design courses impact on the entrepreneurial intention of industrial design students.

The importance of industrial design in a business is acknowledged in global studies, but studies to measure the relationship between the roles of design in the performance of a business are limited, as mentioned by Gemser and Leenders (2001:28), Hertenstein, Platt and Veryzer (2005:3), and Ravasi and Stigliani (2012:464).

Graduates of the TDD programme are trained and skilled in designing products and services, stimulating industrialisation and economic development. The relationship between entrepreneurial intent, business education and business formation by graduates of the (TDD) programme was investigated in this study. Industrial design is still an unexplored field of study in South Africa, and therefore this study aims to contribute to knowledge in this area. The study further investigated whether the entrepreneurial intent of students transformed into an actual business by locating past graduates of the TDD programme.

There is limited research undertaken to measure the outcomes of entrepreneurship training of entrepreneurs that stimulated to start a business of necessity in lower income countries (Lindsay, 2014:119). Studies were executed in higher income countries (Levie & Autio, 2008:235; Acs, Desai & Hessels, 2008:219). This study will also contribute by looking at TDD students with a tertiary education (qualification) starting a business upon the completion of their TDD (graduate) programme.

Entrepreneurship, viewed as a potential panacea to the current economic decline, capture the attention of academics and policy-makers. Thus, the research results may also serve to benefit and inform policy-makers and educators, in as far as providing insight into business (and entrepreneurship) education.

1.5 PROBLEM STATEMENT

The problem that this research seeks to consider is the twin challenges of a high unemployment rate and very low levels of entrepreneurial intention in South Africa. South Africa has a high rate of youth unemployment and a very low rate of entrepreneurship. The World Bank found that most small and medium enterprises (SMEs) do not hire or grow their businesses in South Africa (World Bank, 2011:87). According to the Minister of Trade and Industry (Davies), 70% of SMEs fail in their first year in South Africa (SBP, 2014:2).

As potential entrepreneurs, industrial design students have unique capabilities that are of value to the South African economy in stimulating economic growth and job

creation. Against the above background and aim of the research, the research problem for the study is expressed as:

> *Despite the unique background and capabilities of industrial design students to stimulate economic growth and job creation in South Africa, entrepreneurial intentions of TDD students were not established.*

1.6 RESEARCH QUESTIONS

The research questions were formulated as follows:

a. Research Question 1: What are the entrepreneurial intentions of TDD students?

b. Research Question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions?

c. Research Question 3: To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?

1.7 RESEARCH OBJECTIVES

In this section, the researcher considered the primary and secondary objectives of the study. The research objectives of the study were to establish the entrepreneurial intent of TDD students, (enrolled for the programme in 2015), and to investigate the extent to which entrepreneurial intent in past graduates at TUT (2011 to 2014) transformed into actual businesses.

1.7.1 Primary objective

The primary objective of the study was to establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme TDD in South Africa.

1.7.2 Secondary objectives

The secondary objectives of the study were:

a. To determine the links between business education and entrepreneurial intentions in the undergraduate TDD students for 2015.

b. To investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

1.8 RESEARCH MODEL

The Theory of Planned Behaviour (TPB) was used as the basis of measurement of entrepreneurial intentions in the study. The TPB was developed by Ajzen (1985:11). It has been demonstrated that the best forecaster of behaviour is intentions (Krueger, Reilly & Carsrud, 2000:425). In the TPB there is a close relationship between intentions and the actual performance of a business (Liñán, Rodríguez-Cohard & Rueda-Cantuche, 2005:4; Liñán Rodríguez-Cohard & Rueda-Cantuche, 2011a:195). By creating a high intention for behaviour, one increases the likelihood that this behaviour will occur. Therefore, the action of being an entrepreneur means that one has engaged in planned behaviour.

The TPB identifies three factors that influence behaviour, and these are, in the context of entrepreneurship (Ajzen, 1991:182; Liñán, 2004:15; Liñán & Chen, 2009:596):

a. Personal attitude (PA) reflects on the positive or negative worth the potential entrepreneur assigns to entrepreneurship.

b. Perceived social norms (PSN) are the perceived influence of other people's perceptions on the prospective behaviour, which influence the entrepreneur to act or not to act on entrepreneurial behaviour, and;

c. Perceived behavioural control (PBC) or self-efficacy determine how capable the entrepreneur feels to successfully carry out the behaviour, and therefore mediates the likelihood of the behaviour being performed.

The study used the model in Figure 1.1, adapted from Liñán and Chen (2009) and Liñán, Urbano and Guerrero (2011b) as the entrepreneurship intention model for the purpose of this study. The model is adjusted to accommodate the possible role business education and resultant entrepreneurial knowledge play in stimulating students' entrepreneurial intentions.

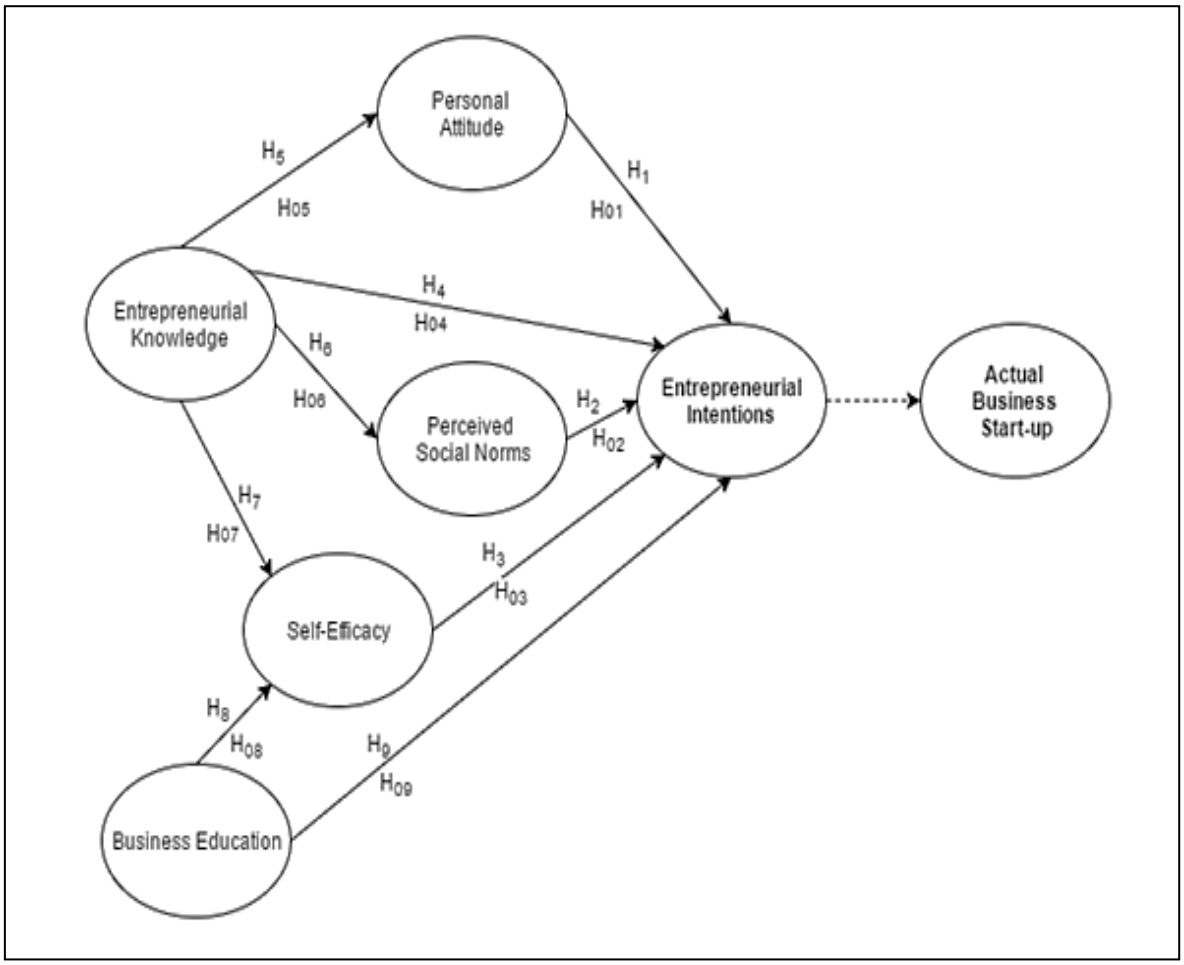

Figure 1.1: Research model of entrepreneurial intentions
Source: Adapted from Liñán and Chen (2009); and Liñán, *et al*; (2011b)

The research model was tested quantitatively as it encapsulates certain assumptions about the antecedents, or influencing variables, of entrepreneurial intentions. Therefore, the model was used to answer research questions 1 and 2,

which investigate the influencing variables of entrepreneurial intentions. Research question 3, which looks at past graduates that transformed their entrepreneurial intent into an actual business start-up, is exploratory in nature, and was not investigated using quantitative measures contained in the research model, but rather qualitative techniques.

1.9 RESEARCH HYPOTHESES

The research hypotheses derived from the research model of entrepreneurial intention (Figure 1.1) and were used to answer research questions 1 and 2, which were subject to quantitative analysis of entrepreneurial intentions.

Research question 1: What are the entrepreneurial intentions of TDD students? It included first, second and third year level industrial design students enrolled at South African Universities of Technology in the programme TDD in 2015. The following hypotheses were formulated:

$H_{01:}$ Personal attitudes negatively influence entrepreneurial intention
H_1: Personal attitudes positively influence entrepreneurial intention

$H_{02:}$ Perceived social norms negatively influence entrepreneurial intention
$H_{2:}$ Perceived social norms positively influence entrepreneurial intention

H_{03}: Self-efficacy negatively influences entrepreneurial intention
H_3: Self-efficacy positively influences entrepreneurial intention

H_{04}: Entrepreneurial knowledge is negatively related to higher levels of entrepreneurial intention
H_4: Entrepreneurial knowledge is positively related to higher levels of entrepreneurial intention

H_{05}: Entrepreneurial knowledge is negatively related to higher levels of personal attitudes

H_5: Entrepreneurial knowledge is positively related to higher levels of personal attitudes

H_{06}: Entrepreneurial knowledge is negatively related to higher levels of perceived social norms

H_6: Entrepreneurial knowledge is positively related to higher levels of perceived social norms

H_{07}: Entrepreneurial knowledge is negatively related to higher levels of self-efficacy

H_7: Entrepreneurial knowledge is positively related to higher levels of self-efficacy

Research question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions? The following hypotheses were formulated:

H_{08}: Business education is negatively related to higher levels of self-efficacy

H_8: Business education is positively related to higher levels of self-efficacy

H_{09}: Business education negatively influences higher levels of entrepreneurial intentions

H_9: Business education positively influences higher levels of entrepreneurial intentions

1.10 RESEARCH METHODOLOGY

This study adopted both quantitative and qualitative research methods for data collection and analysis. There were two groups of participants involved in the study, namely: students enrolled for the TDD programme at South African Universities of Technology in 2015 (Group 1 participants); and past graduates of the TDD programme at TUT for the period 2011 to 2014 (Group 2 participants).

The quantitative method is useful where the subjects being investigated are subject to scientific validation, when the sample size is large, and the study can be easily replicated. Leedy and Ormrod (2010:107) suggest quantitative research when there is sufficient literature available on the subject and the purpose of the research can be measured. This research method is applicable to the data collected from Group 1 participants to test the research model of entrepreneurial intentions. The qualitative method is used when there are not pre-determined responses sought, but rather where the research is exploratory in nature, seeking to gain insight into an issue that requires further investigation. Furthermore, qualitative research commonly uses a small sample size, employs probing questions, requires an interviewer with a special skill set and cannot be easily duplicated. Qualitative research enable researchers to understand people's behaviour (Myers, 2011:5). Qualitative research will ask the "what, why, how and when questions" (Myers, 2011:6). The qualitative method was used for the collection and analysis of data from the Group 2 participants, which addresses the secondary research objective, namely to investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

1.10.1 Population and sampling

The population is the total of all units of analysis which the researcher endeavours to investigate in terms of distinct conclusions (Saunders, Lewis & Thornhill, 2009:577; Welman, Kruger & Mitchell, 2011:53; Salkind, 2012:396). The population in this study was all students in South Africa, registered at CPUT and TUT, who were studying towards the National Diploma in TDD. CPUT had 104 and TUT 57 students in 2015 who met the qualifying criteria, therefore representing the total population. The total TDD design students enrolled at a University of Technology for 2015 was therefore 161. The rationale for choosing these two tertiary institutions is that they were the only universities in South Africa that offered a three year diploma in TDD (SABS Design Institute, 2008:72; Smit, 2010). The University of Johannesburg (UJ) was initially included in the research plan, but was excluded because the TDD programme was phased out in 2014 and the data collection was undertaken in 2015. The researcher verified this information by searching for TDD programmes via the websites of universities in

South Africa as identified by the Department of Basic Education (South Africa. Department of Basic Education, 2013). The investigation confirmed that the TDD programme was offered only at CPUT and TUT in 2015.

1.10.2 Data collection

This research used the quantitative and qualitative research methods for data collection. The study addressed the primary and secondary objectives and research questions using empirical data collected according to two primary approaches:

a. quantitative data was collected from current TDD students (at CPUT and TUT) to answer the primary research objective and secondary objective 1 (research questions 1 and 2) on the research model of entrepreneurial intentions; and
b. qualitative data was collected from past graduates who successfully completed the TDD only at TUT to answer the secondary research objective 2 (research question 3) to investigate to what extent did the entrepreneurial intent of past graduates transform into actual business start-ups.

The quantitative empirical data in this study were collected via the survey method by way of a questionnaire (De Vaus, 2002:6). The questionnaire for the students in TDD was based, with permission, on Liñán and Chen (2009) and Liñán, *et al*; (2011b) to collect data on entrepreneurial intention. Using delivery-collection techniques, research assistants solicited for responses during lecturing times. The researcher tested the relationship between entrepreneurial knowledge, business education, personal attitude, perceived social norms and self-efficacy, and if it influence the TDD students' intentions to become an entrepreneur. The questionnaire format is based on Ajzen's (1985) TPB. The questionnaire was adjusted for South African circumstances.

The qualitative data were collected via interviews (open-ended questions that yielded in-depth responses), observations and fieldwork (interpersonal observations) and documents (social media postings and correspondence) (Patton, 2015:14). The past graduates (Group 2 participants) who successfully

completed the TDD programme's data were collected via an interview guide. The interview guide consisted of demographic and other questions; and open-ended questions.

1.10.3 Data analysis

Analysis of empirical quantitative data were undertaken using descriptive and inferential statistics (Salkind, 2012:161). Descriptive statistics allow the researcher to explain and evaluate the variables numerically (Saunders, *et al;* 2009:444), while inferential statistics assist the data gathered to relate to original hypotheses (Salkind, 2012:161). The Statistical Package for the Social Sciences (IBM SPSS) version 21 and STATA version 13 were used to analyse the data obtained from the questionnaires. All data was captured in Excel and thereafter exported to IBM SPSS. A reliability test and Cronbach's alpha test were conducted to measure internal consistency of the variables and their functioning in the research model. Chi-square tests were used to look at the associations of the variables, and factor analysis was used for the measurement of association and the assessment for validity by reducing variables in smaller clusters of dormant variables. Cronbach's alpha was used to measure the internal consistency or reliability of the research model. Finally, structural equation modelling was used to test the proposed research model and hypotheses.

The qualitative research method was employed to answer the secondary research objective (research question 3). It employed the interview method of data collection based on an interview guide developed by the researcher to serve as a framework for the participants. This method was used to interview past graduates who have successfully completed the TDD programme at TUT for the period 2011-2014. The intention of the researcher was to establish the extent to which the graduates interviewed had used the skills and knowledge they obtained in the TDD programme (and the business management subject) to start their own businesses. This data was analysed using ATLAS.ti version 7.5.9.

1.10.4 Validity and reliability

Validity is the accuracy of the research project (Salkind, 2012:399). Validity refers to the outcomes of the study, and must be interpreted within the environment where the study was conducted (Salkind, 2012:123). The quantitative research used factor analysis to measure content validity of the questions for the TDD students. Reliability in a research study is when the same results are achieved when a specific facet is tested more than once (Salkind, 2012:115). Reliability can be enhanced by the use of clear constructs in the research, having an exact form of measurement, having more than one indicator, and having a pilot test (Neuman, 2011:190). For the quantitative research, Cronbach's alpha was used to test internal reliability (Bryman, 2008:151). The alpha coefficient will vary from zero (no internal reliability) to one (perfect internal reliability), with 0.6 accepted as a satisfactory measure of reliability (Bryman, 2008:151).

The qualitative interview guide needs to be reliable to be valid (Saunders, *et al*; 2009:373). It should be tested prior to the research being carried out; however, this is not always possible (Saunders, *et al*; 2009:373). It was not possible to test the interview guide against other interview guides, as there is no comparable study to compare it against. The researcher used only the demographic and other questions (Section B) from Liñán's questionnaire (Liñán & Chen, 2009 and Liñán, *et al*; 2011b) in the qualitative interview guide (Appendix C). The researcher used two past graduates from TUT who completed the TDD programme as a pilot to test the interview guide, and to refine it to ensure that the questions were understood. The researcher measured the trustworthiness of the qualitative data with the techniques identified by Lincoln and Guba (1985), namely credibility, transferability, dependability and confirmability.

1.10.5 Delineation, limitations and assumptions of the study

In the next section the delineation, limitations and assumptions of the study will be discussed.

a. Delineation

Delineation indicates the boundaries of research (Collis & Hussey, 2003:128). This study was limited to first, second and third year students in TDD for the year 2015 to make it comparable at the two indicated institutions (CPUT and TUT). It excluded the Bachelor of Arts (BA), Baccalaureus Technologiae (B Tech), the extended diploma and the Master Technologiae **(**M Tech) programmes in TDD at UJ and CPUT.

b. Limitations of the study

Limitations of the study were that TDD was only offered at three South African institutions. UJ was included in the pilot study; however, this programme was phased out at UJ in 2014. There were therefore no students from UJ to participate in the study in 2015. The study was limited to the analysis of a specific category of students, namely industrial design students and to students within the particular context of South African Universities of Technology only. Therefore, the conclusions from the research may not be applicable to students generally, or to students outside of the particular discipline of industrial design or outside of the South African context.

c. Assumptions of the study

The quantitative study was based on the present students' views, which limits the ability to process causal outcomes between the variables. The business management and business studies subjects offered were not assessed as a total, and a full assessment of the components of the subject matter was outside the scope of this thesis. The qualitative research was limited to TUT graduates that successfully completed the TDD programme. The researcher did not have access to graduates from CPUT. Consequently, qualitative findings and results may not necessarily be generalisable to the effects of the educational environment on entrepreneurial intentions outside the TDD programme of TUT.

The study further assumed that students in the TDD programme could have entrepreneurial intent and that the business management and business studies subjects could enhance entrepreneurial intent.

1.11 CONTRIBUTION OF THE STUDY

Entrepreneurship education is viewed by countless universities as an “add-on” to business education (Vanevenhoven & Drago, 2015:119). There is a movement to integrate entrepreneurship skills into engineering and technical education (Duval-Couetil, Shartrand & Reed, 2016:23). This study investigated the teaching of a business subject (business management/business studies) in a technical discipline. This study provides potential input to the design of the optimisation of entrepreneurial skills, which is considered a scarce skill in South Africa. It will also add to the body of knowledge associated with entrepreneurship education.

This study investigated how students in industrial design are exposed to business management and business studies, and it provides valuable input to the design and the teaching of the business subjects. Industrial design is still an unknown field of study in South Africa, and therefore this study aimed to contribute to knowledge in this area. Research on the industries that industrial designers operate in South Africa is lacking, and the researcher aimed to collect data to address this gap in knowledge. Furthermore, from the literature, no study could be found on the educational model used in business education for industrial design students in South Africa. Investigating the research topic would contribute to the body of knowledge as a model for a new curriculum in business education training in other disciplines, such as industrial design and engineering. Investigating entrepreneurial intentions in technically skilled students could change the thinking regarding business (and entrepreneurial) education with an important impact on economic growth and employment. Thus, this study can impact on policy debates regarding entrepreneurship and job creation in the private and public sectors.

1.12 ETHICAL CONSIDERATIONS

The study complied with the ethical requirements as stipulated by the University of South Africa's (UNISA's) Research Ethics Review Committee. Ethical clearance was obtained from both TUT and CPUT as well as UJ, where part of the pilot study was conducted. These requirements were adhered to in all respects. No person's rights were violated and all who participated in the study were treated with dignity (South Africa. Department of Justice and Constitutional Development, 2017). The total of all the students enrolled for the National Diploma in TDD in South Africa were requested to participate in the study and were assured that they could withdraw at any time. The purpose and value of the study were explained to the participants. Participants were also assured of anonymity as names were not used and codes were assigned to the empirical data. Questionnaires are kept securely at the researcher's private residence in a safe place.

Group 2 particpants also granted permission to use the images and screenshots provided by them, as presented in Chapter 6 (Figure 6.2, Figure 6.7, Figure 6.8, Figure 6.9, Figure 6.11 and Figure 6.12). Due to ethical implications, these participants remained anonymous; and therefore the sources are not acknowledged with these Figures.

1.13 LAYOUT OF CHAPTERS

The study is structured in seven chapters. The secondary research on industrial design and entrepreneurship and the data analysis sections were both divided into two chapters each. Chapters 2 and 3 detail industrial design and entrepreneurship respectively. Both quantitative and qualitative research methods were used for data collection; the data analysis is similarly divided into two chapters. Chapter 5 addresses research questions 1 and 2, using quantitative data and statistical analysis of the research model. Chapter 6 addresses research question 3, using qualitative interview data.

Chapter one describes the background and provides an overview of the study.

Chapter two explores the existing secondary resources regarding industrial design. In this chapter the industrial designer is defined and discussed, and the features of industrial design in business, the role of industrial design in poverty alleviation, design organisations, industrial design in South Africa and international programmes on industrial design are discussed.

Chapter three explores the theoretical background to entrepreneurship, creativity and innovation in entrepreneurship, entrepreneurship theories and models, technical students and business education, including business education for TDD students at CPUT and TUT. A description of the research model of entrepreneurship intentions concludes this chapter.

In chapter four the research methodology is described. The research population and sampling frame and the data collection, testing of variables, pilot study, data analysis, validity and reliability are discussed. The research limitations and ethical considerations are also presented.

Chapter five presents the results and findings of the analysis of the quantitative data, as well as a test of the research model of entrepreneurship intentions and related hypotheses.

Chapter six presents the results of the analysis of the qualitative data to investigate whether past graduates in the TDD programme started actual businesses.

Chapter seven contains the conclusion and recommendations of the study. It also indicates implications of the research findings and highlights areas for further research.

1.14 CONCLUSION

This chapter provided an outline of this study, titled “Entrepreneurial intentions and start-up realities: The case of industrial design students in South Africa”, which investigated business education in the context of Universities of Technology and

its impact on the entrepreneurial activity of students enrolled for the TDD programme, and students following graduation. This chapter detailed the background and aim of the study, the identified research gap, the problem statement, and presented the research questions and objectives. The research model used to answer the research questions was described, the associated research hypotheses, and the research design and methodology employed to collect and analyse the empirical data were described. The significance and contribution of the study were presented, including the ethical considerations and the layout of chapters.

Following from this chapter is the first of two secondary literature chapters, describing and synthesising the theory regarding industrial design.

CHAPTER 2: SECONDARY RESEARCH ON INDUSTRIAL DESIGN

2.1 INTRODUCTION

This chapter focuses on industrial design internationally and in South Africa. In this chapter, a brief overview of the history of design in relation to industrial design is described. Industrial design is defined, the industrial designer is described, including the features of industrial designers in business. Industrial design's role in poverty alleviation is discussed, and are followed by discussions on design organisations, industrial design in South Africa and educational programmes in Three-Dimensional Design (TDD).

The choice of the Industrial Design students was motivated by the design of their programme (qualification) and more specifically its exit level outcomes that required students to demonstrate that they could create a product or service using the knowledge and skills they have acquired through the duration of their studies. Therefore, the programme in Three-Dimensional Design (TDD) offers a combination of subjects that develop the capabilities, knowledge and technical skills, enabling students to develop designs that could be developed into products. This can attribute to the programme curriculum that enhances students' ability to conceptualise the links between business education, entrepreneurial intentions and the implementation of entrepreneurial knowledge through the creation of industrial designs.

2.2 BACKGROUND TO INDUSTRIAL DESIGN

The concept of industrial design dates back to the industrial revolution and was mostly centred around product development and the improvement of competitiveness (Jevnaker, 1998:13). The birth of industrial design was in Germany in 1907 where an architect and designer named Behrens was hired by Allgemeine Elektricitäts-Gesellschaft Aktiengesellschaft (AEG) to design AEG's products (Heath, Heath & Jensen, 2000:105). Design was important in this period but was more about product enhancement. In 1913, the first industrial design patent was recorded in the United States of America (USA) with the US

Commissioner of patents (Industrial Designers Society of America [IDSA], 2017). The USA is important in the development of industrial design because it was here that the economic value of industrial design was recognised by the implementation of laws aimed at protecting the intellectual property of the creators of such designs through patents.

Industrial designers in the USA were not architects or engineers like the European industrial designers but migrated from advertising and stage design (Meikle, 2001:19). Teague and Geddes, famous USA industrial designers from the 1920s, came from a theatre background (Meikle, 2001:48). Businesses in the USA like General Electric (GE) started with industrial design, but called it “product styling” (Lorenz, 1990:16). The American public became aware of industrial design in 1927 with the Macy’s (a fashion, clothing and accessories business) exhibition, the “Exposition of Art in Trade in New York” that showcased “modern products” (IDSA, 2010). Industrial design in the USA businesses initially used design to enhance a product’s appearance to increase sales. In the late 1950s industrial design became important to businesses for product development in order to create a competitive edge by modernising products (Alpay, Korkut & Özlem, 2003:17; Campbell, 2017:31). Industrial designers’ success in the 1950s, 1960s and 1970s was built on the designers’ personal credibility (Lorenz, 1990:22). A typical example is Stevens (1911-1995), an American industrial designer that designed more than 3 000 products from cookware, lawn movers and the Jeep Wagoneer, introduced by Willys-Jeep in 1963 (IDSA, 2016a).

Industrial design plays a significant role in the economy of the United Kingdom (UK). The UK is aware of the importance of design and has a design policy in place. The former Prime Minister (Cameron), during his tenure, commissioned a review of intellectual property (IP) and growth in 2011 to streamline the process of registering a design patent (United Kingdom. Intellectual Property Office, 2013). For example, in 2009 alone, UK businesses invested more than £15.5 billion in new product development and innovation (Design Council, 2012). In a study by the Design Council in the UK in 2012 the following was found: for every £1 a business invested in design it increased a business’s net profit by £4; exports by £5 and turnover by £20 (Design Council, 2012). The Design Councils’ report (the Design

Economy Report of 2015), reported that the design economy contributed 7.2% to the gross value added in the UK in 2013 (Design Council, 2016).

In a study conducted in the member states of the European Union (EU), Switzerland and the USA, (interviewing 14 118 businesses of which 13 117 across the EU member states) in 2015, found that approximately 75% of EU businesses introduced innovations since January 2012 (EU, 2015:2, 4 & 17).

The above suggest a real focus of substantial investment in the design of innovative products by the EU members, including the British. In the next section, industrial design will be defined.

2.3 INDUSTRIAL DESIGN DEFINED

The South African Bureau of Standards' (SABS') Design Institute defines design, that includes industrial design, as "finding solutions for human needs" (SABS Design Institute, 2016:1). For purposes of this study when referring to design it will include industrial design. Design is the component that combines research, innovation and technology into a product. The Department of Arts and Culture (South Africa), defines design as: "[using] human power to conceive plans and real products that serve human beings in the accomplishment of any indirect or collective purpose. It is a tool to address social and economic development issues in order to create greater wealth and higher market share" (SABS Design Institute, 2008:10). The Industrial Designers Society of America (IDSA) defines industrial design as "the professional service of creating products and systems that optimise function, value and appearance for the mutual benefit of user and manufacturer" (IDSA, 2016c).

The World Design Organisation (WDO) defines industrial design as "a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences. Industrial design bridges the gap between what is and what's possible. It is a trans-disciplinary profession, which harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system,

service, experience or a business, better. At its heart, industrial design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business and customers to provide new value and competitive advantage across economic, social and environmental spheres" (WDO, 2016a).

The researcher describes industrial design for purposes of this study as the creation and adding of value to the business by bringing new products that consumers need and want to purchase. Industrial design is an important factor in business – most products on the market involved a design decision somewhere in the process from its conception (idea) to the market (launching the product).

According to Chiva and Alegre (2009:424), design constitutes "essentially the application of human creativity to a purpose – to create products, services, buildings, organisations and environments which meet people's need". Eisenman (2013:332) perceives design as the efficient and effective application of technology and materials to create and produce reliable manufactured goods. Industrial design is also defined as "an activity that transforms a set of product requirements into a configuration of materials, elements and components" (Gemser & Leenders, 2001:28). According to Brown (IDEO, 2014) the Chief Executive Officer (CEO) of IDEO, an international award winning global product design consultancy, design thinking is "a human-centred approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success". Industrial design realises what is technological achievable and sustainable economically from a human point of view. Jobs, the founder of Apple, Inc. described design as the soul of a creation or product (Noble & Kumar, 2010:640). It involves creativity that results in the innovation of new products or services and technologies that will have use to consumers.

Design is not limited to one discipline of study or one sector in the economy. Industrial design is described as more than studying engineering principles, creativity, innovation, mathematics, sustainability, ergonomics and the use of materials (Reeder, 2006b:16; Rusten & Bryson, 2007:85; Rusten, Bryson &

Aarflot, 2007:133; Klein & Phillips, 2011:9; Pasman & Mulder, 2011:30; Kleinsmann, Deken, Dong & Lauche, 2012:486; Childs, 2013:297; Cifter, Eroglu & Ozcan, 2013:306; Lofthouse, 2013:8; Oman, Tumer, Wood & Seepersad, 2013:65). Industrial design is a multi-disciplinary study because the industrial design student must have knowledge of engineering principles, knowledge of different materials, the ability to draw, have communication skills and understand consumers (Itkonen, Ekman & Kojo, 2009:263).

Industrial design is exercised by a limited number of professionals. With technology and materials becoming accessible and affordable to the general public, more people will use it to design products and services (Diana, 2014:18). An example is desktop 3D printing (Kaivo-Oja, Ahlqvist, Kuusi, Linturi & Roth, 2016). This will impact positively on sectors that require design, such as health services, with doctors being able to render cheaper services; for example in prosthetics (Gerstle, Ibrahim, Kim, Lee & Lin, 2014:446; Liu, 2014:1305). Small businesses will be in the position to create and manufacture their own products because they will have access to the required technology. Another example is the film industry in which film equipment was very expensive in the 1980s and film producers had to invest huge amounts into sound, camera and editing equipment. With the arrival of digital video technology, the challenges to entry decreased, which has driven competition in creating videos because technology is more affordable. The reduction in the price of technology is a positive development because it creates opportunities for creative and innovative people who do not have access to technology or funding. This will enable a larger section of the population to enter the design field, as design tools will be cheaper and more accessible.

The next section provides a background to the key features and the role of an industrial designer.

2.4 FEATURES OF INDUSTRIAL DESIGNERS IN BUSINESS

According to Lorenz (1990:x), the industrial designer is more than just the creator of a nicely shaped colourful product; the industrial designer has knowledge of

marketing, production, finance, strategy and good corporate governance which enables the designer to create a successful product. The designer is described by Strouse (2010:6) as not limited to a product or furniture design but as a person combining engineering, design, art, anthropology and entrepreneurship activities. The designer uses creativity and innovation to provide to the consumer a product or service that they need.

Industrial designers are problem-solvers who find innovative solutions (Reeder, 2006a:11). To succeed as an industrial designer, the following skills are required (Phillips & Thompson, 2011:8):

a. Able to create concepts and to make a final choice for the design problem.
b. Able to draw, and build prototypes.
c. Able to evaluate materials and use the safest.
d. Able to look at what is available for the problem at hand.
e. Be sensitive, and reflect on all the factors that could influence the design like sustainability or cultural factors.

The above skills assist industrial designers as entrepreneurs to start-up an own business. A study by the European Commission (EC) found that most innovative ideas for entrepreneurship originate from creative and technical disciplines (EC, 2008:7). The industrial designer is well placed to create a product and start-up a business. It is therefore important to look at this discipline, including other disciplines, in a holistic manner and not to limit entrepreneurship education to entrepreneurship students.

According to Le Masson, Hatchuel and Weil (2011:218), the industrial designer finds “out of the box” solutions for problems. Industrial designers are “value adders” by enhancing products that increase the market share of the product and contribute towards the reduction in manufacturing costs with affective designs (Melles, de Vere & Misic, 2011:149). The industrial designer also needs to be sensitive and understand the surroundings within which it operates, and use technology and innovations for solutions to problems (Pasman & Mulder, 2011:30; Oman, *et al*; 2013:65).

Key features of industrial designers are that they understand the business and customers' needs; know how to design products that will keep the business competitive; contribute to new product development; are sensitive to the environment and design towards sustainable development; and, are creative innovators. Industrial designers' positions in the business become more important, while they participate in shaping business strategy (Warwick Business School & Design Council, 2011:5).

Industrial design is important in a business, but studies to measure the relationship between the roles of design in the performance of the business towards profit are limited, as mentioned by Gemser and Leenders (2001:28), Hertenstein, Platt and Veryzer (2005:3), and Ravasi and Stigliani (2012:464). In a study by Chiva and Alegre (2009:428) in 2004, they focussed on the ceramic tile producers in Spain and Italy and tested the hypothesis if there is a positive association between business performance and design management. The results from the survey supported the hypothesis that design management increases business performance (Chiva & Alegre, 2009:435).

Industrial design plays a key role in economic growth (SABS Design Institute, 2010:11). A new way of thinking, namely "design thinking", is needed for the 21st century (SABS Design Institute, 2010:95). Knowledge of design will enhance creative and innovative thinking. According to Novoa (2011:23), the "proper use of industrial design can make the difference for industrialised countries so they can keep their hegemony ahead of newly industrialised and emerging economies; the manufacturing industry is no longer sufficient to keep abreast of competition" (Novoa, 2011:23).

In the next section the role of the industrial designer in understanding the consumers' needs will be discussed, followed by industrial designers' contribution to business competitiveness, developing new products, sensitivity to the environment and sustainable development, and the industrial designer as a creative innovator.

2.4.1 Industrial designers understand consumers' needs

Consumers do not just buy a product for its functionality but for the emotional experience as well (Fuchs & Schreier, 2010:17; Secca Ruivo, 2010:62; McDonagh, Thomas & Strickfaden, 2011:301; Singh & Rampal, 2011:356). According to Ventura (2011:73), designers are the intermediary between the design and the customer. The designer needs to be sensitive to the customer because the customer is using the product and can, at times, provide the designer with an idea (Poetz & Schreier, 2012:245). The designer does not design in a vacuum but understands what the consumer needs and designs a product to fulfil this need.

2.4.2 Industrial designers contribute to business competitiveness

Designers assist businesses to stay competitive (Jevnaker, 1998:13). Product design provides the business with an edge over competitors who do not employ or contract a designer (Truong, Klink, Fort-Rioche & Athaide, 2014:867). Design aids the business to be globally competitive by being constantly innovative towards the use of new materials and intelligent manufacturing (Dickson & England, 2011/2012:44). New products can either open new markets or take the market share from competitors (Van Orden, Van der Rhee & Schmidt, 2011:726). Apple is an example of a business that invests in design and it reflects positively in the financial results and market share of the business. An example is the iPod, an Apple product that competed with similar products from Sony, Phillips and Intel. Apple priced the iPod higher than the competitor's prices. Within six years of launching the first iPod in 2001, Apple controlled 73% of the MP3 market (IBTimes Staff Reporter, 2011).

Small businesses play an important part in new innovations, and are well placed to launch disruptive technologies (Carayannopoulos, 2009:422). Small businesses are much more flexible than large businesses. This can be attributed to red tape and bureaucracy that are associated with large businesses. Flexibility gives newly established businesses a chance to innovate and to establish its products before large businesses' competitors can respond (Carayannopoulos, 2009:434). In a

survey in 2005 in the USA of 85 design businesses by Vanchan and MacPherson (2008:277), it was found that most design businesses employ less than 20 workers. It suggests that the size of small businesses, their relative flexibility and the relative small size of their personnel provide them with a competitive advantage in relation to their design achievements, compared to their larger competitors.

Marion and Meyer (2011:773) investigated the role of industrial design in 35 early stage businesses in the USA focussing on new product development. Their findings suggest that design increases effectiveness and efficiency in a business. Including an industrial designer as part of the creative innovation process positively impact on the manufacturing process. The researcher observed that the industrial designer has the knowledge about the material used to create the product, how to design the product, be environmentally sensitive and for the product to be produced cost effective. The product presentation is aesthetically and production cost is effective. The industrial designer potentially increases sales and creates a product that is pleasing to the consumer. The industrial designer can also play a decisive role in the start-up phase of a business by acting as an entrepreneur and creating a product that could be marketed.

2.4.3 Industrial designers develop new products

Retail plays a significant part in an economy. This creates opportunities for industrial designers because they create new products to place on the market. New product development is important for a business; however, less than 25% of developments are successful (Evanschitzky, Eisend, Calantone & Jiang, 2012:21). Noble and Kumar (2010:644) determine that design creates value to new consumer products as follows:

a. Rational value – creating an appealing quality product;
b. Kinaesthetic value – ergonomics, human factors and feedback;
c. Emotional value – holistic (for example temporary consumer satisfaction), differentiating (for example novelty product), and the design appeal (for example the iPhone).

A study by Marion, Friar and Simpson (2012:639) over the period 2001-2007, found in an in-depth case study of two design businesses in the USA that new product development is not structured in business and is more goal orientated to develop a specific product. New product developments have a high failure rate with less than 25% of new product developments being successful; yet, if the industrial designer is involved from the idea phase, better outcomes could possibly be obtained (Evanschitzky, *et al*; 2012:21).

2.4.4 Industrial designers are sensitive to the environment and sustainable development

In the 1980s the role of industrial design shifted focus towards a responsibility to climate change and the preservation of natural resources (Melles, *et al*; 2011:144). Papanek (1991:27) was the first to address ethics and social responsibility in industrial design, suggesting that it be left to the industrial designer to find a way to address it in the process of design and manufacturing and also fulfil the environmental and social responsibility mentioned. Research by Melles, *et al*; (2011:144) supported the previous view and appealed for sensitivity to the environmental impact by designers in developing their products. The industrial designer attempts to "merge the practicalities of engineering, technology and business with subtle elements of interface, social concerns and aesthetic desire" (De Eyto, Mc Mahon, Hadfield & Hutchings, 2008:332). St. Pierre (2014:22) argues that designers can make a substantial and positive impact on environmental issues in donating a few hours a week for free to create a better world for all. Business and design are moving both towards sustainable development of either the product or service rendered.

2.4.5 Industrial designers are creative innovators

The industrial designer is capable of creating a successful product because he/she has knowledge of marketing, production, finance, strategy and good corporate governance (Lorenz, 1990:x). Design enhances teamwork within a business because it works across the business functions. The industrial designer also promotes creativity, innovation, promotes in-depth knowledge of engineering,

technology, materials, drawing and business (Reeder, 2006b:16; Rusten & Bryson, 2007:85; Rusten, *et al*; 2007:133; Klein & Phillips, 2011:9; Pasman & Mulder, 2011:30; Kleinsmann, *et al*; 2012:486; Childs, 2013:297; Cifter, *et al*; 2013:306; Lofthouse, 2013:8; Oman, *et al*; 2013:65). The skill set of the industrial designer is therefore multi-disciplinary.

The above discussion is an indication that industrial designers are creative innovators that can create new and/or competitive products, whilst being sensitive to the environment. The industrial designer understands what the consumer wants, which is very important. Being taught these abilities place the industrial designer in an ideal position to start-up a business.

2.5 INDUSTRIAL DESIGN AND POVERTY ALLEVIATION

The World Bank's (2016:1) latest data showed that 767 million (10.7%) adults globally live in poverty on less than US$1.90 per day and lack basic facilities like water and sanitation (Wyatt, 2014:20). South Africa is also faced with a challenge where people living below the upper-bound poverty line increased with 3.1 million from 2011 to 30.3 million of the population in 2015 and are living below R992.00 per capita per month (South Africa. Department of Statistics, 2017b:8, 69).

Industrial designers are well placed to contribute to developing products for the poor in developing countries, for instance with the Money-maker Pump, an inexpensive irrigation pump (Lofthouse, 2013:8). The Money-maker Pump was designed by IDEO and Kickstart and was launched in 1996. This irrigation Pump is small enough to be transported on a bicycle and can irrigate 1.5 acres a day (Margonelli, 2004). The Money-maker Pump is used in sub-Saharan Africa and it contributed to the formation of a projected 87 000 small-scale agricultural businesses for the period 1991-2009 (Sijali & Mwago, 2009:329). This Pump was launched in South Africa in 2008 (Zvomuya, 2008).

Another example of how design impacts on rural communities is the LifeStraw, developed by Vestergaard Frandsen, a business situated in Switzerland. The

LifeStraw product is a nine-inches long straw that turns polluted water into safe drinking water (Forbes, 2013). LifeStraw is being distributed by the humanitarian focussed business, Aqua for Life (Aqua for Life, 2016). The business distributes LifeStraw products also to rural communities in conjunction with non-governmental organisations and the South African government (Aqua for Life, 2016).

Another example of industrial designers assisting in developing products to enhance the quality of life in rural communities is the Hippo Water Roller designed to assist rural women to transport water more effectively. The Hippo Water Roller transports “90 litres of water inside a rolling wheel - the weight of the water borne to the ground” (Hippo Water Roller Project, 2016). Women can now transport water more effectively and hygienically.

The success of industrial design in combating poverty is influenced by the appropriateness of the product for the targeted market and its unique conditions. Musaazi (2012:99-100) describes the case of the solar cooker specifically designed for the African market. The solar cooker is a simple product; it is inexpensive, but failed in the African market. One reason for failing was that the user needed to clean the cooker thoroughly after each use. Water is scarce in many rural areas in Africa, and the product became unattractive. A vast amount of thought and creativity went into the design of the product, but not into analysing the market and the living circumstances of the product. This product failed because the industrial designer was not aware of the circumstances of the user or customer. It is therefore imperative for industrial designers to be aware of the dynamics of the community for which they design (Melles, *et al*; 2011:152).

It is difficult for industrial designers in a first world economy to design solutions for Africa, as some industrial designers are not exposed to the circumstances in Africa. African industrial designers are in a better position to design their own solutions as they have a better understanding of the contextual problems and the type of solutions required to address African problems. Their designs can therefore contribute to finding solutions for these problems; and to enhance people’s quality of life.

2.6 DESIGN COUNCILS AND ORGANISATIONS

Design councils and organisations are important since they promote the industrial design industry. In this section, the researcher discusses the Industrial Design Councils, the World Design Organisation (WDO), formally known as the International Council of Societies of Industrial Design (ICSID), and the World Intellectual Property Organisation (WIPO).

2.6.1 Industrial Design Councils

Most countries have design Councils that promote design, like the New Zealand Industrial Design Council (NZIDC) that was established in 1967 (Thompson, 2011:223); the Korean Institute of Industrial Promotion (Choi, Cooper, Lim & Evans, 2011:79); the Design Council, previously known as the Council of Industrial Design (CoID) in the UK (Choi, *et al*; 2011:71); and in Turkey industrial design is governed under the State Academy of Fine Arts (Satir, 2006:18). South Africa has the South African Bureau of Standards' (SABS') Design Institute that resides in the SABS and falls in the Department of Trade and Industry's (DTI's) portfolio in government, and is responsible to promote design (SABS Design Institute, 2017).

2.6.2 World Design Organisation (WDO)

The World Design Organisation (WDO), formally known as the International Council of Societies of Industrial Design (ICSID), is an international organisation for industrial designers, founded in 1957 in Paris (WDO, 2016b). The twelve founding members were all from professional design organisations. The purposes of the WDO are to protect the rights of practicing members; to ensure design standards globally by setting standards for design education; and to encourage collaboration between industrial designers (WDO, 2016d). The mission of the WDO is to enhance collaboration between members, to protect the standards within design on regional and international levels, to contribute to design education, and to work with relevant stakeholders to create an understanding for design globally (WDO, 2016f). The WDO (formally known as the ICSID), was formed more than fifty years ago and has grown to an international organisation

with representatives globally (WDO, 2016b). The WDO has several high-profile projects like the World Design Capital (WDC). The WDO brings an awareness and recognition of industrial designers and the important role they fulfil in the business; as well as in alleviating world-wide problems and challenges to enhance the quality of life of ordinary citizens in the world.

The following South African organisations and businesses are members of the WDO (WDO, 2016c):

a. XYZ Design (Pty) Ltd., a design business in Woodstock (Cape Town) and known for the wind-up radio designed for the Freeplay Foundation, and more recently the modular traffic light.
b. The Cape Town Partnership, a non-profit (Section 21) organisation working towards the renewal of the Cape Town Central City.
c. The SABS Design Institute in Pretoria, which is a promotional member to promote South African design and education.
d. The Cape Peninsula University of Technology (CPUT) that strives to develop graduates that serve the needs of South Africa and beyond.

The WDO hosts several programmes (WDO, 2016e), such as the:

a. World Design Capital programme. Countries apply for the title of World Design Capital and when awarded, the WDO promotes the city. The selected city will host several programmes for the duration of the title to promote design. Cape Town was the World Design Capital for 2014.
b. World Industrial Design Day (WIDD) on the 29th of June annually. This programme started in 2007 and is aimed at bringing awareness worldwide of industrial designers and the economic, environmental, social and cultural impact of design.
c. World Design Impact prize. This prize is for industrial designers that work within the WDO's programme of creating a better world by, for example, enhancing the quality of life of people. The winner of the two-yearly project for 2013/2014 was the University of Huddersfield (2014) in the UK for a behaviour changing syringe project. Patients can immediately establish whether syringes were

sterilised with this design. This design solution has a simple colour changing label attached to it that turns red when used (University of Huddersfield, 2014).

d. Inter-design workshops. The WDO organises an annual two-week training programme where regional and international issues are discussed, and solutions explored.
e. World Design Talks where members debate on local challenges in their home country, for example, climate change from a design viewpoint.

2.6.3 World Intellectual Property Organisation (WIPO)

The World Intellectual Property Organisation (WIPO) is a self-funding agency of the UN and its mission is to ensure an effective intellectual property (IP) system. The goals of the WIPO are: to promote a stable IP system; to build IP infrastructure; and to develop an international IP law and protection (WIPO, 2016b). Industrial designers can register designs internationally under the Hague agreement which protects designs worldwide (WIPO, 2016a). The WIPO streamlines the processes for patent registration for industrial designers who live in member countries. The industrial designer now only applies for a patent at WIPO, and not to each individual member country of WIPO. This creates an environment of enablement for the industrial designer whose IP registration is simplified. The design is also automatically protected within all 189 member countries (WIPO, 2016c). South Africa is a member of WIPO since 1975 (WIPO, 2016d).

2.7 INDUSTRIAL DESIGN IN SOUTH AFRICA

South Africa has several organisations to promote design like the SABS Design Institute, the Design Education Forum of Southern Africa (DEFSA), the Institute of Interior Design Professions (IID); the South African Communication Design Council; and the Network of African Designers (NAD) (SABS Design Institute, 2010:81). Design activities during the 1950s in South Africa led to the establishment of the Design Institute in 1969 within the SABS. In the 1980s South Africa had economic sanctions, which benefited South African designers because they were not exposed to competition from foreign designers (SABS Design

Institute, 2007:8). South Africa became reliant on importing finished products, thus, reducing competitiveness (Smit, 2010). Sanctions made local designers more aware about issues close to South Africa, for example, designing mining equipment, such as the long-hole rig that was designed to drill large holes effectively and fast in the mining industry (SABS Design Institute, 2009:20; Kaplan, 2011:13).

South African designers, however, benefited from the lifting of the sanctions after the democratisation of the country in 1994. South African designers are world frontrunners in mining apparatus and products, for example spirals to wash coal, hydropower, shaft sinking, ventilation and turnkey new mine design and operation (Kaplan, 2011:16). South Africa, however, remains dependent on importing some of the technology, products and services that it requires. Industrial design can assist to reduce the need to import technology. In 2007, 89% of the value of products manufactured in South Africa was under the licence of non-South African businesses (Le Roux, 2007:1).

The FinScope South Africa Small Business Survey 2010 found that 78,7% of small businesses were in the retail sector and 21,3% in the service sector (FinScope, 2010:8). Approximately 49% of the retail sector small business owners buy a product and sell it without changing the product or enhancing it (FinScope, 2010:8). A small business owner in this particular study was described as an individual of 16 years or older, employing less than 200 employees, regard themselves as a business owner, and receives an income from the small business (FinScope, 2010:7).

The researcher observed that South African small business owners can sell a product but are merely agents, possibly lacking the skills or the opportunity to design a product because of poor education and/or a lack of opportunity. The designer can supply the product to the entrepreneur via a joint venture. This could possibly lead to an optimum situation where one partner design and create the product, and the other partner market and sell the product. An example is Wozniak who designed the Apple 1 computer in 1976. Jobs immediately realised the opportunity to supply computers to ordinary individuals and got an order from the

local computer store - the Byte Shop (Computer History Museum, 2017). Wozniak was the technical “partner” and Jobs the business “partner”. Wozniak and Jobs’ relationship translated to one of the most successful companies, namely Apple Incorporated. The researcher argues that the relations typical to the Wozniak and Jobs example may be explored in South Africa, where technical skilled people and entrepreneurs could work together in creating businesses and employment opportunities.

According to Smit (2010), industrial design in South Africa is not yet used to optimise the opportunities at hand to stimulate economic growth. There is still a need to accept and understand the role that industrial designers can play in the economy, since South Africa has a culture of importing finished products (Smit, 2010). Industrial designers can play a positive role in designing products that can be locally manufactured rather than imported. They could also assist with the government’s programme of beneficiation, for example in the mineral and energy sector (South Africa. Department of Energy, 2015:16). The DTI identified that while the focus of attention was previously on the opportunities in downstream beneficiation in the mineral sector, there is huge potential in the upstream value chain (South Africa. DTI, 2016:5). In fact, industrial design impacts on all sectors of the economy, namely from defence products to household products (Smit, 2010).

South Africa, however, lacks design legislation. At the Design Policy Conference, “Make a Plan” held in Cape Town in October 2014 as part of the WDC programme, the importance of a design policy for the government was emphasised by delegates and speakers (Design Institute, 2014). A design policy in South Africa will assist in protecting both the designer and the business from the appropriation of their creation through unethical business practices by other businesses.

2.7.1 Industrial design and entrepreneurship

The SABS Design Institute is very positive towards design-based entrepreneurship and job creation. The SABS Design Institute, for example, hosts the Design

Achievers programme. The SABS Design Institute has changed its emphasis to job creation in 2013 and became more entrepreneurial orientated (SABS Design Institute, 2014a). Students can bring projects or ideas to the SABS Design Institute. The SABS Design Institute has mentors and specialists in the different design fields to assist students to realise their ideas into viable products and/or businesses.

The SABS Design Institute established a Design and Innovation Entrepreneurship Centre in 2013 which intends to attract designers and entrepreneurs to develop an idea into a product (SABS Design Institute, 2014b). This Centre initiated the project “43 challenge” in January 2014. The “43 challenge” started with 43 candidates, 43 ideas and 43 opportunities (SABS Design Institute, 2014a). The Design and Innovation Entrepreneurship Centre also provided support to the participants (designers and entrepreneurs) with experienced designers, business people and lawyers. Participants were assisted to transform the idea into a product and to market the product. Products ranged from computer applications (apps), household appliances, pet-feeders and prams. The project was funded by the Technology Innovation Agency (TIA), a government agency established in terms of the TIA Act No. 26 of 2008 (TIA, 2017). The objective of the TIA is to encourage technological innovation to enhance the quality of life of South African citizens and to contribute towards improving economic growth (TIA, 2017).

A typical example of the results of the initiative mentioned above was the case of a designer named Mnyameni (SABS Design Institute, 2014b). Mnyameni had a background in building services and he designed a portable trading device for the informal sector that can transform from a trolley to a storage or display unit (SABS Design Institute, 2014c). After appearing on The Big Small Business Show on “Business Day TV” on television, he sold his first unit (SABS Design Institute, 2014d). Candidates selected for the “43 challenge” like Mnyameni, were assisted by mentors and industry professionals to develop a workable prototype. The candidate now has a prototype that could be shown to possible investors. Candidates could also obtain finance or enter the incubation programme at the SABS Design Institute. The “43 challenge” successes show that design can create new businesses and contribute to job creation. It is important for South Africa to

stimulate design to create new sustainable businesses with an opportunity to grow and to create much-needed jobs.

2.7.2 Outstanding South African industrial designers

There are a number of notable industrial designers in South Africa (Kruger, 2014). These include the automotive industry designers Byrne, a South African engineer and the chief designer at Benetton and Scuderia Ferrari Formula One teams; and Scheepers, a qualified graphic designer and creative designer in the automotive industry. Scheepers' design skills can be seen in the Porsche Carrera GT, Cayenne and Cayman, Audi R8, A5 and A4. She is employed at Volkswagen design; and Helfet, a South African industrial designer who designed the iconic Jaguar XJ220.

Other self-made South African industrial designers are: Roux, who was leading the creative unit for Phillips' design in the Netherlands and who is the Chief Executive Officer (CEO) of the Society for Experiential Graphic Design (SEGD) in the USA (SEGD, 2016); Terblanche, a motorcycle designer, who is responsible for the Ducati Supermono and the Cagiva 600 Enduro – the "Canyon" (Terblanche, 2016). Meagher has clients like Virgin Mobile and created his own brand in the UK for toys, namely Playforever (2016:1). Playforever designs timeless toys inspired by, for example, cars and planes in the 1920s. This brand was established in 2006 and its products are sold in more than 20 countries. These toys are build to last a lifetime. Keevy, who has a successful design and product development consultancy specialising in consumer electronics, furniture and maritime design in Munich, Germany (GK Industrial Design, 2016:1); and Steinhobel, who owns an industrial design and product development consultancy based in Johannesburg with clients in the USA, Europe and Asia. Steinhobel serves different industries like, for example, packaging, electronics, appliances, mining, the pharmaceutical industry, furniture, and the information technology (IT) industry (Steinhobel, 2016:1).

2.8 THREE-DIMENSIONAL DESIGN EDUCATIONAL PROGRAMMES

In the next section, international TDD educational programmes will be discussed, followed by the South African TDD programmes.

2.8.1 International Three-Dimensional Design programmes

International educational programmes in TDD are incorporated at many universities globally. Specific industrial design educational programmes are offered at different schools (universities and colleges) situated across the USA (IDSA, 2016b; IDSA, 2016c). These schools are accredited with the National Association of Schools of Art and Design (NASAD). The accreditation indicates that there was compliance on the level of the programmes and standards. There are more than twenty colleges offering the programme in TDD in the USA (IDSA, 2016b; Study.com, 2016), for example, the University of Southern California (USC).

There are also several universities in the UK that offer the TDD programme, such as the Plymouth University, the University for the Creative Arts (UCA), and the University of Northumbria in Newcastle. Students need to be creative, according to university requirements, to enrol for the TDD programme at the University of Northumbria. The programme focuses on product and furniture design, and is cultural and environmental sensitive (Northumbria University Newcastle, 2016).

Europe has several well-established design programmes. For example, Austria has a programme in design and architecture at the New Design University, and Italy has a programme in product design – in Cagliari at the Istituto Europeo di Design (IED) (2017). Furthermore, several other industrial design programmes are offered in Europe, for example, the Bachelor of Science (BSc) in Industrial Design degree in the Netherlands at the Eindhoven University of Technology. Creativity is a prerequisite to enrol for the BSc industrial design programme in the Netherlands. “Ambient intelligence” is emphasised with the design of intelligent products, systems and services within a societal framework (Eindhoven University of Technology, 2016). Creativity is a prerequisite at most universities; however, it is

outside the scope of this study to determine how international universities test the creativity of potential students in industrial design programmes.

2.8.2 Industrial design education in South Africa

In the late 1980s, the SABS Design Institute realised the importance of design education and invited tertiary design schools to form a committee to further education in the design field. This committee transformed into the Design Education Forum of Southern Africa (DEFSA) in 1990 (SABS Design Institute, 2007:10; DEFSA, 2017). DEFSA became independent from the SABS Design Institute in 1999. These institutes complement each other as DEFSA incorporates education in design while the SABS Design Institute supports the development, creation and enhancement of practical designs.

In the tertiary education sector, the first tertiary diploma in South Africa to offer an industrial design programme was the School of Art in Johannesburg in 1963 (University of Johannesburg, 2017). The School of Art changed its name in 1979 to become the Technikon Witwatersrand (TWR) and to the University of Johannesburg (UJ) in 2005. The industrial design programme was phased out at UJ at the end of 2014. Industrial design is offered at the CPUT since 1988 and at the Tshwane University of Technology (TUT) since 2008 (Campbell, 2008:82). Industrial design is placed in the Faculty of Informatics and Design at CPUT and in the Faculty of Art, Design and Architecture (FADA) at UJ (CPUT, 2016a; UJ, 2016). Industrial design at TUT falls in the Faculty of Engineering and the Built Environment (TUT, 2016a). The programme in TDD is comparatively similar at the universities, although each of the three mentioned are placed in different faculties.

Table 2.1 presents the different subjects of the TDD programme at the two institutions (TUT and CPUT). Both institutions offer a business subject during all three years of study; namely at TUT in business management and at CPUT in business studies. All subjects reported in Table 2.1 are compulsory.

Table 2.1: Three-Dimensional Design programmes at TUT and CPUT

Level	TUT	CPUT
Programme	Three-Dimensional Design	Three-Dimensional Design
Duration	Three years	Three years
First year	Business Management I Freehand Drawing History of Art and Design Industrial Design I First semester: Mechanical Engineering - Drawing Manufacturing I Second semester: Computer-Aided Design Engineering Design I	Design Studies I Drawing for Design I Technology I Business Studies I History of Art I
Second year	Business Management II History of Industrial Design Industrial Design II Material Technology I Presentation Drawing First semester: Manufacturing II Second semester: Engineering Design II	Product Design II Design Media II Technology II Business Studies II History of Industrial Design II
Third year	Business Management III Design Theory Industrial Design III Material Technology II Multimedia Presentation First semester: Ergonomics Manufacturing III	Product Design III Design Media III Technology III Business Studies III History of Industrial Design III

Source: CPUT (2015:151); TUT (2016a:90); TUT (2016b); CPUT (2016a)

The TDD programme provides students with a holistic understanding of generating a product from an idea to a final product and peculiar to the needs of South Africa**;** for example, renewable energy solutions (Smit, 2010). Students at the two institutions (CPUT and TUT) are equipped to find solutions for problems in South Africa during their programmes. The TDD students' projects are not only aimed at profitability, but to enhance the quality of life of citizens. Industrial design can make a difference in solving problems such as poverty relief and creating much needed jobs. The researcher asserts that industrial design does not only design

commercial products, but contributes also to rural communities by designing products to enhance their lives.

2.9 CONCLUSION

This chapter provided background information on industrial design. An overview was presented on the industrial designer, including industrial design features in business. Industrial design reduces poverty alleviation, and various examples in this regard were highlighted. Some design Councils and organisations were discussed, such as the WDO, previously the ICSID and the WIPO. An overview was also provided on industrial design in South Africa, and some international and national TDD educational programmes were highlighted. The value of design is realised by businesses in the UK, EU and the USA. Businesses are aware of the benefits to invest in design that translate into high net profits, turnover and exports. However, studies are not available in South Africa to measure the value of design to businesses and the economy.

The next chapter presents the secondary research on entrepreneurship.

CHAPTER 3: SECONDARY RESEARCH ON ENTREPRENEURSHIP

3.1 INTRODUCTION

The focus of Chapter three is to discuss the theoretical foundation and secondary research related to entrepreneurship. The chapter highlights the relevant literature on entrepreneurship; creativity and innovation in entrepreneurship; entrepreneurial intent; entrepreneurial theories and models; and business (entrepreneurship) education.

This research study on entrepreneurial intentions focused on technical students in South Africa who acquire a skill set to produce a product or render a professional service. The technical students were Three-Dimensional Design (TDD) students at the two Universities of Technology (Cape Peninsula University of Technology [CPUT] and Tshwane University of Technology [TUT]), which offer the design programme mentioned. The researcher measured the entrepreneurial intent of the TDD students in this study. The TDD programme incorporates in its curriculum, components specifically designed to develop entrepreneurial capacity in the form of business skills and knowledge.

The researcher also discusses the different types of entrepreneurship theories and models, and the motivation for using the Theory of Planned Behaviour (TPB) as the basis for understanding entrepreneurship in the study. Business education is discussed and the curriculum in the business subject (business management and business studies) used for the TDD programmes at the two identified universities (CPUT and TUT) are described. Finally, the research model used to investigate entrepreneurial intentions amongst the industrial design students is, described.

In the next section, an entrepreneur and entrepreneurship will be discussed.

3.2 ENTREPRENEUR AND ENTREPRENEURSHIP: AN OVERVIEW

The word entrepreneur was initially used in the French economy during the 17th century (Davis, 2002:4). Entrepreneurs can be defined as persons that would venture new and improved ways of doing things, resulting in a positive impact on the economy (Schumpeter, 1942:132; Davis, 2002:4). Katz and Green (2011:4) define an entrepreneur as an individual who starts or owns an organisation, which could be a business. Entrepreneurship is defined by Rankhumise (2013:6) as entrepreneurs pursuing perceived gaps in the market and do not limit themselves to available resources; they will look at the opportunity at hand and will not be limited by circumstances.

Entrepreneurship is described by Schumpeter (1961) as the main vehicle by which to move an economy forward, based on the combined capabilities of entrepreneurial individuals. The capabilities which the entrepreneur introduces into the society are a) new qualities, b) new methods/processes, c) development of new markets, d) new sources of supply, and e) new ways of organising the business/production (Davis, 2002:4; Braunerhjelm, 2011:166). Entrepreneurship is described as a progression that develops over time (Gartner, Shaver, Gatewood & Katz, 1994:5; Kyro & Carrier, 2005:14). It also involves obtaining required funds to create economic value for the entrepreneur and satisfaction to the consumer or client (Leach & Melicher, 2012:5).

Entrepreneurship is an innovative process to generate wealth with current assets (Huarng & Ribeiro-Soriano, 2014:659). The Commission of the European Communities (United Kingdom. House of Lords, 2003:5) describes entrepreneurship as “the mind set and process to create and develop economic activity by blending risk-taking and creativity and/or innovation with sound management within a new or an existing organisation”. The process of becoming an entrepreneur starts with the decision to be an entrepreneur; the development of ideas to create a business; selection of the best idea to start a business and then to actually start the business (Guclu, Dees & Anderson, 2002:1; Barringer & Ireland, 2012:49). Baron (2012:25) explains entrepreneurship as the process that drives ideas from conceivable to real. Entrepreneurship generally starts with an

innovative idea that advances into a business. Household brands and corporate businesses, were started as ideas by entrepreneurs. According to Hills and Singh (2004:266) in a study of 480 entrepreneurs in the United States of America (USA), 42% indicated that the choice to start a business was most important; 37% indicated that the business idea came first in starting a new business; and 21% indicated that the decision and idea were equally important. Entrepreneurs continuously carry out new combinations and ideas and develop new products (Bull & Willard, 1993:184; Fayolle & Todorov, 2011:14).

Entrepreneurship creates new businesses, jobs, new products, new technologies, a positive influence on individuals, and contributes positively to economic development. The focus in policy making and government incentives to support economic growth has, in recent years, moved from large businesses to small businesses and entrepreneurship (Lazonick, 2011:19).

It is important to recognise the role and contribution of entrepreneurship to economies. Small businesses are perceived to be job creators. An example is Malaysia, where the growth in the small business sector in its contribution to Malaysia's Gross Domestic Product (GDP) has surpassed overall GDP growth since 2004 (Independent Contractors Australia, 2012). Small businesses contributed 46% of the private non-farm GDP in the USA in 2008 (Small Business Administration [SBA], 2011). In the USA, the gross job gains of small businesses outpaced large businesses by approximately 3 to 1 in 2010 (SBA, 2011).

South Africa has similar trends where small, medium and micro businesses contribute more than 45% of the GDP, and 50% of employment opportunities (Graduate School of Business University of Cape Town, 2012). A study by FinScope (2010:15) found that small businesses created 11 605 million employment opportunities in 2010. The National Planning Commission (NPC) in the Presidency in South Africa envisages that small and expanding businesses will be responsible for 90% of job creation in South Africa by 2030 (South Africa. The Precidency. NPC, 2012a:119). The government recognises the important role that is played by small businesses and entrepreneurship towards job creation and economic growth, as specified in the National Development Plan (NDP) (South

Africa. The Prescidency. NPC, 2012b:29; South Africa. The Prescidency. NPC, 2015:4, 23).

The above highlights the significant role that entrepreneurs play in developing economies through entrepreneurship, and suggests that support for these activities by the government contribute positively towards economic development.

3.3 CREATIVITY AND INNOVATION IN ENTREPRENEURSHIP

According to Penaluna and Penaluna (2011:51), creativity and innovation are positive descriptors of an effective business. It is important to distinguish between innovation and creativity because they are sometimes used as synonyms. Radipere (2012:20) describes creativity as the creation of new ideas and innovation as the implementation of successful ideas. It is important for an entrepreneur to create an innovative and creative culture in a business (Katz & Green, 2011:97).

3.3.1 Creativity

Creativity leads to new ideas and products (Lamb, Hair, McDaniel, Boshoff, Terblanche, Elloitt & Klopper, 2011:273). Creativity evolved from the Latin word “creare” which means: to make, and the Greek word “krainein” which means: to fulfil (Young, 1985:77). A creative person takes problems and finds efficient solutions for them. In a business, one needs creativity, as it assists the business to create new products or new uses for existing products. Kim, Kim and Wilde (2008:45) describe creativity as the development of worthwhile unique designs. According to Kuratko, Morris and Covin (2011:215), creativity is the soul of entrepreneurship; people are born creative, yet, some people suppress their creativity. Children are taught to conform to rules and regulations when growing up which can oppress the individuals’ creative thinking. Creativity has become more important globally in businesses because of change in competition, while technology and creative individuals in the business world find solutions for problems (Batchelor & Burch, 2013:29; Gundry, Ofstein & Kickul, 2014:529). Creativity also strengthen organisational innovation (Amabile & Pratt, 2016:161).

3.3.2 Innovation

Innovation is defined as new processes that are interrelated, and is not limited to a mechanism, idea or invention. Innovation in business is more than an idea; it is the process of developing an idea into a product or service that can be commercially marketed (Conway & Steward, 2009:10). Innovation is described by several authors as a key element to the economic development and progression of a country (Drucker, 1999:79; Moses, Sithole, Blankley, Labadarios, Makelane & Nkobole, 2012:1; Zsusanna & Herman, 2012:268; Fulvio & Miguel, 2013:579; Hisrich, Peters & Shepherd, 2013:99; Soriano & Huarng, 2013:1964; Williams, Smith, Yasin & Pitchford, 2013:851).

There is a shift in business towards creativity and innovation. Central to the entrepreneurial process is innovation, which is the development of the product or service. According to Thompson (1965:2), innovation is defined as “the generation, acceptance and implementation of new ideas, processes or services”. Innovation involves the transformation of an idea into a viable product, process or service. Economists identify innovation as crucial for economic development (Galunic & Rodan, 1998:1193; Yemini & Haddad, 2010:1220; Mazzarol & Reboud, 2011:2).

The innovation process in a business is driven by economic value (Raasch & von Hippel, 2013:33). In design, the innovation process starts with an idea, building a prototype and testing the product (Norman & Verganti, 2014:78). The innovation process can start with a problem for which a solution should be found or changing an existing product or service. The human capital component of innovation is the inventor, who must have a large skill set in order to drive the innovation process (Melero & Palomeras, 2015:154). Innovation is imperative when a business strives to be sustainable and profitable (Davis, 2010:6532; Arlbjørn & Paulraj, 2013:3). Entrepreneurs need to innovate to ensure profit and survival because every product has a life cycle and will not be profitable indefinitely (Envick & Wall-Mullen, 2009:1). New products create sustainability and growth for the entrepreneur, and innovation in entrepreneurship can give emerging economies a competitive benefit to become important players because they have new products and services (Urban, 2010b:1; Ahmed, 2013:191). The entrepreneur ensures commercialisation

of new products or services through the application of knowledge in strategic management, investment, marketing and other business aspects of the product or service.

Innovation helps with the increase of efficiency of processes and products. The USA sees innovation as very important as evidenced by spending of 2.5% to 3% of GDP on research and development (R&D) (Innovation, 2011). R&D is not always successful in creating a new product, but the development of a new product can transpire out of the knowledge of research. Innovation in this sense is the link between R&D and new products (Mujumdar, 2014:1). Innovation can also be process or product orientated (Lind, 2012:131-132). Process innovation streamlines the process of production and happens on the factory floor to deal with bottlenecks or to save money in production. A business can innovate by changing and streamlining the production processes in the factory or even administration procedures in, for example, the finance department. Product innovation is about enhancing an existing product or developing a new product in order to add value to the business (Envick & Wall-Mullen, 2009:1). Innovation creates new methods to resolve problems. It is therefore imperative to teach individuals to proactively perceive opportunities in their milieu in order to exploit them (Wilson, 2011:11).

3.3.3 Creativity and innovation in the small business

Creativity and innovation are easier executed in small businesses than in large businesses. In small businesses, there are fewer employees, which leads to less bureaucracy, and easier communication as the chain of command is shorter and the small business normally has a flat leadership style. The small business can act quickly to respond to changing technology and market changes (Bos-Brouwers, 2010:420; Bocken, Farracho, Bosworth & Kemp, 2014:46). There is also a proven link between innovation and the start-up of new businesses (Moutray, 2011:81). Another advantage of a small business is that, in general, small business owners have a propensity for risk-taking.

Large businesses have a formalised organisational structure in place and are bureaucratic where top management is sometimes isolated from customers and

workers on lower levels in the business (Bos-Brouwers, 2010:420). Hewlett Packard Big, for example, rejected Wozniak's computer, which led to the start-up of Apple (Stokes & Wilson, 2017:120).

According to Braunerhjelm (2011:161), there is still a lack of understanding of the relationship between growth, innovation and entrepreneurship. To attain economic growth, there must be an increase in production as this may lead to employment creation.

Several studies, as summarised in Table 3.1, has been executed globally, on the role of innovation in the small business. It can be observed from Table 3.1 that small businesses are highly innovative globally and are innovators of note, except in France. Table 3.1 indicates that in the study by Nauwelaerts, Van Assche and Van Beveren (2011) in Belgium, and Gough and Olson (2011) in the USA, access to finance hindered small businesses' innovation. Nauwelaerts, *et al*; (2011) found that large businesses were favoured by government policies. Clark (2011:153) concludes that innovation is market driven in New Zealand and Canada's small business innovations are mainly in the product and service industry.

Table 3.1: Findings on innovation in small businesses

Authors	Summary	Country
Nauwelaerts, *et al*; (2011)	It was found that the businesses' studied were highly innovative yet had difficulty to obtain finance. Students in the design field were poorly equipped to take the opportunity forward to commercialise a product. Existing government policies on innovation were aimed at large corporations and did not cater for small businesses.	Belgium
Clark (2011)	It was found that 60% of small businesses in the study introduced more than 10 innovations over a three-year period on average, and 22% introduced between 6 and 10 innovations. A large part of these innovations were market development innovations. An example is the Weta Workshop that produces internationally digital effects for the film industry.	New Zealand
Gough and Olson (2011)	In a study in the USA executed on 15 SMEs varying in age and size in the high-technology industry, it was found that the group had a positive approach towards venture capital and intellectual property (IP) rights. The least positive result was on financial resources. Participating companies all had technical training from the Northwest of the USA and were in business sectors like computer software, computer electronics and other computer related industries where the cost to develop is high, yet, to produce is negligible.	USA
Baronet and Queenton (2011)	A study in Canada of 64 businesses concluded that 57% had 1 to 5 innovations on average in the past three years, 29% had 6 to 10 innovations and 15% had more than 10 innovations (rounded of to 101). A total of 64% Canadian innovations are based on the product-service industry.	Canada
Wang and Verzat (2011)	French engineering entrepreneurs at the Ecole Central de Lille and ITEEM (Institut Technologique Européen d'Entrepreneuriat et de Management), a French institute in France (joint venture between Ecole Central de Lille, a Graduate Engineering School and Skema Business School) study found that engineering students prefer to work in a business as an employee, rather than being an entrepreneur. ITEEM has a dual curriculum with teaching in management and engineering. Exposure of the students at ITEEM to entrepreneurial projects created the entrepreneurial intentions of these students.	France

In the next section, creativity and innovation in South Africa will be discussed, followed by discussions on creative industries.

3.3.4 Creativity and innovation in South Africa

Examples of some South African innovators and innovations are (Nsehe, 2012; Brand South Africa, 2013):

a. The “Cat Scan”, developed by Cormack, a South African physicist at Tufts University in the United Kingdom (UK) (Awarded the 1979 Nobel prize for this development for physiology or medicine);
b. Sasol innovative energy-related technologies, initially with coal as a feedstock, then with gas, and today, with renewable energy sources;
c. Pratley Putty epoxy developed in South Africa by Pratley was used to hold bits of the Apollo XI mission Eagle’s landing craft together in 1969;
d. MTN with InternetOnTV, which is a device that allows web browsing from a television.

From the above, it is obvious that South Africa has the talent to design and innovate when given the opportunity. South Africa is an emerging market that creates great innovation opportunities, for example with health and energy.

Innovation, the search for changing new ideas into viable products, is extremely vital in emerging economies like South Africa where economic growth is of utmost importance (Kourilsky & Walstad, 2002:1). Innovation in developing countries is different from developed countries (Bradley, McMullen, Artz & Simiyu, 2012:710) and is needed to address problems like poverty in developing countries. South Africa is rated 54 out of 128 countries in the 2016 Global Innovation Index, conducted by the Johnson Cornell University, INSEAD, The Business School of the World (INSEAD) and the World Intellectual Property Organisation (WIPO) (Dutta, Lanvin & Wunsch-Vincent, 2016:20). South Africa’s position enhanced from 2013 when it was 58 out of 142 countries (Dutta, Lanvin & Wunsch-Vincent, 2014:257). The Global Competitiveness Report placed South Africa on position 47 out of 138 countries for innovation for the period 2016 to 2017, and 39 out of 137

countries for the period 2017 to 2018 (Schwab, 2016:25; Schwab, 2017:268). South Africa is therefore steadily improving towards innovation. A total of 85% of businesses in South Africa viewed innovation as vital and spend 1.7% of their turnover on innovation in 2007 (Moses, *et al*; 2012:2).

In the South African Innovation Survey 2008 conducted by the Human Sciences Research Council (HSRC) in 2008 for the period 2005-2007, 65.4% of businesses participated in innovative activities (HSRC, 2011:2). The results for the next survey by the HSRC for the period 2010-2012 are not available yet (HSRC, 2016).

Furthermore, it is argued, that South Africa is well positioned to innovate with the latest technology, capacity for innovation and protection of intellectual property (IP) rights. According to the World Economic Forum's (WEF's) Competitiveness Report in 2017, South Africa scored on a 1 to 7 scale, 5.2 on the availability of the latest technology; 4.9 on capacity for innovation; 5.8 on patents and applications, and 3.5 on the availability of scientists and engineers (Schwab, 2017:269).

The WEF identifies twelve pillars to determine a country's stage of development (Schwab, 2014:4-10). Stage one is factor driven economies where institutions (pillar 1), infrastructure (pillar 2), the macro-economic environment (pillar 3) and health and primary education (pillar 4) are identified. In stage two, the efficiency driven economy, countries need to meet the criteria of higher education and training (pillar 5), good market efficiency (pillar 6), good labour efficiency (pillar 7), financial market development (pillar 8), technology readiness (pillar 9) and market size (pillar 10). Stage three is the innovation driven economy, where the pillars are business sophistication (pillar 11) and innovation (pillar 12).

South Africa is innovative and ranks 39th out of 137 countries for innovation for the period 2017 to 2018 in the Global Competitiveness Report, which could be observed as good performance given that South Africa has an efficiency driven (stage two) and not innovation driven economy (Schwab, 2017:268). The global economy changes rapidly and if countries are stagnant in development, for example with technology, the country will fall behind in competitiveness (Kressel &

Lento, 2012:36). South Africa should be aware of developments on the African continent that could take its competitive advantage away.

Herrington and Kew (2016:39) found that new products offered from businesses increased from 15.9% to 39.5% over the period 2005 to 2013. Table 3.2 shows that 51.5% of all the products/services offered to customers in South Africa in 2014, and 51.9% in 2015 are considered new by the business owner. This is more than the 38% for Africa who believed that their products/services offered to the customer were new. A total of 55.7% in 2014 and 52.8% in 2015 reflected that no businesses offered the same product. It is observed that South African businesses believe that they have new products and/or services to offer to customers and that none or a few competitors have a similar product.

Table 3.2: New products and services in South Africa, 2014 to 2015

	South Africa 2014	South Africa 2015	Africa Average
Product/service is new to all or some customers	51.5%	51.9%	38%
Few/no businesses offer the same product	55.7%	52.8%	37.4%

Source: Herrington and Kew (2016:39)

South Africa is more focused on process orientated rather than product orientated innovation. Product orientated innovation is when a new product is developed for the market or business or a minor change is made to an existing product (HSRC, 2011:26). Process orientated innovation changes the method of manufacturing; it changes the delivery or distribution method or support activities (HSRC, 2011:28). Some businesses innovate on both product and process innovation. The South African Innovation Survey conducted in 2008 covering the period 2005 to 2007 and published in 2011 found that 38.2% of businesses had innovation as an on-going process. On non-technical innovation, South Africa was more engaged in organisational innovation (51.2%) than marketing innovation (27.1%) (HSRC, 2011:23). Figure 3.1 indicates from the 2008 South African Innovation survey of the HSRC in South Africa, that medium (more than 50 but less than 200 employees) and large (more than 200 employees) businesses are more process orientated in the innovation process, where very small (less than 20 employees)

and small (more than 20 but less than 50 employees) businesses are more product than goods or services orientated. However, all businesses are involved in goods, services, product and process innovation.

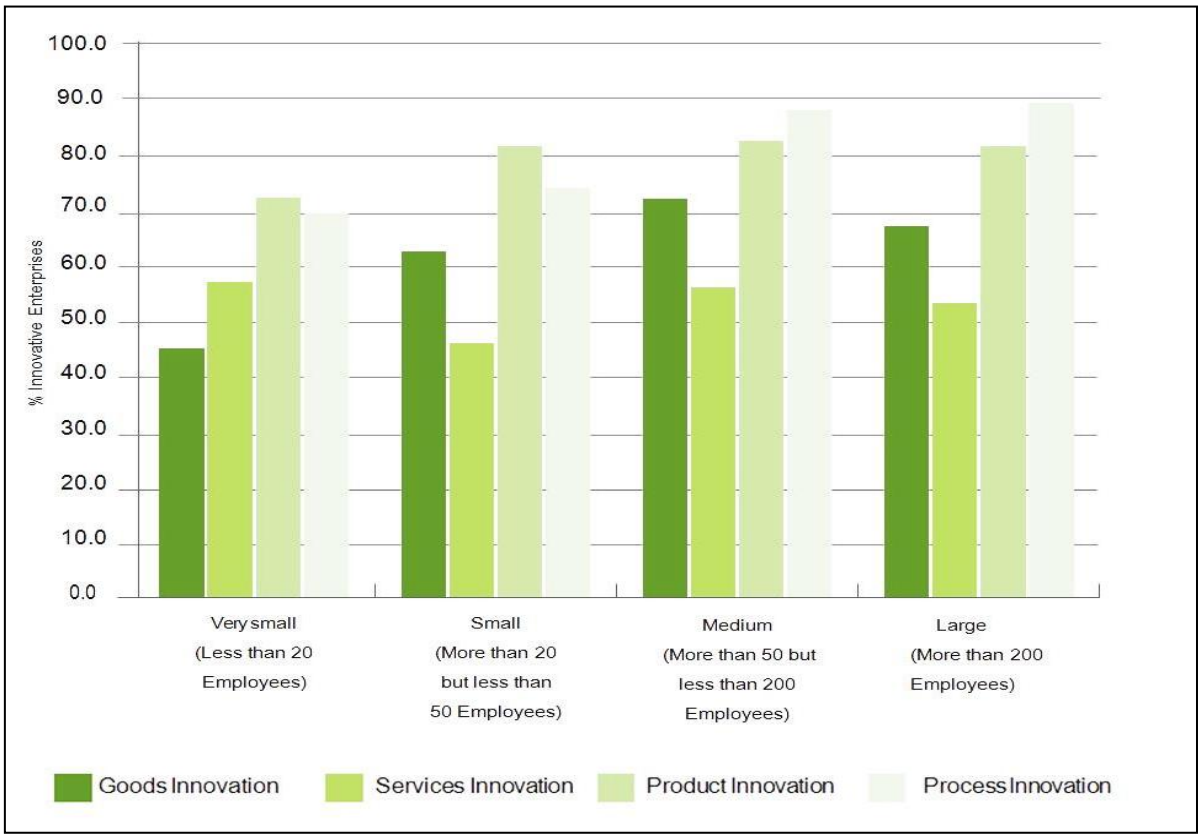

Figure 3.1: Innovation activities in South Africa according to class size
Source: HSRC (2011:15)

In a study in 2011, using the data obtained from the South African Innovation survey in 2008 by the HSRC, Booysens (2011:67) found that innovation spending is high in both small and large businesses in South Africa. The South African Innovation survey in 2008 found most innovations were in manufacturing, services, and the wholesale and retail trade (HSRC, 2011:127). Businesses in this survey indicated the high cost of innovation (23.8%) and a lack of funding (27.8%) as limitations to innovate in businesses (HSRC, 2011:46).

In the next section, creative industries will be discussed.

3.3.5 Creative industries

The United Nations Conference on Trade and Development (UNCTAD) in 2010 identified the following activities in the creative goods and services industry: heritage, performing arts, visual arts, publishing and print media, design, audio-visual, music, new media, creative industries, royalties and licence fees and other related industries (Kea European Affairs, 2013:12). In general, creative industries are associated with arts and crafts. Rae (2011:105) identifies traditional creative industries as creative design and manufacture, for example, equipment and fashion design, performance and experience like music, event and festival promotion, digital, media and promotion like graphic design, stills photography and video photography and trading, for example, art dealers.

In this study, the researcher concentrates on creative design and specifically industrial design. Industrial design influences not only consumer goods, but designs for other industries such as motor vehicles and automated teller machines (ATMs). Industrial designers are classified by UNCTAD and the United Nations Development Programme (UNDP), as a category in the creative industry sector. UNCTAD defines the creative sector being goods and services that require creativity to produce (UNCTAD & UNDP, 2010:1). This sector goes beyond normal cultural activities to include fashion and computer software. An example is computer software that is produced, however, it involves creativity to develop.

3.3.6 Creative industries in South Africa

Creative industries contribute to economic growth and job creation. Foreign direct investment (FDI) in the creative industry in South Africa was R8 958 billion for the period 2003 to 2015, and a total of 2 036 jobs were created from this investment (Tshongweni, 2016). Creative industries become more important because of their high growth prospects and relationship with innovation and success (Kea European Affairs, 2013:6). This illuminates the role of innovation and creativity and suggests that South Africa has the potential to develop its economy by actively developing and supporting creativity and innovation to stimulate economic growth.

The next section provides an account of the theories and models of entrepreneurship.

3.4 ENTREPRENEURIAL THEORIES AND MODELS

The researcher adopted a theoretical framework on entrepreneurial intent as a basis of the study. Different theories on evaluating and measuring entrepreneurial intent were identified and will be discussed in this section. There are different entrepreneurial intention models that are based on the different entrepreneurial intention theories, for example, Bird's intention model (1988:442; Fayolle & Liñán, 2014:663). Bird's model (1988) concentrates on the execution of entrepreneurial concepts in the entrepreneurial intention process. The literature must still confirm Bird's model (1988) (Fayolle & Liñán, 2014:664).

Both Shapero and Sokol (1982) and Ajzen (1985) have intention-based theories, which are well-developed theories in the field of study. Shapero and Sokol (1982) focus on the position of entrepreneurship in economic development. Ajzen (1985) identified three attributes (attitude to act, social norms and perceived behaviour control) that can affect intended behaviour. Perceived behaviour control in Ajzen's (1985) model has the same characteristics what Bandura identified in 1997 as self-efficacy.

Both Shapero and Sokol (1982) and Ajzen (1985) have considerable commonalities with its focal point on proximal behaviours. The TPB appears to be appropriate to measure entrepreneurial intent. However, researchers should be explicit with what is understood with entrepreneurial intent in the study. Entrepreneurial intent should clearly be defined in studies.

For this study, the focus was on the entrepreneurial intent of students enrolled for the TDD programme at CPUT and TUT.

In understanding why an individual becomes an entrepreneur, various authors investigated different aspects like personality features or traits (McClelland, 1961:1; Obschonka, Schmitt-Rodermund, Silbereisen, Gosling & Potter,

2013:104), characteristics like age or gender (Reynolds, Storey & Westhead, 1994:443; Storey, 1994:1; Campo, 2011:14; Henry, Foss & Ahl, 2013; Koveos, 2014:140), culture (Liñán & Chen, 2009:593; Siu & Lo, 2013:147), demographics (Robinson, Stimpson, Huefner & Hunt, 1991:13; Kundu & Rani, 2013:377), work environment (Lee, Wong, Foo & Leung, 2011:124; De Clercq, Honig & Martin, 2013:652) or environmental factors (Liñán, *et al*; 2005:2-3; Liñán, *et al*; 2011b:187; Almeida, Ahmetoglu & Chamorro-Premuzic, 2014:102). These studies point to various factors that could influence entrepreneurial intention.

The next section provides an exposition of entrepreneurial intention.

3.4.1 Entrepreneurial intention

Vesalainen and Pihkala (1999:1) explain intentions as "a state of mind directing a person's attention towards a specific object or path in order to achieve something". Bird (1988:442; 1989:8) defines entrepreneurial intentions as "a conscious state of mind that directs attention towards a specific object (goal) or pathway to achieve it (means)". Entrepreneurship is planned behaviour because the entrepreneur needs to plan to start the business (Schlaegel & Koenig, 2014:293). Certain attitudes forecast intention, and intentions forecast behaviour (Krueger, *et al*; 2000:413; Nabi & Holden 2008:548; Saeed, Yousafzai, Yani-De-Soriano & Muffatto, 2015:1127). Entrepreneurial intention is also the consequence of rational systematic processes or intuitive thinking (Fayolle, Gailly & Lassas-Clec, 2006:706).

The entrepreneurial opportunity creates entrepreneurial intentions to start a business. The entrepreneurial opportunity is described by Eckhardt and Shane (2010:49) "as situations in which new goods, services, raw materials, markets, and organising methods can be introduced for profit". Sarasvathy, Dew, Velamuri and Venkataraman (2010:79) define the entrepreneurial opportunity comprising of new ideas or inventions; positive beliefs to realise the conceivable value; and, actions to produce and implement new products or services or to create a new business. The entrepreneur will examine different options to create a situation of opportunity for profit. Factors influencing the actual decision or intentions to start a business

are: the perceived opportunity by the potential entrepreneur; the entrepreneur having the confidence to actually start the business; status of entrepreneurship in the potential entrepreneurs' sphere; the availability of good job alternatives; the market; finance; and, the fear of failure (Herrington & Kew, 2013:22; Amorós & Bosma, 2014:26).

When the potential entrepreneur becomes aware of the opportunity, the individual may act upon the opportunity. It was argued by Fayolle, Liñán and Moriano (2014:679) that current and past studies on entrepreneurial intentions measure entrepreneurial intentions but there is a paucity of studies on how entrepreneurial intentions translate the actual development of a business (Fayolle & Liñán, 2014:663). The researcher located past graduates who successfully completed the TDD programme, and determined whether these students' entrepreneurial intentions transformed into the actual start-up of a business.

In the next section, the researcher will discuss the Theory of Reasoned Action, Shapero and Sokol's Model (1982) of the Entrepreneurial Event (SEE) and the TPB.

3.4.2 Theory of Reasoned Action

The Theory of Reasoned Action is essentially a motivational theory (Ajzen & Madden, 1986:454). Before any behaviour occurs, there is an intention to execute that specific behaviour in question. The higher the intention levels of an individual, the higher the chance of the behaviour been executed. The more the person attempts to execute the behaviour, the higher the intention. There are two causes of intention (Ajzen & Madden, 1986:454), as indicated in Figure 3.2. These are the attitude towards behaviour (personal factors) that is the individual's assessment of the behaviour whether it is perceived as positive or negative, and, the subjective norm (social factor) as the social pressure on an individual to execute a certain behaviour or not to.

The Theory of Reasoned Action assumes that both the attitude and social norm are equally significant to determine behavioural intention. Intention is seen as the

only forecaster of behaviour, which generates a problem where there is no control over the anticipated behaviour (Ajzen & Madden, 1986:456; Burak, Rosenthal & Richardson, 2013:1436).

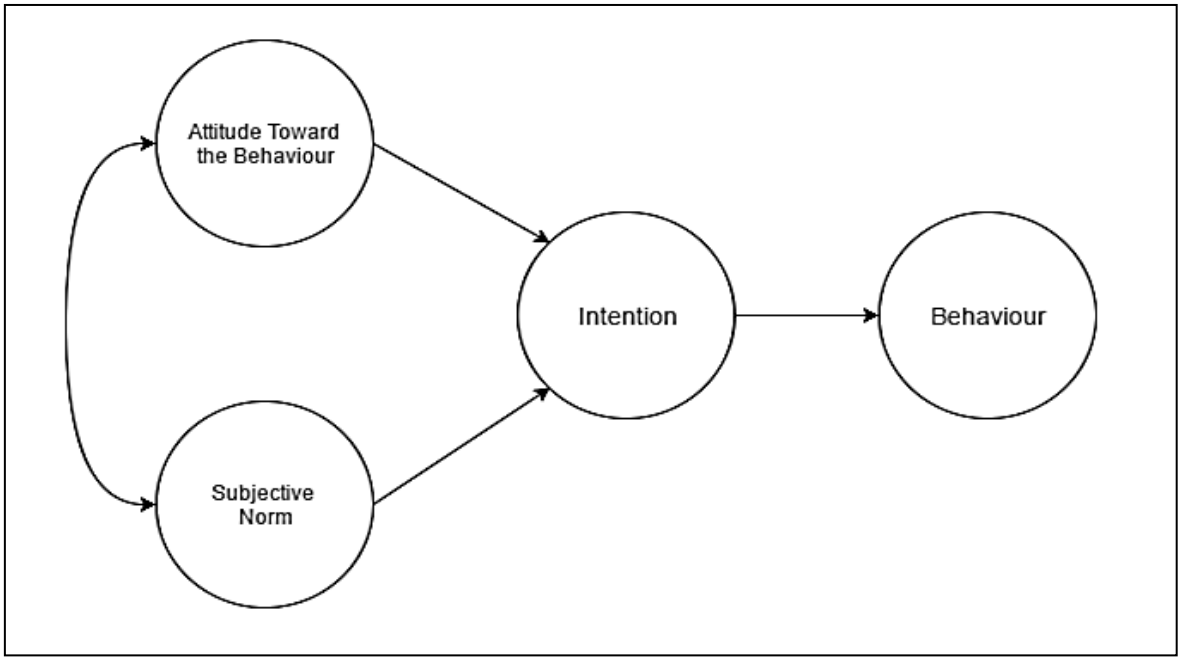

Figure 3.2: Theory of Reasoned Action
Source: Ajzen and Madden (1986:454)

The Theory of Reasoned Action is not suitable for the study to measure the entrepreneurial intentions of the TDD students at the two Universities of Technology, as it does not provide for the factors of perceived behaviour control or self-efficacy, which are important for determining intention.

3.4.3 Shapero and Sokol's Model of the Entrepreneurial Event

Shapero and Sokol's (1982) model of the entrepreneurial event (SEE) (Figure 3.3) is based on the Theory of Planned Behaviour (section 3.4.4) and is a model of behavioural intention, and specific to the area of entrepreneurship. In the SEE, intentions to start a business derive from perceptions of desirability and feasibility of the action, and from a propensity to act upon opportunities. Entrepreneurial events thus require the possibility to start a business (credibility and propensity to act) to exist before the activation of a subsequent propensity to perform (Shapero

& Sokol, 1982; Fitzsimmons & Douglas, 2011:433). The SEE suggests that entrepreneurial intention is based on the interaction between personal characteristics, perceptions, values, beliefs, background and environment. The SEE has three variables that act on entrepreneurial intentions (Shapero & Sokol, 1982:72), namely:

a. **Perceived Desirability:** According to Fini, Grimaldi, Marzocchi and Sobrero (2009), perceived desirability is the person's belief related to how easy (or difficult) the enactment of the behaviour is in an intended situation. Liñán (2004:4) describes perceived desirability as the degree to which a person feels an attraction towards a given behaviour (to become an entrepreneur). An individual's perception of desirability of entrepreneurship is affected by personal attitudes, values, and feelings (Shapero & Sokol, 1982:72; Miralles, Riverola & Giones, 2012).

b. **Propensity to Act:** The propensity to act refers to the personal disposition to act on one's decisions, reflecting volitional aspects of intentions (Shapero & Sokol, 1982). Shapero and Sokol (1982) argue that any path been considered, has to be perceived as not only desirable, yet, but also as feasible.

c. **Perceived Feasibility:** According to Shapero and Sokol (2009), "the perceived feasibility is related to an individual's perception of available resources; in other words, it measures the individual's personal perceived ability to carry out certain behaviour". Liñán (2004:4) defines perceived feasibility as "the degree to which people consider themselves personally able to carry out that behaviour". The presence of role models, mentors or partners would be a decisive element in establishing the individual's feasibility level. A study by Krueger, *et al*; (2000) and supported by Liñán (2004), equated perceived feasibility to self-efficacy, which refers to the belief that an individual has the ability to act on a given opportunity.

The importance of the prior entrepreneurial involvement of the person and the person's characteristics in determining future entrepreneurial behaviour are emphasised by Shapero and Sokol (1982). The entrepreneurial event model of

Shapero and Sokol (1982) assumes that individuals will do nothing until something happens to change the status quo. The change may be negative like losing a job or positive like inheriting financial resources from a family member. The individual perception pivots on how the opportunity is observed, and how personally gratifying the professed achievement would be.

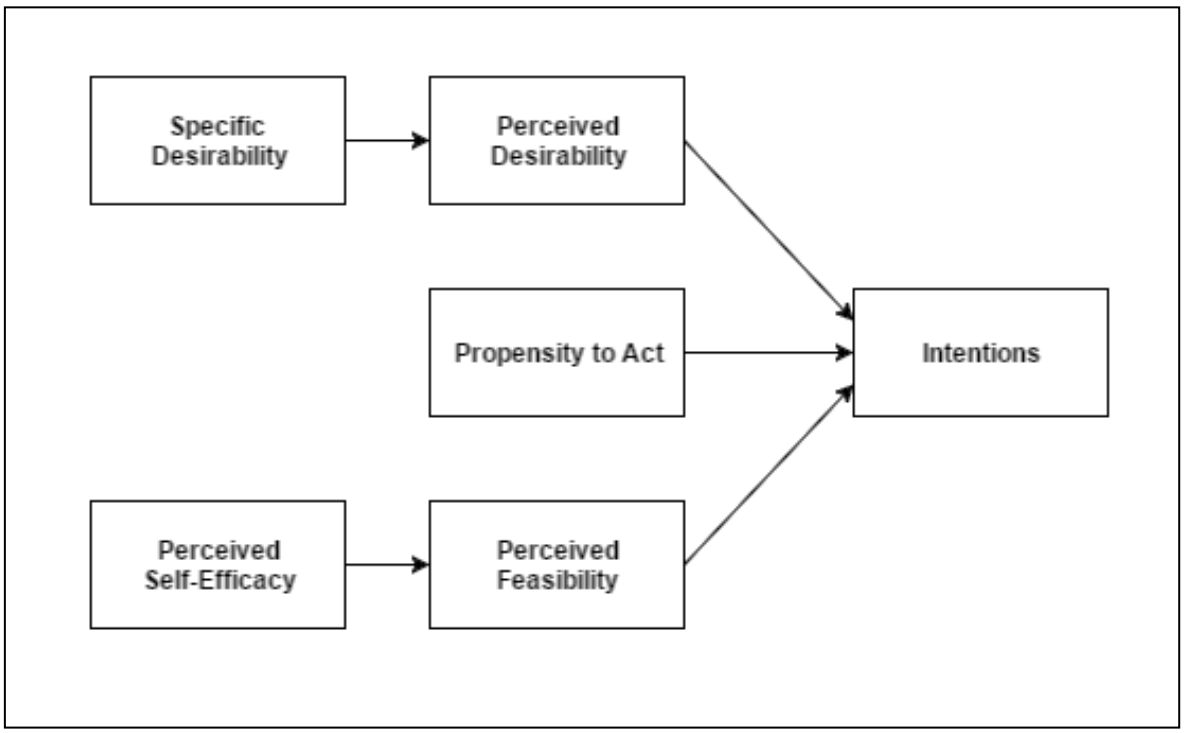

Figure 3.3: Shapero and Sokol's (1982) model of the entrepreneurial event
Source: Radipere (2012:69)

3.4.4 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) (Ajzen, 1985) is universally accepted as a powerful model of behaviour, and has been used to measure entrepreneurial intentions (McEachan, Conner, Taylor & Lawton, 2011:97). Ajzen (1985) first published the TPB in 1985 and this theory has been successfully used in different disciplines. According to the TPB, every action in human behaviour is planned (Ajzen, 1985:11; Ajzen, 2017b). The TPB measures the intentions of the individual to enact behaviour, and in the case of this study, intentions to participate in entrepreneurial behaviour such as to start a business. The TPB extends the

Theory of Reasoned Action by adding the variable of behaviour control (Ajzen, 2017a:1).

The TPB, according to Ajzen (2017a:1) and as shown in Figure 3.4, identifies that there are three kinds of antecedents that influence human behaviour, namely:

a. Behavioural beliefs or expected values are describe as attitude towards the behaviour and are the results of behaviour, and produce a positive or adverse attitude towards the behaviour.
b. Normative beliefs, which are describe as subjective norm, constitute views about the normative anticipations of others and a consequence from apparent social pressure.
c. Control beliefs are describe as perceived behavioural control, which are determined by the degree of control the individual believes he or she possesses to enact the behaviour.

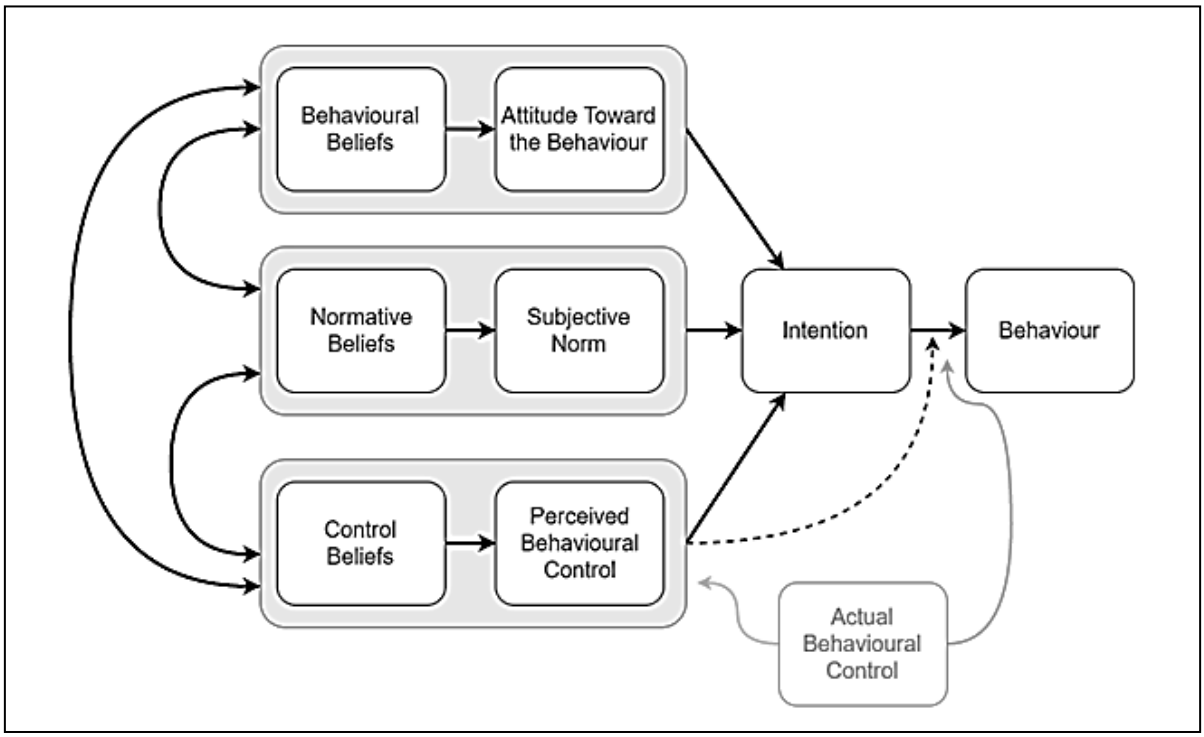

Figure 3.4: Theory of Planned Behaviour

Source: Ajzen (2017a)

Behavioural and normative beliefs are variables that influence the apparent attractiveness to execute a specific behaviour (Krueger, *et al*; 2000:416). The antecedent of behaviour, perceived behavioural control, alludes to the perceptions of the individual of situational capability or self-efficacy. The three antecedents of behavioural intention as described by the TPB are described as follows:

a. **Personal Attitude (attitude towards behaviour):** Personal attitude is the extent to which a person has a favourable or unfavourable assessment towards a particular behaviour. The individual can experience the behaviour as positive or negative which will influence their attitude towards the specific behaviour. Ajzen (1991:188) describes attitude as the view an individual has towards the behaviour in question, being favourable or unfavourable. Attitude involves the process of deliberation to conclude to perform a specific behaviour. Personal attitude and self-efficacy were found to be a main factor explaining entrepreneurial intentions in a study by Liñán, *et al*; (2011b:205). These findings were in line with previous studies (Kolverreid, 1996; Tkachev & Kolvereid, 1999; Krueger, *et al*; 2000; Autio, *et al*; 2001; Liñán & Chen, 2009). The construct on measuring self-efficacy deliberates on the attractiveness of the individual to engage certain kinds of behaviour. It is important to look at attitude as Souitaris, Zerbinati and Al-Laham (2007:567) found that attitude increased students' intention because of participation in entrepreneurship programmes. It would be of importance to investigate the role of attitude in the industrial designer as a predictor of entrepreneurial intent.

b. **Perceived social norms (subjective norms):** Perceived social norms (or subjective norms) refer to an individual's belief whether peers think he or she should engage in the behaviour. Social norms also include habitual codes of conduct in a group of people. Perceived social norm measures the perceived social pressure by the individual to act, or not to act on entrepreneurial activities. Studies by Ajzen (1991), Autio, Keeley, Klofsten, Parker and Hay (2001) and Liñán, *et al*; (2011b:203) have found that perceived norms were not significant. However, because there is no entrepreneurial intent study on TDD students in South Africa, the researcher decided to include and test perceived social norms in the suggested research model. It would be significant to

determine whether industrial design students in this study are influenced by peers, role models, parents and/or successful entrepreneurs.

c. **Self-efficacy (Perceived behavioural control):** As stated earlier (section 3.4.4), the TPB is an extension of the Theory of Reasoned Action (Ajzen, 1985), introducing the factor of perceived behavioural control (PBC) to account for behaviours over which people have incomplete control. This factor accounts for situations where non-motivational factors play a role in attitude translating into action (Ajzen, 1991:183), acknowledging that the resources and opportunities available to a person must to some extent dictate the likelihood of behavioural achievement. Specifically, perceived behavioural control refers to the perceived ease or difficulty of performing the behaviour (Ajzen, 2017a). Perceived behavioural control involves judgements concerning individuals' capability to perform a given behaviour, the extent to which they have the requisite resources and the belief that they can overcome the obstacles they may encounter (Ajzen, 2002:677).

Perceived behavioural control is very similar to Bandura's (1997) conception of self-efficacy as it reflects an individual's personal judgement of their ability to perform a prospective behaviour (Ajzen, 2017b). Consequently, Ajzen (1991) incorporated self-efficacy and controllability items into intention measures to improve behaviour prediction. Perceived self-efficacy is defined by Bandura (1994:2) as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives.

Self-efficacy is related to the individual perceiving a definite performance outcome, or the extent to which an individual is competent to execute certain behaviour (Krueger, *et al*; 2000:418; Schlaegel & Koenig, 2014:317; Ajzen, 2017a:1). Self-efficacy is how the individual perceives the easiness or complexity to execute a specific behaviour – namely to start a business (Urban, 2010a:133). Several studies have found a positive relationship between self-efficacy and the actual start-up of a business (Markham, Balkin & Baron, 2002:149; Zhao, Seibert & Hills, 2005).

Self-efficacy beliefs determine how people think, motivate themselves, and how they behave. An individual with a positive self-perception and attitude will have a higher intention to perform. If a person has control over a process, for example to start a business, the intention will be carried out when the opportunity arises (Autio, *et al;* 2001:145). Entrepreneurs have a high belief in being able to achieve what they set out to achieve (Baron, 2012:101). The TDD student is creative and this creates openness to experiences, engaging in two or more tasks at the same time, and capacity beliefs that lead to higher self-efficacy (Farmer & Tierney, 2017:34).

3.4.5 Theory of Planned Behaviour entrepreneurial intention studies

Starting a business involves planned behaviour because a person does not just start a business. A business needs planning, for example, finance, premises and personnel. However, the individual does not have total control over the process because of external factors, such as funding. The TPB maintains that the more control on achievement the individual perceives to possess, the bigger the effect on intentions and behaviour (Autio, *et al*; 2001:146; Fitzsimmons & Douglas, 2011:433). There are many international and South African studies to support the usefulness of Ajzen's TPB (1985) to measure intentions (Kolvereid, 1996:47; Autio, Keeley, Klofsten & Ulfstedt, 1997:133; Tkachev & Kolvereid, 1999:269; Krueger, *et al;* 2000:411; Noar & Zimmerman, 2005:275; Souitaris, *et al*; 2007:566; Gird & Bagraim, 2008:711; Liñán & Chen, 2009:593; McEachan, *et al*; 2011:97; Cameron, Ginsburg, Westhoff & Mendez, 2012:1; Othman & Mansor, 2012:517; Kautonen, van Gelderen & Fink, 2013:665; Sesen, 2013:624; Sniehotta, Gellert, Witham, Donnan, Crombie & McMurdo, 2013:106; Vinogradov, Kolvereid & Timoshenko, 2013:719; Ebewo, 2014:1; Malebana, 2014a:130; Tshikovhi, 2014a:1). The studies identified in Table 3.3 used the TPB to successful measure entrepreneurial intentions.

A study was executed by Gird and Bagraim (2008:711) at two universities in the Western Cape (South Africa), using the TPB to measure entrepreneurial intentions in final year commerce students. The results presented substantial support for the use of the TPB. The study also found that personality traits, situational influences

and demographics did not contribute considerably to the variance described by the TPB. The findings of the study concluded that the TPB was an important aid to forecast entrepreneurial intentions in the Western Cape and possibly in South Africa.

Malebana (2014a:130) undertook a study in 2010 in the Eastern Cape and the Limpopo provinces at two rural universities using the TPB and Liñán and Chen's (2009) entrepreneurial intentions' questionnaire, and measured the entrepreneurial intentions of final year commerce students (Malebana, 2014b). According to Malebana (2014a:130), most respondents indicated an intention to start a business in future.

Tshikovhi (2014a) used the TPB adjusted by Liñán (2004), in 2013 to measure the influence of students' exposure to the student structure in Entrepreneurial Action Us (Enactus) in South Africa on entrepreneurial intention. Enactus is "a community of students, academic and business leaders committed to using the power of entrepreneurial action to transform lives and shape a better and more sustainable world" (Mdzikwa, 2014). Enactus worldwide is represented in 36 countries at 1 710 universities with 69 000 participating students (Enactus, 2017). Enactus is active on 27 campuses in South Africa (Enactus, 2017). Tshikovhi's (2014b) study conducted in 2013 supported that students' contact with Enactus had a positive influence on entrepreneurial intentions (Tshikovhi, 2014b). Enactus is supported by business people, academics and students.

Table 3.3: Theory of Planned Behaviour entrepreneurial intention studies

Author	Demographic variables	Variables	Units of analysis	Findings
Kolvereid (1996)	Family background Gender Self-employment Experience	Attitude Subjective norm Perceived behaviour-al control	Norwegian business school students	Self-employment, experience, gender, and family background only indirectly influence self-employment intentions through their effect on attitude, subjective norm and perceived behavioural control
Tkachev and Kolvereid (1999)	Family background Gender Self-employment Experience	Attitude Subjective norm Perceived behaviour-al control	Russian university students	Attitude, subjective norm and perceived behavioural control determine employment status among Russian students
Liñán and Chen (2009)	Role model Self-employment Experience Work experience Personal data (age, gender)	Personal attraction Social norms Self-efficacy	Spanish and Taiwan university students	Demographic variables except gender have relatively few significant effects over the antecedents of entrepreneurial intention
Souitaris, *et al*; (2007)	Entrepreneur-ship programme	Attitude Subjective norm Perceived behaviour-al control	London, UK and Grenoble, France university students	Entrepreneurship programmes are a source of trigger-events, which inspire students (arouse emotions and change mindsets)

Source: Wu and Wu (2008:756)

The above studies confirm that the use of the TPB to study entrepreneurial intentions in South Africa successfully describes these intentions. This study therefore deems it appropriate for expanded research and South African circumstances. The researcher therefore used the TPB and Liñán and Chen *(*2009) and Liñán, *et al's*; (2011b) questionnaire, and adapted it for TDD students and South African context. In this process, the researcher also took cognisance of the previous research done by Gird and Bagraim (2008); Malebana (2012), executed in 2010; and Tshikovhi (2014b), executed in 2013; in the South African environment.

3.5 ENTREPRENEURSHIP EDUCATION

The literature and studies acknowledge the link between entrepreneurship education and entrepreneurial intention. In this section, entrepreneurship education will be defined, the role of entrepreneurship education in the entrepreneurial process will be discussed, followed by the role of educators in entrepreneurship education, and lastly entrepreneurial education, entrepreneurial intent, and actual businesses will be discussed.

3.5.1 Entrepreneurship education defined

According to Shepherd and Douglas (1997:1), entrepreneurship education is defined as “the ability to envision and chart a course for a new business venture by combining information from functional disciplines and from the external environment in the context of the uncertainty and ambiguity which faces a new business venture”. Entrepreneurship education is also explained as “the purposeful intervention by an educator in the life of the learner to impart entrepreneurial qualities and skills to enable the learner to survive in the world of business” (Isaacs, Visser, Friedrich & Brijlal, 2007:614). Entrepreneurship education entails more than educating individuals to start up new businesses; it also prepares students with the knowledge, entrepreneurial skills and aptitudes necessary to engage in a more innovative and flexible way within a changing environment (Hynes & Richardson, 2007:733). In concurrence, Refaat (2009:88) comments that entrepreneurship education and training allow students to develop and use their creativity, and to utilise initiatives and risks.

Operationally, entrepreneurship education is described as a “programme-derived entrepreneurial inspiration, as a change of hearts (emotion) and minds (motivation) evoked by events or inputs from the programme directed towards considering becoming an entrepreneur” (Thrash & Elloitt, 2003:871). Entrepreneurship education is fundamental in aiding the youth to develop entrepreneurial skills, traits and behaviours to comprehend and realise entrepreneurship as a career, and to support positive entrepreneurial intentions (Charney & Libecap, 2000; Kuratko, 2003; Schoof, 2006). Charney and Libecap

(2000:5) found that entrepreneurship education contributes significantly to risk-taking, the start-up of new businesses, and the propensity to be self-employed.

3.5.2 The role of entrepreneurship education in the entrepreneurial process

The entrepreneurial process starts with the individual or entrepreneur. The entrepreneur has skills, like an ability to solve problems or to negotiate; and attributes, like a positive self-belief, self-confidence and inventiveness to find solutions to challenges or to obtain finance.

The entrepreneur has attributes, for example autonomous thinking, self-confidence, dynamism, resourcefulness and is achievement-orientated. Figure 3.5 depicts the entrepreneurial process, encapsulating the behaviour, entrepreneurial abilities, skills and attributes entailed. The entrepreneurial individual has skills and attributes (Gibb, 1993:11; Shook, Priem & McGee, 2003:379; Heinonen & Poikkijoki, 2006:710; Chell, 2013:6; Obschonka, *et al*; 2013:104). The entrepreneurial process consists of (Heinonen & Poikkijoki, 2006:710):

a. **Intention** – making the student aware of entrepreneurship, and to pursue achievement of goals.

b. **Opportunity search and discovery** – innovation is emphasised as it is part of the programme of the student and the lecturer opens the student's eyes to an opportunity.

c. **Decision to exploit opportunity** – the business environment is complex and the student investigates how to proceed with an opportunity.

d. **Exploitation of opportunity** – the student acts autonomously and deals with the problem and opportunity that are presented.

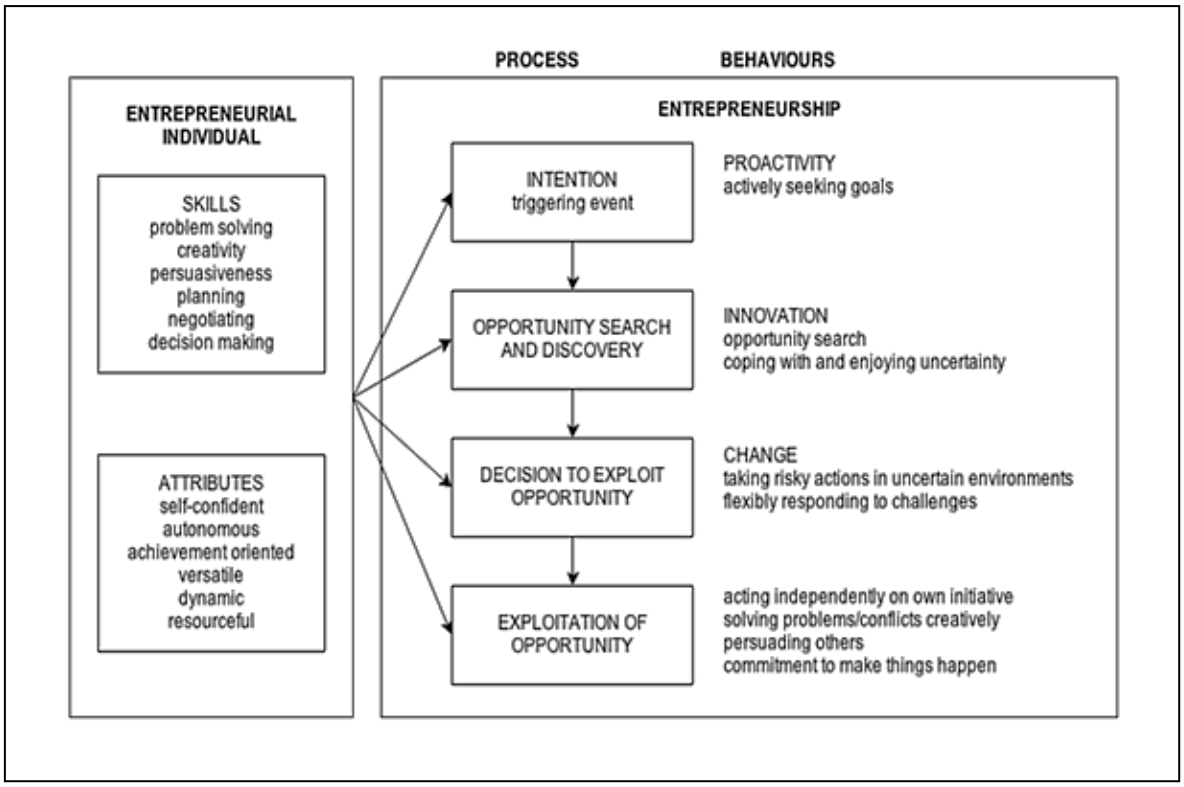

Figure 3.5: The entrepreneurial process: behaviours, skills and attributes
Source: Gibb (1993:11); Shook, *et al*; (2003:379); Heinonen and Poikkijoki (2006:710)

These skills and attributes contribute to the success of the entrepreneurial venture because an entrepreneur must be able to manage change and to be innovative. The entrepreneur gets exposure to the possibility of an entrepreneurial opportunity and intention is created. The next step in the process is that opportunity will be discovered, for example, through innovation by creating or designing a new or enhanced product. When this process is completed, the entrepreneur will decide to utilise the opportunity. Once the decision is made, the entrepreneur will ensure that all relevant stakeholders are supportive and the product can be launched. The entrepreneur needs to go through the process to minimise the risk of failure.

Figure 3.6 indicates the role of entrepreneurship education in the entrepreneurial process. Once a student develops intentions to start a business, the next step will be to create awareness by the student of the opportunities. In the case of this research, the business subjects (business management and business studies) for the TDD programme indicate to the student how to identify an opportunity. The

TDD students are taught about creativity and are exposed to creative exercises. These students are also exposed to events where they get the opportunity to network with business people. The entrepreneur operates in an environment (micro, market and external) which is key for any potential business. The educator teaches the student to develop creativity and opportunities within the possible restrictions of the environment. Intention to develop the opportunity is created. Once the opportunity is identified, the planning to start the new business is the next step. The business will be launched, and through the efforts and input of the entrepreneur (student), hopefully grow.

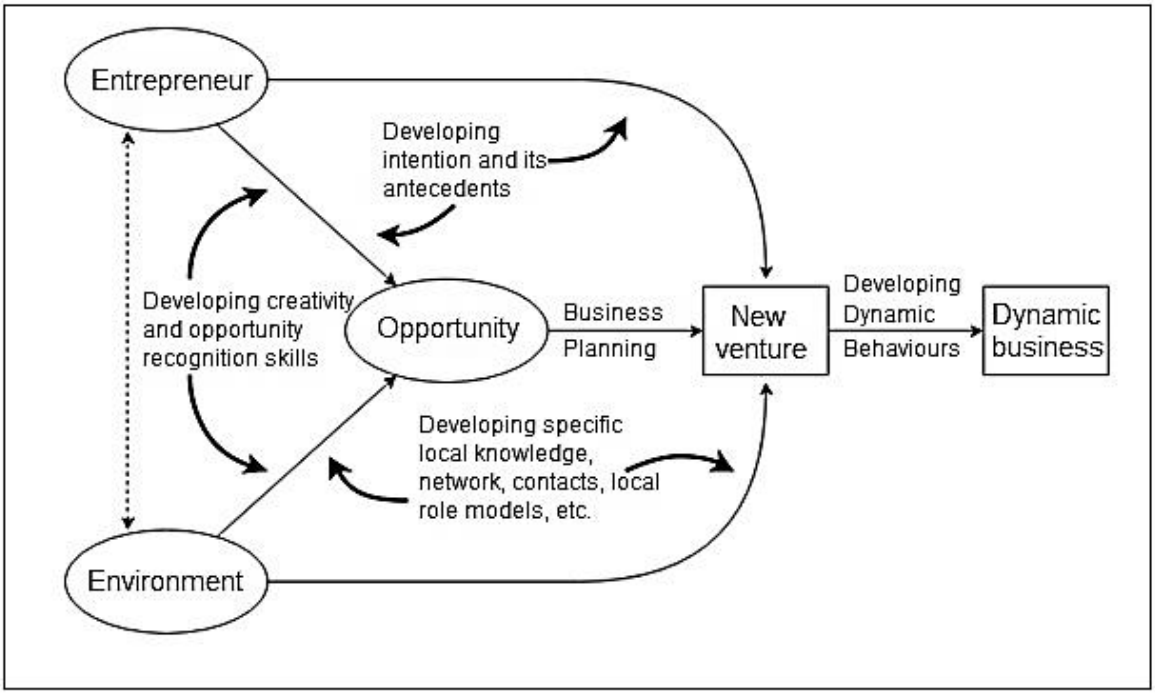

Figure 3.6: Role of entrepreneurship education in the entrepreneurial process

Source: Liñán (2007:241)

The educator needs to teach all these processes and steps to students, and where possible, provides practical examples and scenarios. This will enable the student to be prepared for conducting business in the real world.

3.5.3 Role of educators in entrepreneurship education

Very few educators engage in entrepreneurial activities themselves (Astebro, Bazzazian & Braguinsky, 2012:663). Since students need exposure to practical business situations, this could be obtained through student structures like Enactus; an international non-profit organisation on university campuses across the world, also represented at 27 South African universities. Enactus involves business people, academics and students, giving members an understanding of entrepreneurship in action (Enactus, 2017). Enactus students become involved in small-scale community projects and co-operatives, which assist in equipping them in terms of dealing with the challenges of starting a business.

Educators need to understand the entrepreneurial process and support teaching it to students as part of the curriculum. In a study conducted in South Africa in 2011 by Senne and Shambare (2012:5) on entrepreneurship education and entrepreneurial challenges in higher education, the main barrier experienced by students was reported to be the teaching methods used by academic staff. Lecturers do not live up to the expectations of students. Students are dependent on educators, yet some lecturers only cover the content in the prescribed curriculum and are not prepared to commit adequate time and effort for their students. Given the high unemployment rate in South Africa, education needs to be relevant to address this. A study conducted in 2009 by Yaghoubi (2010:1905) in Iran with students in the agriculture field, found that universities discourage, rather than encourage, students to become entrepreneurs.

In a study in 2011 in 17 European countries, including efficiency-driven and innovative-driven economies, using the TPB to determine the effect of education on entrepreneurial intentions, it was found that entrepreneurship education had a positive effect on intentions (Küttim, Kallaste, Venesaar & Kiis, 2014:658). Jones, Jones, Packham and Miller (2008:597) found that entrepreneurial education leads to entrepreneurial intentions and ambitions. According to Mills (2012:766), entrepreneurial education assists to promote creativity and to transform it into an actual business. Creativity is an important factor in entrepreneurial intentions and creative exercises can be used to increase entrepreneurial intentions of

entrepreneurship education students (Hamidi, Wennberg & Berglund, 2008:304; Gundry, *et al*; 2014:529).

In a study in 2013 by Mudondo (2014:1) at the Great Zimbabwe University in the Faculty of Commerce, it was recognised that entrepreneurship education had a positive influence on entrepreneurial intention. A 2006 survey by Co and Mitchell (2006:348) on entrepreneurship education in South Africa found that entrepreneurship education was still in a developmental stage and research in entrepreneurship was observed as less rigorous than other management disciplines. In an evaluation of entrepreneurship and education in 2008 and 2009 by Von Graevenitz, Harhoff and Weber (2010:110), a gap in knowledge was identified, and they came to the conclusion that little is known on the impact of entrepreneurship education programmes. Ndedi (2013:128), in a study in 2009 on the challenges of entrepreneurship education and training in South Africa, noted that entrepreneurship education should seek to equip the student with knowledge, expertise and impetus to start up an own business. Ndedi (2013:131) concludes that a multi-disciplinary approach is needed in entrepreneurship education and training where students from different faculties come together to create business ideas.

A study conducted by Finch, Hamilton, Baldwin and Zehner (2013:681) noted that universities should, in addition, concentrate on skills like verbal and written communication skills, listening skills and problem-solving skills. Mwasalwiba (2010:20) recorded 108 articles on entrepreneurship education regarding educational goals and instruction approaches. It was found that there is a move towards “attitude-changing” in entrepreneurship education. Entrepreneurship education aims to grow an entrepreneurial spirit and in a lesser extent, contribute to society (Co & Mitchell, 2006:348).

Dickson, Solomon and Weaver (2008:253) found that there is a positive connection between education and entrepreneurial performance. A well-educated entrepreneur has the capability to form businesses that will develop quicker than an entrepreneur who had no training (Schwarz, Wdowiak, Almer-Jarz &

Breitenecker, 2009:273). Educators should note that not all students enrolled for a programme in entrepreneurship might start their own businesses.

3.5.4 Entrepreneurship education, entrepreneurial intent and actual businesses

The researcher searched for studies on “Google Scholar” and the Unisa library, and contacted Liñán (2014) for studies on entrepreneurial intent transforming in an actual business. Studies on entrepreneurship emphasised entrepreneurial intent as a field of study and not measuring the entrepreneurial intent converting into a business (Katz, 1990:23; Henley, 2007:253; Kautonen, van Gelderen & Tornikoski, 2013:704). A novel approach was used by Henley (2007:266) in a study in 2006, with data collected by the British Household Panel Survey in the UK representing 5 000 households. Henley (2007:265) concluded, from the data collected from 13 751 respondents, that 12% were trained to seek a new job of which 36,5% moved to self-employment. Eventually, only 4,7% of this group made the transition towards self-employment (Henley, 2007:266).

In a longitudinal study in 2006 by Laguna (2013:258) over a period of one year in Poland, 332 individuals registered at an unemployment agency were taught how to write a business plan as part of their entrepreneurship training. It was found that only 18 of the 332 individuals (5,4%) started a business. The entrepreneurs in the study in Poland started commercial (grocery, clothes and pet shops) or service (electrical or paint shop) businesses. Lu and Chen (2013:204) found in a study in 2008 in Taiwan of 216 female students (age group 26-35 years) who participated in the “Free and Young Student” programme of the National Youth Commissioner of Executive Yuan, only 10% started a business when measured six months after completion of the programme. The businesses started by female students in Taiwan were mainly in the service and beauty industries.

Figures on how many individuals started a business could be an indication if the entrepreneurship (business) curriculum is sufficient, or if other challenges prohibit the individual to start a business. Challenges that can hamper entrepreneurship include: individual (family and education), organisational (finance, physical

resources and marketing), and environmental (socio-cultural and rules, laws and regulations) (Stamboulis & Barlas, 2014:2). It is evident from the studies by Henley (2007:265), Laguna (2013:258) and Lu and Chen (2013:204) that the translation rate from intentions into an actual business is low. Additionally, Joensuu, Viljamaa, Varamaki and Tomikoski (2013:781) established that entrepreneurial intentions decline during students' studies. Further research is required on how to improve the actual starting of businesses by students that are enrolled for entrepreneurship programmes.

It is important to understand and discuss entrepreneurship education as it may impact on the intentions of students enrolled for engineering programmes. Huang-Saad and Arbor (2009:1) point out that education needs to change from its current system because students are part of a worldwide market where technology growth outpaces education. The Chairman of the South African National Government Task Team on Entrepreneurship, Education and Job Creation, Dr Blecher, emphasises that experiential learning, competitions and awards should form part of all entrepreneurship programmes (Blecher, 2013:9). This approach would give students valuable experience that could assist them later in the workplace or when starting their own businesses. Both Yaghoubi (2010:1905) and Blecher (2013:9) indicate that education needs to shift from its current format. It becomes therefore imperative for entrepreneurship lecturers and educators to assess various approaches that serve to educate, as well as to equip students with the necessary knowledge and skills to create their own businesses. Entrepreneurship training is practical orientated and educators will benefit from the knowledge and skills from business people (Jack & Anderson, 1999:121; Wilson, 2011:26).

Entrepreneurial education programmes that are effective with the youth embrace simulations of real business situations and games; collaboration; group activities; giving scholars the chance to buy and sell at occasions using real money; trips to businesses; guest speakers from the private sector; business plan competitions, and student businesses (Wilson, 2011:13).

The researcher claims that the success of entrepreneurship programmes can be determined by measuring the entrepreneurial intentions of students whilst

studying, and determine whether an actual business was started after the successful completion of the programme in TDD. It could be argued that a high level of entrepreneurial intentions of students should result into actual business start-ups; and if not, the reasons should be established for such deviation. Universities can also measure if the programme and/or business subjects presented meet the demands of students to start a business. The researcher argues that entrepreneurship programmes and subjects should measure the entrepreneurial intentions of students against the actual start-up of businesses. The researcher further observed that high entrepreneurial intentions and low actual business start-ups could be due to challenges experienced by the individual. Data collected from the participants will provide the researcher with information on the most prominent challenges experienced by students, specifically with the business subjects (business management and business studies), and how to reduce these challenges. The researcher will therefore contribute to this field of study by identifying the challenges that TDD students face at Universities of Technology, and in South Africa.

3.6 TECHNICAL STUDENTS AND ENTREPRENEURSHIP

The teaching of entrepreneurship in technical skilled disciplines like engineering and industrial design is still largely unknown, according to Standish-Kuon and Rice (2002:33). These disciplines lend themselves to entrepreneurship; however, as innovations are more prevalent in technical skilled disciplines, it is important to expose these students to business training and to be aware of issues such as finance and marketing. This will complement their technical knowledge with the knowledge required to engage in entrepreneurial behaviour. Non-business students have their own fields of study (engineering, design, computer science and other areas) and have specific knowledge that can be build-on when teaching them entrepreneurship (Hynes, 1996:14; Brand, Wakkee & van der Veen, 2007:60). It is important to equip students to reach their full potential through their specific training programme. Technical skilled students and engineers, for example, develop and design new technologies and it is essential to be creative, original and innovative (Cobb, Agogino, Beckham & Speer, 2008:420; Farr & Brazil, 2009:3).

Entrepreneurial skills are classified by Elmuti, Khoury and Omran (2012:84) into three groups, namely: technical skills (for example technical management); business management skills (for example planning); and entrepreneurial skills (for example innovation and risk taking). Entrepreneurial skills can be acquired through education. The TDD students are well placed, because they are creative, know how to recognise an opportunity, can solve problems, have a technical skill, and develop new products and/or services, and are taught business subjects (business management and business studies). The success rate of developing an idea into a commercial product is very low - around 1 in 3 000 (Stevens & Burley, 1997:1). New business development (NBD) has been part of businesses' operations for more than 60 years. In a global study of 360 industrial businesses that introduced 576 new industrial products into the market by Stevens and Burley in 2003, only 56% of new products that were launched in the USA are successful in the market, compared to 61% in the Netherlands and 62% in the UK (Stevens & Burley, 2003:16). It was asserted that new products do not generate the anticipated revenues for businesses in the USA and that between 50% and 90% end up as financial failures (Andrew & Sirkin, 2003:76; Gourville, 2006:98). In the USA packaged industry, 70% to 90% of products fail within one year (Gourville, 2006:98). In a study in Western Europe by Nielson between 2011 and 2013, it was found that 76% of the 12 000 launched products were taken off the market within one year because of poor sales performance (Nielson, 2014:10; Dijksterhuis, 2016:243).

The technical skills of individuals in industrial design increase their innovation and creativity, which lead to the possibility of higher entrepreneurial intentions if they are exposed to business subjects and studies. Technical skills are mainly found in a mechanical or scientific field where an individual gets training in a specific field, that is combined with practical training (Mack, 2014). Individuals obtain a skill in a technical field, for example engineering, and apply the technical knowledge to create a product. Individuals can also obtain skills to render a service, for example an accountant. The ideal situation would be to combine a technical skilled individual with a business-orientated individual.

In looking at the role and relationship between business and technical skilled fields and engineering, it was found that the USA is far ahead of other countries on combining engineering programmes with entrepreneurship programmes and subjects. More than 400 engineering schools offered entrepreneurship programmes to engineering students since 2007 in the USA (Luryi, Tang, Lifshitz, Wolf, Doboli, Betz, Maritato & Shamash, 2007:T2E-10). Engineering schools in the USA create "entrepreneurial engineers" who will find products and commercialise it (Besterfield-Sacre, Ozaltin, Shartrand, Shuman & Weilerstein, 2011:3). It is important to understand the role of technically skilled people and their role as possible entrepreneurs to create sustainable businesses. Universities should therefore introduce more innovation-based programmes in both under-graduate and post-graduate programmes (Williams, *et al;* 2013:863). Top USA universities like the Massachusetts Institute of Technology (MIT) have different relevant entrepreneurship programmes and an annual entrepreneurship competition, "MIT $100K", which is open to different faculties like engineering, science, humanities and agriculture (Chang & Sung, 2009:26). Another example is the Stanford University's "Stanford Technology Ventures Programme" for entrepreneurship education which is accommodated by the Stanford School of Engineering (Chang & Sung, 2009:26).

In a study in 2009 by Gerba (2012:270) on the impact of entrepreneurship education on entrepreneurial intentions of business management and engineering students in Ethiopia, it was found that the management students who had studied entrepreneurship as part of a programme displayed higher entrepreneurial intentions than the engineering students who had no exposure to a business management subject. Souitaris, *et al*; (2007:567) tested the significance of entrepreneurship subjects on the entrepreneurial intentions and attitudes of 250 engineering students at two universities (London and Grenoble University in France). The inception date of the study was 2002. It was found that the entrepreneurship subject increased the entrepreneurial intentions and attitudes of engineering students.

It is clear from the above studies that technical skilled individuals think creatively, and possess the ability to transform an idea into a new product. Technical skilled

individuals do not only need to have a technical skill set, but also a business skill set to determine the market share, introduce and develop new products, implement new systems of production, train employees, produce legal agreements, grow the business, and obtain finance.

There is an effort from universities to incorporate entrepreneurship programmes in science fields like engineering (Wang & Kleppe, 2001:565; Creed, Suuberg & Crawford, 2002:185). Abdulwahed, Hamad, Hasanain and Hasna (2013:3) note there is no valid instrument to evaluate engineering entrepreneurship education. The researcher addressed this gap in knowledge by adjusting Liñán and Chen (2009) and Liñán, *et al's*; (2011b) entrepreneurial intention questionnaire for South African circumstances to measure the entrepreneurial intentions of TDD students in South Africa. The field of entrepreneurship and business education in engineering in South Africa is still unexplored. It could therefore be argued that entrepreneurship education in technical skilled fields is still in an early stage in South Africa. There are, however, a few studies on entrepreneurial intentions, but not in technical disciplines such as industrial design.

3.7 BUSINESS EDUCATION FOR THREE-DIMENSIONAL DESIGN STUDENTS AT CPUT AND TUT

In this study the researcher measured the entrepreneurial intentions of TDD students, at two Universities of Technology (CPUT and TUT). Technical skilled students are students in the disciplines of physics, information technology (IT), mechanical or civil engineering and other science fields. These students obtain a technical skill and receive theory and practical classes to be equipped with the necessary skills to apply this knowledge gained. The business subjects (business management and business studies) are compulsory for all TDD diploma students. Innovation and creativity are requirements for students in industrial design to be admitted to the TDD programme. Potential TDD students need to submit a portfolio that includes examples from work that was done by the student and that was not a school project. Potential TDD students need to demonstrate original thinking as part of the portfolio requirements, and students are not allowed to copy from any sources (TUT, 2016c:1; CPUT, 2016b:37).

Both institutions offer the compulsory year subjects in business (business management and business studies) on all levels (first, second and third year). The curriculums at the two Universities of Technology are designed to prepare the TDD student to enter the business world. For example, students should be able to design a product, do a costing of a product and determine if there is a market for it, whether the price is competitive, and how to combine these aspects in a business.

Table 3.4 indicates the hours per week that TDD students receive formal classes in the business subject. CPUT spends more time on the subject, business studies, with 2 hours and 15 minutes per week on the first year level; 3 hours per week on the second year level; and 1 hour and 30 minutes per week on the third year level. TUT students receive 1 hour and 30 minutes per week on the subject, business management, on all three levels (first, second and third year).

Table 3.4: Contact time per week for business subjects

University	CPUT	TUT
Subject	Business Studies	Business Management
First year	2 hours 15 minutes	1 hour 30 minutes
Second year	3 hours	1 hour 30 minutes
Third year	1 hour 30 minutes	1 hour 30 minutes

Source: Duff (2015)

Students obtain a holistic view of the business studies (CPUT) and business management (TUT) subjects to enable them to create a viable product from an idea to a final product specific for South African needs; for example, renewable energy solutions (Smit, 2010). The TDD students work independently, as well as in teams, on different projects at the two institutions.

3.7.1 Business education at CPUT

The TDD diploma (programme) at CPUT is driven by what industry requires, for example, participation in the design of a sustainable project in the Cape Town

area, known as “The Fringe” (CPUT, 2016a; Creative Cape Town, 2017). “The Fringe” is Cape Town’s innovation district, and is located between Roeland and Darling streets, Buitenkant- and Cantebury streets and join land with CPUT from Longmarket- to Tenant streets. CPUT is located within “The Fringe”. All curriculums in business studies are very practical-orientated and students obtain experience in real life business situations.

- **Business Studies I**

Business Studies I introduce TDD students to a basic business vocabulary and establish numeracy skills. An awareness of the political, social, technological and economic environments and the positioning of industrial design therein are also determined. The following aspects are discussed in the Business Studies 1 curriculum for industrial design students at CPUT (Botha, 2014):

a. An introduction to design, job opportunities and the advantages and disadvantages of being self-employed are discussed.
b. The characteristics of an entrepreneur and skills required to be a successful entrepreneur are discussed. The importance and relevance of entrepreneurship in design are also demonstrated.
c. The economy and the role and significance of the entrepreneur in the economy. The following aspects are discussed, namely, the types of economic systems; the role and importance of supply and demand; and how to trade in the domestic market and internationally.
d. The types of businesses and ownership are discussed, namely sole proprietorship, partnership, co-operatives, private companies and trusts. The advantages and disadvantages of each type of business form are discussed, including the risks associated with each business ownership form.
e. Students are educated to determine the resources required to start a business, for example finance.
f. Ethics and social responsibility in business.
g. Mathematics for business and business statistics.
h. How to identify a business opportunity and the writing of a business plan.

- **Business Studies II**

The TDD students develop knowledge of the organisational and managerial functions in the context of entrepreneurship. The economic legal framework is explored to contextualise the ethics of business activities. Business studies II for industrial design students at CPUT discusses the following aspects (Botha, 2014):

a. Market research and competitive advantage in business.
b. How to market a product or service. The marketing mix and promoting products and services.
c. Cost: differentiate between fixed and variable costs, and between direct and indirect costs.
d. Understanding financial statements in a business.
e. How to finance the business. Start-up and different forms and avenues of financing.
f. How to compile a business plan from the viewpoints of the entrepreneur, investors and other stakeholders.

- **Business Studies III**

Business Studies III concentrates on the application of the theories, principles and business techniques through project work, case studies and group work. The principal objective is to develop critical thinking and problem-solving skills. Areas of specific importance for skills application are the marketing and financial functions, as well as project management. Business Studies III for industrial design students at CPUT covers the following areas (Botha, 2014):

a. The importance of market research is emphasised to identify the target market of a product. The steps in the market research process.
b. Marketing of a product or service in a business. Developing a marketing mix for a product or service. Promoting a product, and how to compile a budget for promotion.
c. Business decisions: what it entails and how to execute it.
d. Financial statements: how to understand and read financial statements.

e. Financing methods in business: create an understanding of finance, and how to obtain the best finance option for the business.
f. The business plan: how to prepare a business plan, and to understand the value of a business plan.

3.7.2 Business education at TUT

This subject comprises both a theory and application component. There is a strong emphasis on entrepreneurship in the business management subject.

- **Business Management I**

This subject contributes to the programme outcomes by introducing TDD students to the basic principles of the design of a business, money fundamentals and inculcates the culture of entrepreneurship. The following aspects are studied in Business Management I for industrial design students at TUT (Mvula, 2016a:6):

a. Money and banking concepts like interest and interest rates, exchange rate and repo rate, banking structures and procedures, debit and credit, GDP, tax and value-added tax (vat) are explained at an introductory level.
b. Business types like sole proprietor, partnership, private company, public company, trusts, and non-governmental organisations are explained at an introductory level.
c. Business plan concepts are explained within an entrepreneurial context such as to identify a business idea, the target market, the cost of products, revenue recovery, ordering quantities, profit margin, turnover, and market strategy.
d. Manufacturing business concepts are related to product design and IP, and include aspects such as: project and product budget control, capital investment, capex, machine recovery, ex-factory costs, overheads and fixed assets.
e. Product distribution concepts: retail costs, packaging costs (primary, secondary and tertiary), preferred supplier status, invoicing, service policy, storage, supply chain and warranty relating to new product development are explained.

f. Basic business concepts are introduced, for example, the business environment (macro, market and micro environment), as well as management concepts (planning, organising, leading and control).
g. The business canvas model is introduced and explained (key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure and revenue streams).

- **Business Management II**

This subject is concerned with detailed application of business concepts within the context of product design. In applying these business concepts to product design problems, TDD students are prepared for a career either as an entrepreneur, or as an effective designer within an in-house team or consultancy. Business concepts and ethical practices are strengthened throughout the duration of the subject. This subject comprises both a theory and application component. Business executives from industry are also invited to address students.

The TDD design students visit factories (field trips) as part of one of the assignments, and these are integrated with other TDD subjects. Students are taught how to design a product, the use of colour (marketing function) and how to cost an item (finance function). Students also get practical assignments where they need to combine their technical and business skills. For example, they design the packaging for an olive-oil company's products, and do the costing of the packaging and delivery at the factory. In this way, students can be creative and become aware of costs. The following aspects are studied in the Business Management II subject for industrial design students at TUT (Mvula, 2016b:6):

a. Application of the money and banking concept. The TDD design students are taught why knowledge on tax, for example, is important in TDD and how to apply this in a business.
b. Application of IP concepts like the different types of IP, and licensing and royalty agreements are applied to new product development.
c. Application of manufacturing business concepts such as capex, cost recovery and amortisation are applied to new product development.

d. Application of product distribution concepts like transport costs, invoicing and time management storage relating to new product development.
e. Application of industrial design professional practice concepts like a job sheet, project plan and budget estimate, new product decision matrix, time sheet, project status report, work change order, client approval and industrial designer client agreement.
f. Application of basic business concepts and the business environment.
g. Application of the business canvas model.

- **Business Management III**

The third year in business management for industrial design students is specific on teaching the student how to conduct business in an industrial design environment. Students compile projects and use a specific design, including their business skills. These projects form part of an exhibition at the end of the academic year where industry partners are invited. It provides students with an opportunity to showcase their products and designs to industry members. The following aspects are studied in the Business Management III subject for industrial design students at TUT (Whythe, 2016:7):

a. To be industry ready on the use of professional consulting practice and new product development for industrial design solutions.
b. To be industry ready on the professional consulting practice of industrial design.
c. To be industry ready for the industrial design business of new product development.

In the next section, the research model used in this study will be discussed.

3.8 THE RESEARCH MODEL

The researcher utilised an adjusted model of the TPB (Ajzen, 1985; Liñán & Chen, 2009; Liñán, *et al*; 2011b) which incorporates business education in the model to measure the role of education on the entrepreneurial intentions of TDD students.

The study highlights entrepreneurial intentions and if these transform into starting an actual business. The researcher also looked at possible reasons why entrepreneurial intentions do not translate into an actual business. This will not only highlight the importance of industrial design in entrepreneurship, but will add to the gaps in knowledge, in this discipline in South Africa. The researcher believes that low entrepreneurial intentions could impact negatively on the creation of new businesses. This study therefore contributes to the existing body of knowledge as most studies measure entrepreneurial intentions, and not if entrepreneurial intentions transform into an actual business.

Figure 3.7 presents the research model that is used in the study.

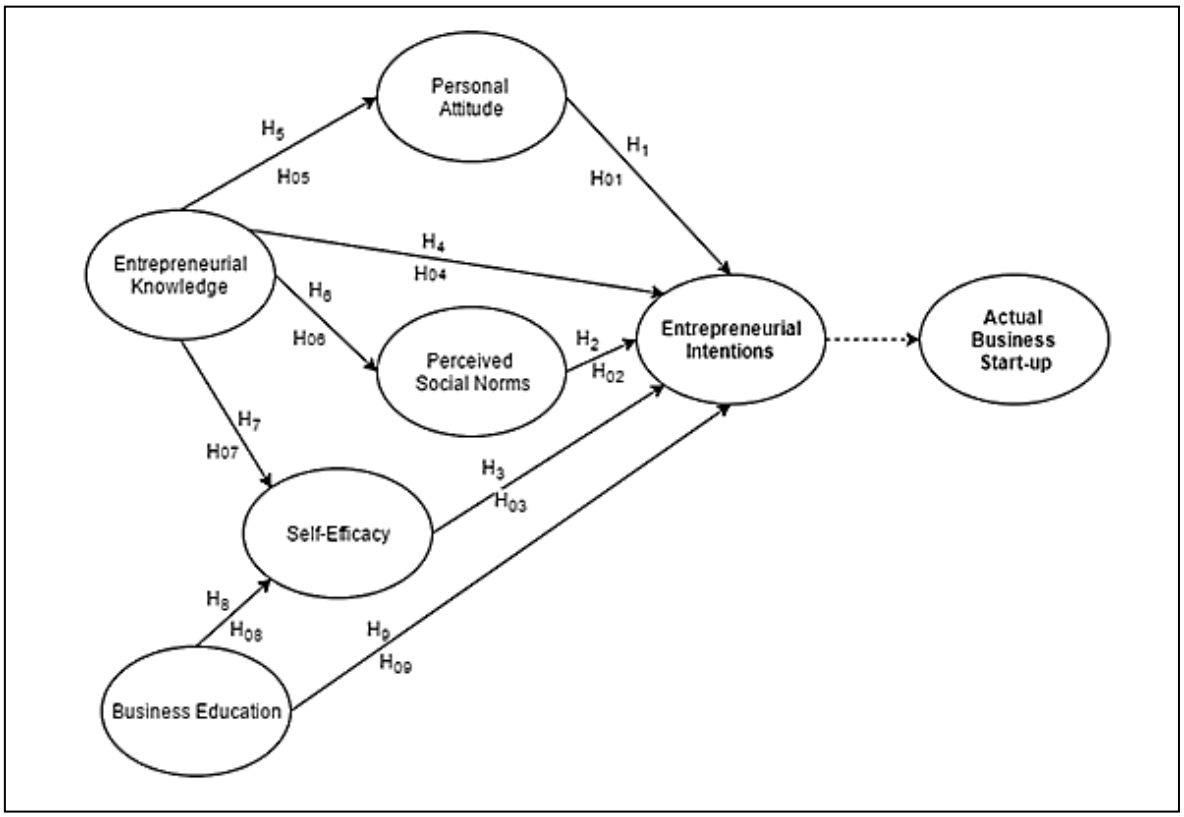

Figure 3.7: Research model of entrepreneurial intentions
Source: Adapted from Liñán and Chen (2009); Liñán, *et al*; *(*2011b)

The research model is based on Ajzen's (1985:11) Theory of Planned Behaviour (TPB), and adapted by Liñán and Chen (2009) and Liñán, *et al*; *(*2011b). It consists of, in the context of TDD students, on the following variables:

a. Independent variables

- ***Business education*** **(BE)** is added to the TPB to assess the role and influence of business education and its impact on the entrepreneurial intentions of TDD students. Business education, for the purpose of this study, is the business management/business studies' subjects that form part of the TDD programmes (qualifications) at TUT and CPUT.

- ***Entrepreneurial knowledge*** **(EK)** is added to the TPB as it enables the TDD students to recognise business opportunities and how to manage a business. Entrepreneurial knowledge is the knowledge that the individual obtains through experience and other ways; for example, the business subjects assist students to realise business opportunities. Entrepreneurial knowledge identifies and recognises a business prospect because of past knowledge about a specific situation (Scott, 2000:448; Armstrong, 2015: 279).

- ***Perceived social norms*** **(PSN)** capture the social factors that influence behaviour, conceptualised as the social pressure on an individual to execute a certain behaviour, or not to (Ajzen, 1991:199).

- ***Personal attitude*** **(PA)** is the individual's assessment of the behaviour, and is the level of attraction an individual feels towards certain behaviour (Ajzen, 1991:188).

- ***Self-efficacy*** **(SE)** is the level an individual considers him- or herself to be able to execute the behaviour and the ability to execute the necessary activities to start the business (Urbig, Weitzel, Rosenkranz & Van Witteloostuijn, 2011:384).

b. Dependent variable

- Entrepreneurial intention (EI) is the dependent variable, which is influenced by the antecedents described above, and represents how serious the individual is

to start an own business or the prospects that the individual will start a business.

The research model of entrepreneurial intentions (Figure 3.7) presents a theoretical underpinning of the variables involved in developing entrepreneurial intentions, and that ultimately determine whether entrepreneurship is practically realised in the form of starting a business. The relationship between the variables is therefore what is analysed, and these constitute the research hypotheses to be tested quantitatively. The researcher assessed the translation of entrepreneurial intentions into actual business start-ups through qualitative analysis.

An entrepreneurial intention questionnaire was designed by Liñán and Chen (2009) and Liñán *et al*; (2011b), and was tested on final year business and economics students in Spain in 2006. Interestingly, the inclusion of entrepreneurial knowledge had no effect on this study. A number of further studies were conducted in 2006 by Liñán (2008:257), which reaffirmed that the entrepreneurial intention questionnaire is a valid instrument to measure entrepreneurial intention. This study measures the intentions of TDD students using Liñán and Chen (2009) and Liñán, *et al's*; (2011b) questionnaire and was adjusted for South African circumstances, taking into account previous studies completed by South African researchers in this field.

This research model therefore measured the entrepreneurial intentions of TDD students at TUT and CPUT, and whether the business subjects (business management/business studies) contributed to the entrepreneurial intention of these students. Past graduates also participated in the study to confirm if entrepreneurial intentions had transformed into actual business start-ups.

3.9 CONCLUSION

In this chapter, literature on entrepreneurship, creativity and innovation, entrepreneurial theories and models, and business education focusing on technical skilled students were discussed, followed by the suggested research model for the study. The literature review emphasised the importance of

entrepreneurship towards job creation and economic growth, and the important role creativity and innovation plays in the process of sustainable entrepreneurship. Industrial design students are in a unique position to pursue entrepreneurial activities as they can create an own product or service. It is therefore important to determine students' entrepreneurial intentions; and how to increase their entrepreneurial intent.

Creativity and innovation are key components of entrepreneurship. These three concepts are interrelated as creativity is an idea, innovation is the development of the selected idea, and entrepreneurship is the entrepreneur starting a business to accommodate the product or service created. The researcher described how design is closely related with creativity, innovation and entrepreneurship, as it transforms a raw product into a marketable product.

The methodological approaches applied to answer the research questions and to test the hypotheses are explored in the next chapter.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

The previous two chapters discussed the secondary research on industrial design (chapter 2) and entrepreneurship (chapter 3). The rationale of this chapter is to describe the research methodology used to conduct the empirical research for this study. This chapter discusses the research objectives and questions, the research model and research hypotheses, the research philosophy, strategy, and research approach. The population and sample, data collection and analysis techniques, validity, reliability and trustworthiness of the empirical research findings are discussed. Both Group 1 (students enrolled for the Three-Dimensional Design [TDD] programme at Cape Peninsula University of Technology [CPUT] and Tshwane University of Technology [TUT] for 2015) and Group 2 (past graduates that successfully completed the TDD programme for the period 2011-2014) will be discussed. Thereafter, the research limitations and ethical considerations will be presented.

The study employed two distinct methodological approaches to conduct empirical research to meet the primary and secondary research objectives. The primary research objective focused on the measurement of the entrepreneurial intentions of industrial design students enrolled for the TDD programme at two South African universities; CPUT and TUT. The quantitative research method was also used for secondary objective 1: to determine the links between business education and entrepreneurial intentions in the undergraduate TDD students for 2015. Towards this end, the researcher tested a research model of entrepreneurial intentions using quantitative methodology. The past graduates who successfully completed the TDD programme were surveyed and the researcher used both quantitative and qualitative research methodology to obtain the needed data from the participants. The qualitative method was employed because it gives thick and rich data that can be valuable to understand. An interview guide was used by the researcher for interviewing Group 2 participants, which were the graduated students.

Consistent with the division of research approach to the collection of empirical data to meet the research objectives, the study had two groups of participants, namely Group 1 from whom quantitative data were collected to address the primary research objective and secondary objective 1; and Group 2 from whom quantitative and qualitative data were collected to address the secondary research objective 2, namely to investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

The TDD programme was selected because the business subjects (business management and business studies) incorporate business and entrepreneurship education that are strategic elements in entrepreneurial intentions' development. This study was designed to investigate the relationship between entrepreneurial intentions and personal attitude, perceived social norms, self-efficacy, entrepreneurial knowledge and business education. The study also looked at the actual business formation by graduates that successfully completed the TDD programme. Graduates of the TDD programme are trained and skilled in designing products and services, which stimulate economic development and growth.

To achieve the research objectives, research questions were formulated. Below are the research questions and research objectives that the research methodology seeks to answer through collection and analysis of empirical data:

Research questions

1. Research Question 1: What are the entrepreneurial intentions of TDD students?

2. Research Question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions?

3. Research Question 3: To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?

Research objectives:

1. The primary objective of the study was to establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme TDD in South Africa.

2. The secondary objectives of the study were:

    a. To determine the links between business education and entrepreneurial intentions in the undergraduate TDD students for 2015.

    b. To investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

In the next section, the research model and hypotheses will be discussed.

4.2 RESEARCH MODEL AND HYPOTHESES

A hypothesis can be derived from theory or proven studies because the hypotheses must be able to be tested empirically (Babbie & Mouton, 2006:124). The hypotheses for the measurement of entrepreneurial intentions in the TDD students have been previously proven in international studies (Liñán, *et al*; 2005:23; Wu & Wu, 2008:752; Liñán & Chen, 2009:593; Engle, Dimitriadi, Gavidia, Schlaegel, Delanoe, Alvarado, He, Buame & Wolff, 2010:35; Ebewo, 2014:1), and studies that involved South African students (Gird & Bagraim, 2008:711; Farrington, Venter & Neethling, 2012:17; Urban, 2012:16; Malebana, 2014a:130; Tshikovhi, 2014b:1; Nieuwenhuizen & Swanepoel, 2015:151).

Several studies have acknowledged that a good hypothesis transforms the problem statement of the study into a question to enable testing using research methods (Neuman, 2011:12; Salkind, 2012:28). There are two types of hypothesis namely the null and the research hypothesis (Wilson, 2014:256). The null hypothesis, is according to Salkind (2012:28), “a statement of equality”. The null hypothesis acts as a standard against which research results can be measured

against. There is no link amongst variables with the null hypothesis (Salkind, 2012:29). According to Salkind (2012:29), “research hypothesis are statements of inequality”. There is a definite relationship between the two identified variables (Scherbaum & Schockley, 2015:143).

The researcher identified the hypotheses from a research model of entrepreneurial intentions, used to address the primary research objective. Figure 4.1 indicates the research model of entrepreneurial intentions that was adapted from Liñán and Chen (2009) and Liñán, *et al*; (2011b) and used in the study.

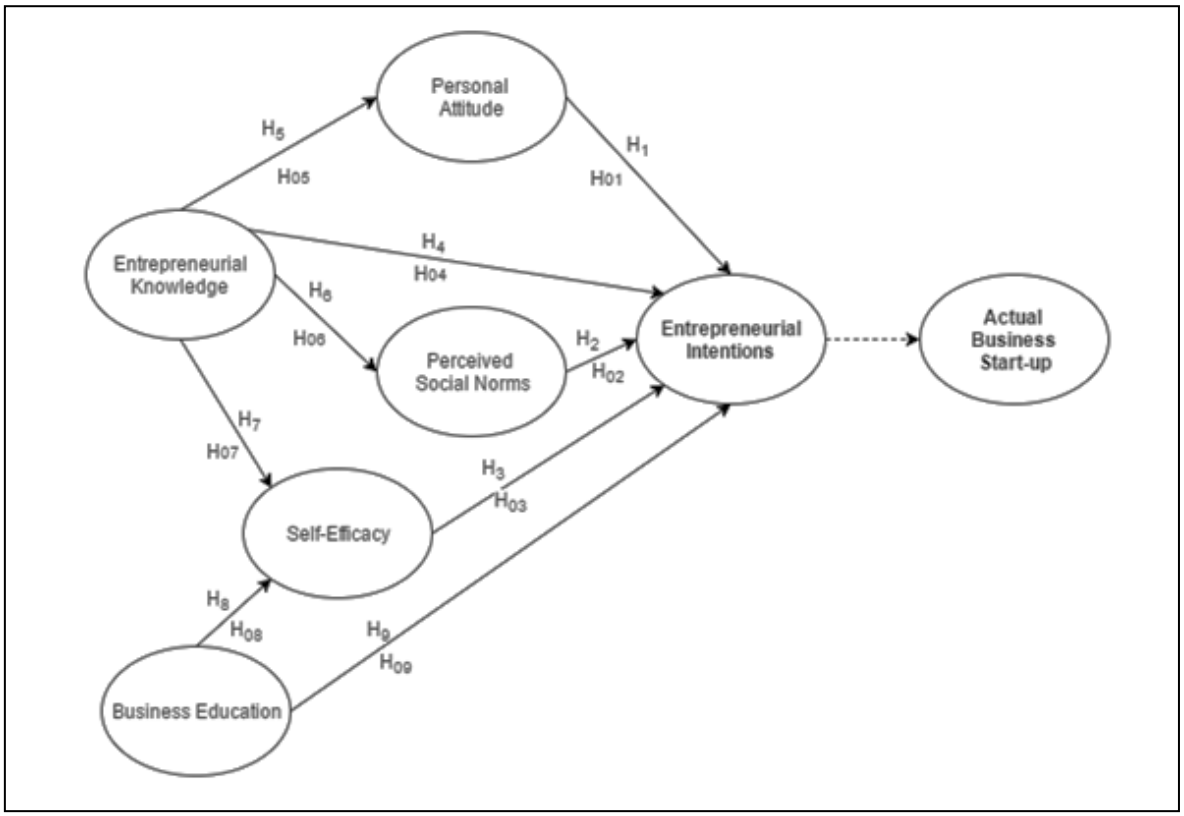

Figure 4.1: Research model of entrepreneurial intentions
Source: Adapted from Liñán and Chen (2009); Liñán, *et al*; (2011b)

Table 4.1 depicts the research questions related to the primary research objective and secondary objective 1 and associated research hypotheses. The hypotheses derived directly from the research model of entrepreneurial intention. Secondary objective 2 (research question 3) was qualitative research and there were therefore no hypotheses set for this objective.

Table 4.1: Research questions and hypotheses

Research questions	Hypotheses
Research question 1: What are the entrepreneurial intentions of TDD students?	Personal Attitude H_{01}: Personal attitudes *negatively influence* entrepreneurial intention H_1: Personal attitudes *positively influence* entrepreneurial Intention
	Perceived social norms H_{02}: Perceived social norms *negatively influence* entrepreneurial intention H_2: Perceived social norms *positively influence* entrepreneurial intention
	Self-efficacy H_{03}: Self-efficacy *negatively influences* entrepreneurial intention H_3: Self-efficacy *positively influences* entrepreneurial intention
	Entrepreneurial knowledge H_{04}: Entrepreneurial knowledge is *negatively related to higher levels of* entrepreneurial intention H_4: Entrepreneurial knowledge is *positively related to higher levels of* entrepreneurial intention
	Entrepreneurial knowledge H_{05}: Entrepreneurial knowledge is *negatively related to higher levels of* personal attitudes H_5: Entrepreneurial knowledge *is positively related to higher levels of* personal attitudes
	Entrepreneurial knowledge H_{06}: Entrepreneurial knowledge *is negatively related to higher levels of* perceived social norms H_6: Entrepreneurial knowledge *is positively related to higher levels of* perceived social norms
	Entrepreneurial knowledge H_{07}: Entrepreneurial knowledge is negatively related to higher levels of self-efficacy H_7: Entrepreneurial knowledge *is positively related to higher levels of* self-efficacy
Research question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions?	H_{08}: Business education *is negatively related* to *higher levels of* self-efficacy H_8: Business education is *positively related* to *higher levels of* self-efficacy
	H_{09}: Business education *negatively influences higher levels of* entrepreneurial intentions H_9: Business education *positively influences higher levels of* entrepreneurial intentions

4.3 RESEARCH PHILOSOPHY

Research philosophy is important because it influences what the researcher understands and investigates (Saunders, *et al*; 2009:108). There are four philosophies which may be adopted towards research, namely: positivism, realism, interpretivism and pragmatism (Saunders, *et al*; 2009:119). Positivism, an epistemological approach, entails that methods in the natural sciences are applicable in the social sciences (De Vos, Strydom, Fouche & Delport, 2007:5; Bryman, 2008:697). Realism is likewise an epistemological point of view which holds that objects exist autonomously of their being or our understanding (Saunders, *et al*; 2009:599).

Interpretivism, another epistemological viewpoint, believes that it is key to be aware of the differentiations between humans in their position as social actors (Saunders, *et al*; 2009:593; Wilson, 2014:10), while pragmatism argues that the research problem is the key determinant of the research thinking (Saunders, *et al*; 2009:598).

According to Saunders, *et al;* (2009:109), there are three main thinking processes regarding research philosophy, namely ontology and epistemology. Ontology concentrates on reality. Epistemology comprises of suitable knowledge in the discipline of the study. Epistemology is thus how knowledge is created (Scherbaum & Shockley, 2015:145). Axiology is a third thinking process and is drew from the Greek words “axios” (worth or value) and “logos” (logic or theory) (Biedenbach & Jacobsson, 2016:140). Axiology is the way the researcher understands the values in the research. Axiology is the ethics and values, the rationale and the tools deployed to question concepts (Mertens, 2007:212; Biddle & Schafft, 2015:321). The researcher used the epistemology thinking process and positivism as the research philosophy in the study because it would provide credible data and facts (Myers, 2011:37).

Table 4.2 depicts the research philosophies in relation to ontology, epistemology and axiology.

Table 4.2: Four research philosophies

	Positivism	Realism	Interpretivism	Pragmatism
Ontology: The researcher's view of the nature of reality being	External, objective and independent of social factors	Is objective. Exists independently of human thoughts and beliefs of knowledge of their existence (realist), but is interpreted through social conditioning (critical realist)	Socially constructed, subjective, may change, multiple	External, multiple, view chosen to best enable answering of research question
Epistemology: The researcher's view regarding what constitutes acceptable knowledge	Only observable phenomena can provide credible data and facts. Focus on causality and law like generalisations, reducing phenomena to simplest elements	Observable phenomena provide credible data and facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (critical realism). Focus on explaining within a context or contexts	Subjective meanings and social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings and motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: The researcher's view of the role of values in research	Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Research is value laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the research	Research is value bound, the researcher is part of what is being researched, cannot be separated and will be subjective	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view
Data collection techniques	Highly structured, large samples, measurement, quantitative, but can also use a qualitative method	Methods chosen must fit the subject matter, quantitative or qualitative method	Small samples, in-depth investigations and qualitative method	Mixed or multiple method designs, quantitative and qualitative methods

Source: Saunders, *et al*; (2009:119)

4.4 RESEARCH APPROACH

The study used both quantitative and qualitative research methods for data collection. Quantitative research is where the researcher collects numerical data which can be interpreted to make valuable and useful conclusions (Saunders, *et al*; 2009:598; Swift & Piff, 2010:xiii). The quantitative method is useful where the subjects been investigated are subject to scientific validation, when the sample size is large, and the study can be easily replicated. Leedy and Ormrod (2010:107) suggest quantitative research when there is sufficient literature available on the subject and the purpose of the research can be measured. This research method is applicable to the data collected from Group 1 participants to test the research model of entrepreneurial intentions. The data for participating students were collected through survey questionnaires. The questionnaire for the Group 1 participants, being students enrolled for the TDD programme in 2015, were pre-determined (adjusted from the questionnaire used by Liñán and Chen (2009) and Liñán, *et al*; (2011b). Codified responses were used, being Likert scales, for most questions.

The qualitative method is used when there are not pre-determined responses sought, but rather the research is exploratory in nature, seeking to gain insight into an issue that requires further investigation. Furthermore, qualitative research commonly uses a small sample size, employs probing questions, requires an interviewer with a special skill set and cannot be easily duplicated. Qualitative research enable researchers to understand people's behaviour (Myers, 2011:5; Patton, 2015:14). Qualitative research will ask the "what, why, how and when questions" (Myers, 2011:6). The qualitative method was used for the collection and analysis of data from Group 2 participants, which addresses the secondary research objective to investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

The study employed an interview guide with 74 questions for the past graduates in TDD to complete. These contained 48 close-ended questions, 16 open-ended questions and ten demographic and other questions. The qualitative method was most suited to measure whether the entrepreneurial intentions of TDD graduates

translated into an actual business; whether the business subject (business management) contributed to the decision to start an actual business; whether the students experienced other external factors limiting the decision to start a business, and what could be done to improve the business subject (business management) lectured to the TDD students. Table 4.3 indicates the difference between quantitative and qualitative research methods.

Table 4.3: Difference between quantitative and qualitative research methods

Quantitative methods	Qualitative methods
Pre-determined	Emerging methods
Instrument based questions	Open-ended questions
Performance data, attitudes data, observational data and census data	Interview data, observation data, and audio-visual data
Statistical analysis	Text and image analysis
Statistical interpretation	Themes, patterns, and interpretation

Source: Creswell (2013:17)

The following sections describe the research approach followed in meeting the research objectives, employing a quantitative methodology to meet the primary research objective and answer research questions 1 and 2, and employing a qualitative methodology to meet the secondary research objective and answer research question 3.

4.5 GROUP 1 PARTICIPANTS (UNDERGRADUATE TDD STUDENTS 2015): QUANTITATIVE RESEARCH METHOD

The meeting of the primary research objective, namely to establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme TDD in South Africa, and the secondary objective 1 was to determine if the links between business education (business management and business studies) and entrepreneurial intentions were achieved through use of a quantitative methodology to answer research questions 1 and 2. The research model of entrepreneurial intentions was tested through collection of quantitative data from a

sample of TDD students from CPUT and TUT. The data were collected with the use of a self-completion questionnaire with 107 close-ended, three open-ended, and 10 demographic and other questions, designed to test the research hypotheses derived from the research model and were included in the questionnaire of entrepreneurial intentions. There were many close-ended questions, to profile the Group 1 participants as it was the first time in South Africa to measure entrepreneurial intent in this specific group of participants (TDD students).

4.5.1 Population and sample

The population is the total of the units of analysis which the researcher is focused on investigating (Kent, 2001:245). For the primary research objective and secondary objective 1 the population was TDD students at CPUT and TUT. All the students in the TDD programmes at these two Universities of Technology were approached to participate in the survey. Table 4.4 indicates the total number of students enrolled for the TDD programme at the two universities in 2015, and the percentage of the total population participating in the research.

Table 4.4: Research population and sample

Level of study	Enrolment for 2015 (population)	Participants in study (sample)	Percentage of participation (%)
First year	67	56	83.6
Second year	52	51	98.1
Third year	42	38	90.5
Total	161	145	90.1

The total population of TDD students enrolled in 2015 was 161, and a final sample of 145 students participated in the study. Of the total population, 16 students were not reachable and did not participate in the study. A total of 92 students from CPUT and 53 from TUT completed the questionnaire.

4.5.2 Data collection

The collection of empirical quantitative data was performed by the use of a self-reporting survey questionnaire (Mouton, 2011:99) applied to the research sample at

the two universities. The research instrument collected the quantitative data. Likert-scale measures on a scale from one to seven, for example how strongly a participant agrees or disagrees with a given statement, were used in the questionnaire (Saunders, *et al*; 2009:594; Leedy & Ormrod, 2010:189; Salkind, 2012:395). Questions derived from the research hypothesis were used to test the research model of entrepreneurial intentions.

The researcher adjusted the questionnaire used by Liñán and Chen (2009) and Liñán, *et al*; *(*2011b:215), which have proved to be consistent in prior studies (see Appendix B) (Gird & Bagraim, 2008; Liñán & Chen, 2009; Malebana, 2014b; Tshikovhi, 2014b; Nieuwenhuizen & Swanepoel, 2015). Permission was obtained from Liñán (2013) to use the questionnaire (see Appendix A). The questionnaire included a cover letter explaining the purpose of the study, and it took the participants 30 minutes to complete.

The researcher arranged with the relevant Head of Departments of Industrial Design at CPUT and TUT to collect the data during lecturing times. The researcher collected the data personally at CPUT and research assistants collected the data at TUT.

4.5.3 Variables tested

According to Salkind (2012:23), a variable represents “a class of outcomes that can take on more than one value”. Saunders, *et al*; (2009:590) describe the dependent variable as a “variable that changes in response to other variables”. A dependent variable measures whether the independent variables have an influence on an outcome as the independent variables cause changes in a dependent variable (Saunders, *et al*; 2009:367; Salkind, 2012:24).

In this study, the dependent and independent variables were derived from the research model of entrepreneurial intentions, whereby entrepreneurial intention (EI) is the dependent variable, and personal attitude (PA), perceived social norms (PSN), self-efficacy (SE), entrepreneurial knowledge (EK) and business education (BE) are the independent variables.

4.5.4 Pilot study

A pilot study is normally conducted in research to test the questionnaire; whether valid and reliable data will be collected from the questions in the questionnaire (Saunders, *et al*; 2009:597). The purpose of a pilot study is to ensure that the time is sufficient to complete the questionnaire; that participants understand the questions; that questions are clear; that participants feel comfortable with the questions and that the layout is clear (Bell, 2005:147). The questionnaire for Group 1 participants used in this study was tested in the pilot study with the third year group of TDD students at the University of Johannesburg (UJ) and TUT in 2014. The TDD programme at UJ was discontinued at the end of 2014, meaning that UJ students could not participate in the final research. Seven TDD students at UJ and 7 students from TUT participated in the pilot study, as indicated in Table 4.5. There were no problems experienced with the completion, timing or understanding of the questionnaire, and therefore the researcher continued with the empirical data collection in 2015 using the original questionnaire format.

Table 4.5: Participation in pilot study

Institution	Participants in pilot study
UJ	7
TUT	7
Total	14

4.5.5 Data analysis

The primary data collected from the research participants measured the conceptual model of research variables of three immediate antecedents of entrepreneurial intention. In keeping with the research objectives as well as replication logic, hypotheses and the model were tested using structural equation modelling. To perform the selected statistical multivariate tests, the data needed to be reduced or summarised into smaller sets of manageable dimensions or latent variables using factor analysis (Pallant, 2010). To conduct factor analysis, the following factorability tests were performed (Field, 2013): (1) adequate sample size, (2) Kaiser-Meyer-Olkin (KMO) criterion, and (3) correlation tests.

Data from the questionnaires were captured on a spreadsheet and analysed using the Statistical Package for the Social Sciences (SPSS) version 21 and STATA v13. Both descriptive and several multivariate techniques were used. The analysis was conducted in several stages using correlation analysis, independent t-tests, multiple regression analysis, repeated-measures, and Structural Equation Modelling (SEM) methods.

In the first stage, preliminary analysis was performed. First, the data were screened to check for errors by inspecting the frequencies of each variable, including all the individual items that make up the scales. Then descriptive statistics were assessed to describe the characteristics of the sample and to check for statistical conclusion validity by looking for violation of the assumptions underlying the statistical techniques used to address the specific research question. The descriptive statistics computed for selected indicators and constructs in the research model provide a preliminary view of the raw data and explain the underlying information (Tabachnick & Fidell, 2007). This involves computing the means, standard deviation and frequency for each selected variable.

The second stage involved data reduction and testing the scales using principal components analysis (PCA) to confirm measurement reliability and validity and to establish whether measurements of the model are stable within the South African context. In other words, to validate the Theory of Planned Behaviour (TPB) in a South African context. Inter-correlation analysis was undertaken to determine first the direction of relationship between variables (antecedents), and secondly the significance of those relationships.

Finally, to test the mediating effects and hypotheses as well as to identify the best model fit, SEM using STATA v13 were tested against the obtained measurement data from SPSS. SEM, a second-generation multivariate analysis tool (Bagozzi & Fornell, 1983:24), incorporates an economic perspective focused on prediction and a psychometric approach that model concepts as latent variables that are indirectly inferred from multiple observed measures (Hair, Black, Babin & Anderson, 2010). Mayhew, Hubbard, Cynthia, Finelli, Harding and Carpenter (2009) explain that SEM

goes beyond regression models by providing coefficients that estimate the statistical significance and magnitude of the structural relationship between theoretical constructs. Furthermore, SEM allows for multiple simultaneous directions of causality, and distinguishes the direct effect and the indirect effect as well as the total effect of an explanatory variable on each dependent variable (Behjati, Pandya & Kumar, 2012:33). SEM enables the evaluation of the measurement and structural models in a single systematic and comprehensive analysis (Esposito Vinzi, Chin, Henesler & Wang, 2010; Acock, 2013). This study used fit indices to provide information on the paths between the seven main constructs for the structural model to make adjustments, to paths that failed to converge, and to evaluate the overall model's goodness of fit.

A global criterion of goodness of fit index as proposed by Tenenhaus, Amato and Esposito Vinzi (2004:739) was applied to measure the quality of the causal model. The index takes into account the model's performance in both the measurement and the structural model, providing a single measure for the overall prediction performance of the causal model (Esposito Vinzi, *et al*; 2010). The goodness of fit is the decision to see if the model fits into the variance-covariance matrix of the dataset. The confirmatory factor analysis (CFA), measurement and structural model has a good fit with the data based on assessment criteria (Bagozzi & Yi, 1988:74). All CFAs of constructs produced a relatively good fit as indicated by the goodness of fit indices such as CMIN/df ratio (<2); p-value (>0.05); Goodness of Fit Index (GFI) of >0.90; and root mean square error of approximation (RMSEA) of values less than 0.08 (<0.08) (Hair, *et al*; 2010).

4.5.6 Validity and reliability

Validity is the accuracy of the research project (Salkind, 2012:399). Validity refers to the outcomes of the study, and must be interpreted within the environment where the study was conducted (Salkind, 2012:123). The researcher used factor analysis to measure the validity of the questions for the TDD students. Factor analysis assists researchers to condense large quantities of data sets to smaller sets (Neuman,

2011:541). The researcher requested all the students enrolled for the programme TDD in 2015 to participate.

Reliability in a research study is when the same results are achieved when a specific facet is tested more than once (Salkind, 2012:115). Reliability can be enhanced by the use of clear constructs in the research, having an exact form of measurement, having more than one indicator, and having a pilot test (Neuman, 2011:190). Cronbach's alpha was used to test internal reliability (Bryman, 2008:151). The alpha coefficient will vary from zero (no internal reliability) to one (perfect internal reliability), with 0.6 accepted as a satisfactory measure of reliability (Bryman, 2008:151). The cut off for the study was set at 0.70.

4.6 GROUP 2 PARTICIPANTS (PAST GRADUATES 2011 TO 2014): QUALITATIVE RESEARCH METHOD

Qualitative research methods were used in collecting data from the Group 2 participants, being past graduates of the TDD programme, to meet the secondary research objective 2: to investigate the extent that entrepreneurial intent of past graduates transformed into actual business start-ups, and to answer research question 3. Qualitative research was deployed to ensure richness and depth in the data collected. Qualitative research studies the empirical world from the viewpoint of the participants (Krefting, 1991:214). It was important to understand the viewpoint of the participants in Group 2 because it would give an indication of the factors contributing to the success of establishing a business in South Africa. Qualitative research methods are appropriate when research is exploratory in nature, seeking to gain insight into an issue that requires further investigation.

4.6.1 Population and sample

The research population for the empirical data collected to answer Research Question 3 (secondary objective 2), were all past graduates of the TDD programme at TUT. CPUT graduates were excluded from the research due to a lack of access to them. The researcher employed convenience sampling to locate past graduates who

successfully completed the TDD programme at TUT. Utilising convenience sampling, the past graduates of the TDD programme included in the sample are those students who graduated from 2011 to 2014. Graduates from the first year of completion of the TDD programme in 2010 were not contactable. The total number of students that completed the TDD programme at TUT from 2011 to 2014 was 51. Of this total population, 22 students were located via an email address database of past graduates, Facebook, Whatsapp and Linkedin, and participated as the final research sample. Table 4.6 shows the research sample for Group 2 participants.

Table 4.6: TDD graduates at TUT, 2011 to 2014

Year	Number of graduates	Participants in the study
2011	8	3
2012	11	4
2013	18	6
2014	14	9
Total	51	22

4.6.2 Data collection

Primary or secondary data can be collected in a qualitative study (Salkind, 2012:225). The researcher collected primary data because the information regarding the research focus area did not exist in its current form in South Africa. Data were collected by means of an interview guide with 16 open-ended, 48 close-ended questions and ten demographic and other questions (see Appendix C). The close-ended questions gathered information on demographic and other relevant variables. The open-ended questions gathered information on participants' opinions, reflecting how the participant felt about different aspects. Qualitative research methods were used in collecting data from Group 2 participants, being past graduates of the TDD programme, to meet the secondary research objective 2. This secondary objective was investigating the extent that entrepreneurial intent of past graduates transformed into actual business start-ups (research question 3).

A qualitative study interview guide (semi-structured questionnaire) must be easy to complete and to read (Saunders, *et al*; 2009:387). The interview guide took participants approximately 30 minutes to complete. Participants received a cover

letter explaining the purpose of the study. Students completed the interview guide and submitted these via email to the researcher, with 5 participants preferring to conduct a personal interview telephonically.

4.6.3 Data analysis

According to Saunders, *et al*; (2009:482), qualitative data is non-standardised data that need to be grouped together and codified in order to be analysed by way of conceptualisation. Qualitative data were collected form Group 2 participants, with the resulting data analysed to identify themes. The qualitative data from the graduates who successfully completed the TDD programme were analysed using ATLAS.ti version 7.5.9.

4.6.4 Trustworthiness

The interview guide needs to be reliable to be valid (Saunders, *et al*; 2009:373). The interview guide should be tested prior to the research being carried out, however, this is not always possible (Saunders, *et al*; 2009:373). It was not possible to test the interview guide against other interview guides because no comparable study was available to compare it against. The researcher used only the demographic and other questions from Liñán and Chen (2009) and Liñán, *et al's*; *(*2011b) questionnaire in the qualitative questionnaire. The researcher tested the interview guide designed for the qualitative part of the study with two past graduates from TUT who completed the programme in TDD and was satisfied that the interview guide was clear and understandable.

The researcher measured the trustworthiness of the qualitative data with the techniques identified by Lincoln and Guba (1985), namely: credibility, transferability, dependability and confirmability, which will be discussed in section 6.2. Internal consistency is where the researcher compares the questions of the interview guide to the other questions in the interview guide for reliability. Krippendorff's alpha was used to measure internal consistency. Krippendorff's alpha was developed to evaluate the reliability of textual meanings for qualitative research (Krippendorff, 2004:787).

In the next section, the ethical considerations for the study will be discussed.

4.7 ETHICAL CONSIDERATIONS

This study complied with the ethical requirements of the Department of Business Management's Research Ethics Review Committee, UNISA. Ethical clearance was obtained from the two universities from which research participants were drawn - TUT and CPUT. Ethical clearance was also obtained, and adhered to from UJ, for the pilot study. Consistent with UNISA's Ethics Policy, the following ethical guidelines were adhered to:

a. Respondents were advised on the nature of the research, aim and importance of the study being conducted, their role in the study, how the information they provided was to be used, and their voluntary consent to participate.

b. Consensus was reached in advance with TUT, CPUT and UJ before the research instruments were issued.

c. Anonymity and confidentiality of respondents were preserved throughout the entire research process and at no stage during the research process were participants placed in any psychological or other form of risk. All information gathered was treated as group data and no individual was reported on.

d. The data that were obtained during the research process will be stored and retained for a minimum of 5 years.

e. The dignity and character of all stakeholders were upheld and no student was subjected to embarrassment or inappropriate behaviour.

4.8 CONCLUSION

This chapter described the methodology used to conduct the empirical research for the study. The study used quantitative research methods to meet the primary research objective and secondary objective 1, and qualitative research methods to meet secondary research objective 2. The quantitative research tested the research model of entrepreneurial intentions, using Group 1 participants being students enrolled for the TDD programme at TUT and CPUT, in 2015, who completed a survey based on a tested instrument designed by Liñán and Chen (2009) and Liñán, *et al*; (2011b), with modifications for South African circumstances. The collected quantitative data were analysed using statistical methods to test the research model and hypotheses.

Numerous studies internationally and in South Africa measure entrepreneurial intentions but do not measure whether the intentions translated into an actual business start-up. The qualitative component of the research measured whether past graduates of the TDD programme's entrepreneurial intentions translate into the establishment of businesses, and whether the studying of the business subject (business management) contributed to business start-ups. The qualitative data were collected via an interview guide. Qualitative data were analysed by coding and thematic grouping of participant responses. (Chapter 6 presents the results of the qualitative research).

In the next chapter the results for the quantitative study for the Group 1 participants will be discussed.

CHAPTER 5: QUANTITATIVE DATA ANALYSIS

5.1 INTRODUCTION

In this chapter, the results of the quantitative research are presented. The primary research objective to establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme Three-Dimensional Design (TDD) in South Africa; and the secondary objective 1 (to determine the links between business education and entrepreneurial intentions in the undergraduate TDD students of 2015) were also measured via the quantitative research method. These objectives were realised through investigation of a research model of entrepreneurial intentions based on Ajzen's (1985) Theory of Planned Behaviour (TPB), adapted by Liñán and Chen (2009) and Liñán, *et al*; (2011b). To test the model, quantitative data were collected from a sample of enrolled students for 2015, in the TDD programme at the Cape Peninsula University of Technology (CPUT) and Tshwane University of Technology (TUT), which incorporates business subjects (business studies and business management).

The IBM Statistical Package for the Social Sciences (IBM SPSS) version 21 and STATA version 13 was used to analyse the data collected from the TDD students (Group 1 participants). Descriptive analysis was used to describe the data of Group 1 participants related to the variables contained within the research model under study. Chi-square tests were used to look at the associations of the variables, and factor analysis was used for the measurement of association and the assessment for validity by reducing variables in smaller clusters of dormant variables. Cronbach's alpha was used to measure the internal consistency or reliability of the research model. Finally, structural equation modelling was used to test the proposed research model and hypotheses.

The chapter presents the analysis of the quantitative data as follows: the demographics and other data of Group 1 participants are presented, followed by selected questions, a descriptive analysis of the variables, testing of the research model and hypotheses and tests for reliability and validity.

5.2 DEMOGRAPHICS AND OTHER DATA

In this section, the demographic and other data of the Group 1 participants will be discussed (Section B of the questionnaire – Appendix B). When questions from the questionnaire are referred to, the question number will be indicated in brackets. Refer to Appendixes D and E for detailed demographic and other data.

The study targeted for participation in the quantitative empirical research all students enrolled for the TDD programme at Universities of Technology in South Africa. The TDD programme is offered at two universities, namely CPUT and TUT. The TDD programme was offered at the University of Johannesburg (UJ), but was phased out in 2014. At the time of the research, there were 161 students enrolled for the TDD programme at CPUT and TUT, and 145 students, or 90.1% of the total population participated in the study.

5.2.1 Age

A total of 97.2% of the participants in the survey were in the age group between 17 and 29 years, as indicated in Table 5.1. CPUT had 3 participants in the age group between 30 and 39 years, and 1 participant in the age group between 40 and 49 years. The probability value (p value) is widely used in statistical hypothesis testing, specifically in null hypothesis significance testing (Weisberg, Krosnick & Bowen, 1996:233). If the p value is less than 0.05, the result is significant. The p value tests the null hypothesis. The null hypothesis is rejected when the p value is <.05 and not rejected when the p value is >.05. Institution and age are not significantly associated (p=0.409). (Refer to Appendix D); that is, the proportions of participants at TUT to the proportion of participants in CPUT are not significantly different. Thus, TUT and CPUT did not differ significantly as to the age group of the participants.

5.2.2 Gender distribution

A total of 77.2% of the Group 1 participants enrolled for the TDD programme at CPUT and TUT were male and 22.8% were female participants (Table 5.1). The ratio

at TUT was 5.6 males in relation to every female student, and at CPUT 2.7 males in relation to every female student. Institution and gender are not positively associated (p=0.095). (Refer to Appendix D). That is, the proportions of participants in TUT to the proportion of participants in CPUT are not significantly different. Thus, TUT and CPUT did not differ significantly as to how they responded to gender.

5.2.3 Level of study

A total of 38.6% of the TDD students that responded at CPUT and TUT were first year students; 35.2% were second year and 26.2% were third year students, as indicated in Table 5.1. Institution and level of study are not significantly associated (p=0.662). (Refer to Appendix D). That is, the proportions of participants in TUT to the proportion of participants in CPUT are not significantly different. Thus, TUT and CPUT did not differ significantly as to how they responded to the level of study.

5.2.4 Ethnic group

The ethnic composition of the participants was 60% white; 28.6% African; 9.3% coloured; 0.7% Indian; and 1.4% were of other responses where participants indicated that it was not relevant to indicate their ethnic group (Table 5.1). The TUT students and CPUT students were significantly different in the composition of ethnic groups. White participants formed 71.6% of the total enrolment of the TDD programme at CPUT and 38.5% at TUT. The South African population compilation are: Black African 80.5%, coloured 8.8%, Indian/Asian 2.5% and white 8.3% (South Africa. Department of Statistics, 2015:10). The enrolment and responses of TDD design students does therefore not reflect a proper representation of the population.

5.2.5 Place of birth and residence

Participants were born in the Western Cape (37.1%); Gauteng (33.4%); Limpopo (8.3%); KwaZulu-Natal (6.8%); Eastern Cape (3.1%); North-West (3.1%); Mpumalanga (2.3%); Free State (1.5%) and from other countries like the Netherlands, Australia, USA, UK and Namibia (4.4%). Participants were based in

2015 when the study was conducted, mostly in Cape Town (52.5%) and Pretoria (26.6%) as reported in Appendix E. The participants were based in the Western Cape (62.2%) and Gauteng (37.8%) in accordance with their attendance at CPUT and TUT respectively.

5.2.6 Education level and sector of employment of parents

Parents of the respondents with primary level education were 5.7% and secondary education was 22.4%. A total of 71.9% of the parents were graduates (Table 5.1). According to a general household survey in 2015 (South Africa. Department of Statistics, 2016:19), only 14.1% of the population (persons aged 20 years and older) had a higher qualification than Grade 12. It is observed that the parents of the Group 1 participants were in the top 14.1% of the population regarding education. Figure 5.1 indicates the sector of employment of parents.

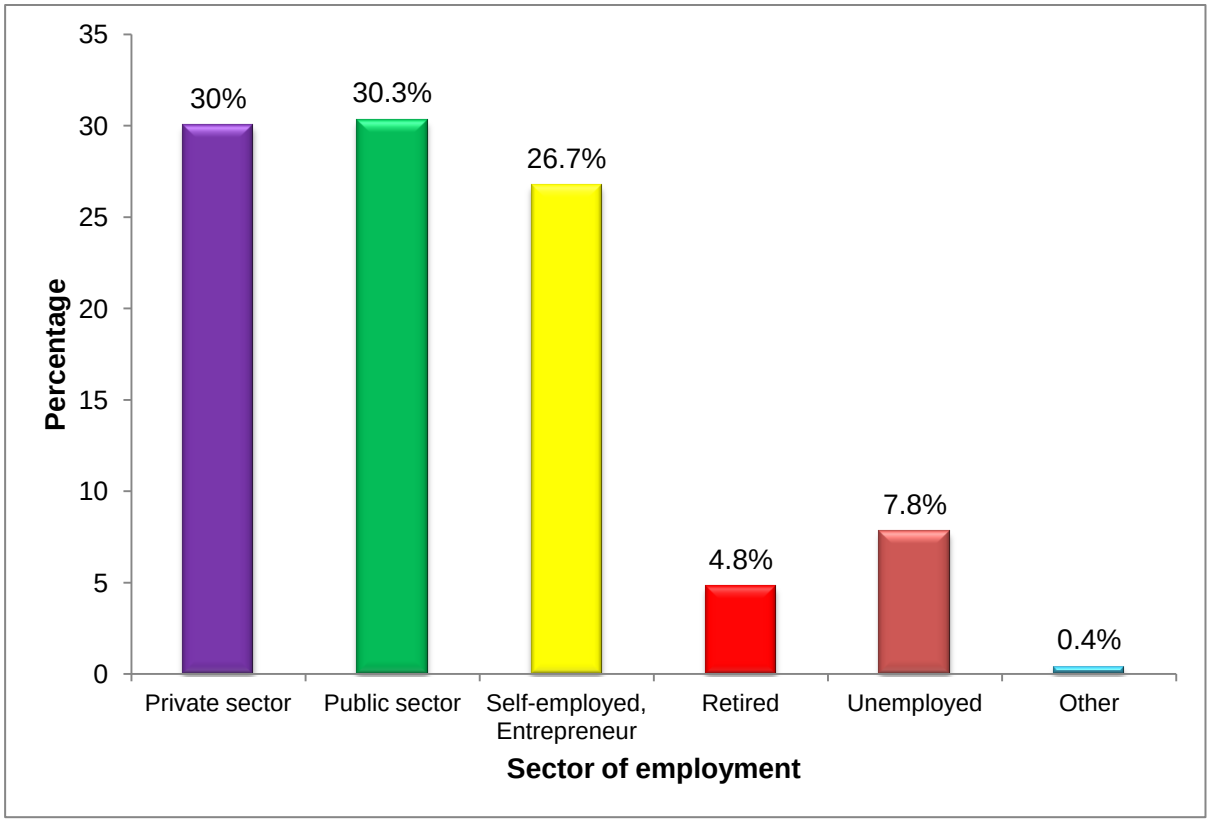

Figure 5.1: Sector of employment of parents

The parents worked in the private (30%) and public sectors (30.3%), followed by self-employment or being an entrepreneur (26.7%). Retired parents presented 4.8% and unemployed parents 7.8%. One parent (0.4%) was a home executive. These results indicate that students came from households where most parents are employed, as indicated by the employed status of parents.

5.2.7 Household size

Most participants resided in a household with 3 to 4 people (51.9%), followed by 26.7% with 5 to 7 people living in a household. A total of 17% lived in a household with 1 to 2 people and 4.4% lived in a household with 8 to 11 people (Table 5.1). As reported in the 2011 Census on household size calculated on conventional households, the average household size for South Africa was 3.6 people per household (South Africa. Department of Statistics, 2012:57). It is asserted that the Group 1 participants are in line with the South African average per household.

5.2.8 Monthly household income

Table 5.1 indicates the estimated total monthly income per household of Group 1 participants. The researcher observed that 65.2% of the participants had a total monthly income of more than R20 001 per month. Again, these results indicate that students came from households with resources available, allowing them to engage in tertiary study, and likely to influence their views of their own entrepreneurial opportunities and self-efficacy as potential entrepreneurs. The institution and estimated income were not positively associated ($p=0.213$). (Refer to Appendix D). That is, the proportions of participants in TUT to the proportion of participants in CPUT were not significantly different. Thus, TUT and CPUT did not differ significantly regarding the level of household income.

Table 5.1: Group 1 participants' demographics and other data

Demographics	Groupings	Frequency	Percentage
Age	17-29 years	141	97.2
	30-39 years	3	2.1
	40-49 years	1	0.7
Total		145	100.0
Gender	Male	112	77.2
	Female	33	22.8
Total		145	100.0
Level of study	First year	56	38.6
	Second year	51	35.2
	Third year	38	26.2
Total		145	100.0
Ethnic group	African	40	28.6
	White	84	60.0
	Coloured	13	9.3
	Indian	1	0.7
	Other	2	1.4
Total		140	100.0
Place of birth	Gauteng	44	33.4
	Western Cape	49	37.1
	Limpopo	11	8.3
	Other	28	21.2
Total		132	100.0
Educational level of parents	Primary	15	5.7
	Secondary	59	22.4
	Tertiary education	101	38.4
	Post graduate	88	33.5
Total		263	100.0
Sector of employment of parents	Private sector	81	30.0
	Public sector	82	30.3
	Self-employed or entrepreneur	72	26.7
	Retired	13	4.8
	Unemployed	21	7.8
	Other	1	0.4
Total		270	100.0
People living in your household	1-2	23	17.0
	3-4	70	51.9
	5-7	36	26.7
	8-11	6	4.4
Total		135	100.0
Estimated monthly income in your household	Up to R5 000	13	9.8
	R5 001 and R10 000	13	9.8
	R10 001 and R20 000	20	15.2
	R20 001 and R40 000	41	31.1
	R40 001 and R70 000	26	19.7
	R70 001 and R100 000	5	3.8
	R100 000+	14	10.6
Total		132	100.0

The following sections report participants' answers to close-ended questions that explore issues additional to demographic data and relate to participants' entrepreneurial experience and objectives (Section B of the questionnaire – Appendix B).

5.2.9 Employment experience

Participants were asked whether they had any employment experience (E01). A total of 72.4% of participants indicated employment experience, as reported in Figure 5.2.

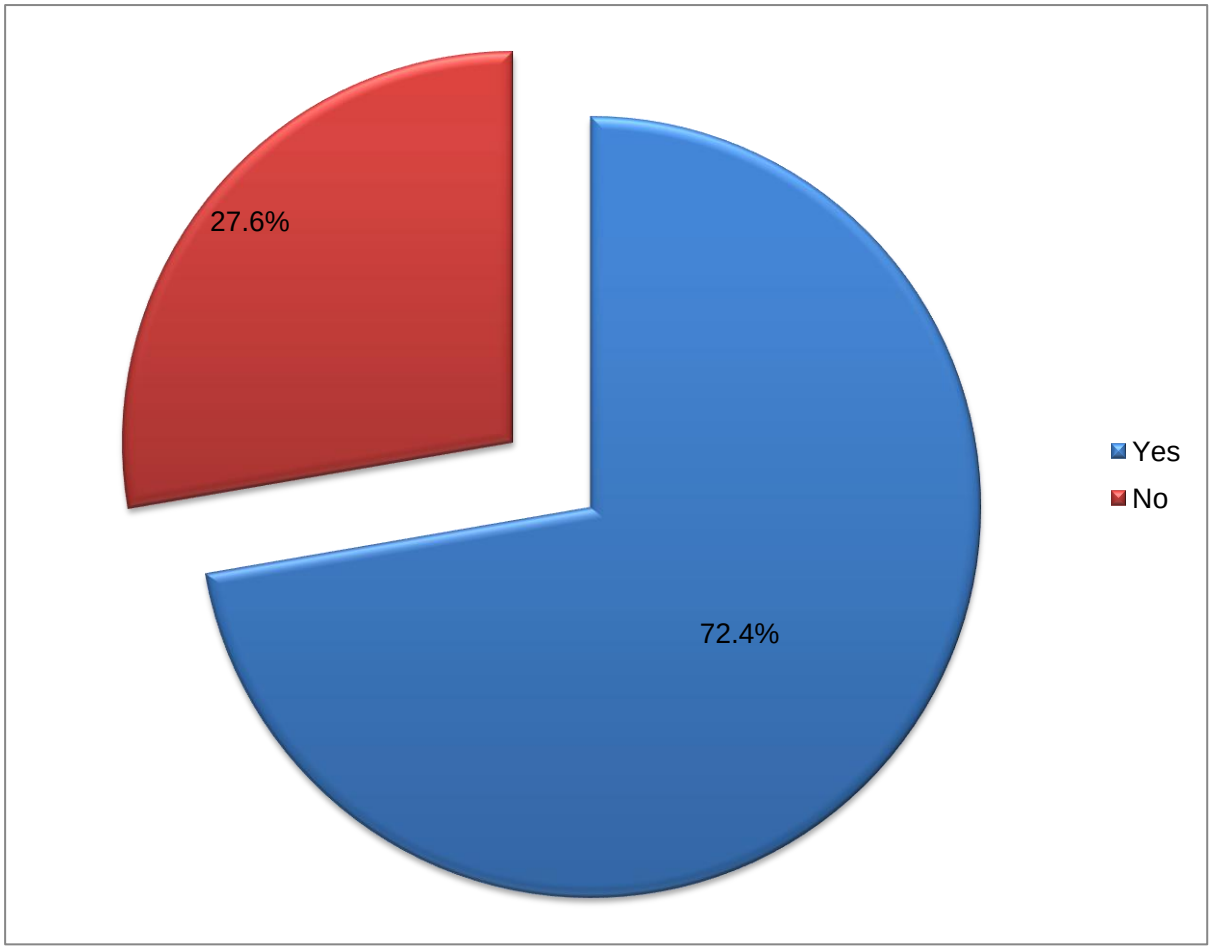

Figure 5.2: Employment experience of Group 1 participants

5.2.10 Reasons for choosing industrial design

Figure 5.3 reflects that 88.9% of Group 1 participants thought career opportunities were an important reason to choose industrial design as a career (F01). Nearly half

(49.6%) of the Group 1 participants indicated the career opportunities in industrial design as an important factor in the choice of career. Participants chose from the following options on the Likert-scale: not at all important, low important, slightly important, neutral, moderately important, very important and extremely important (F01, F02 and F03).

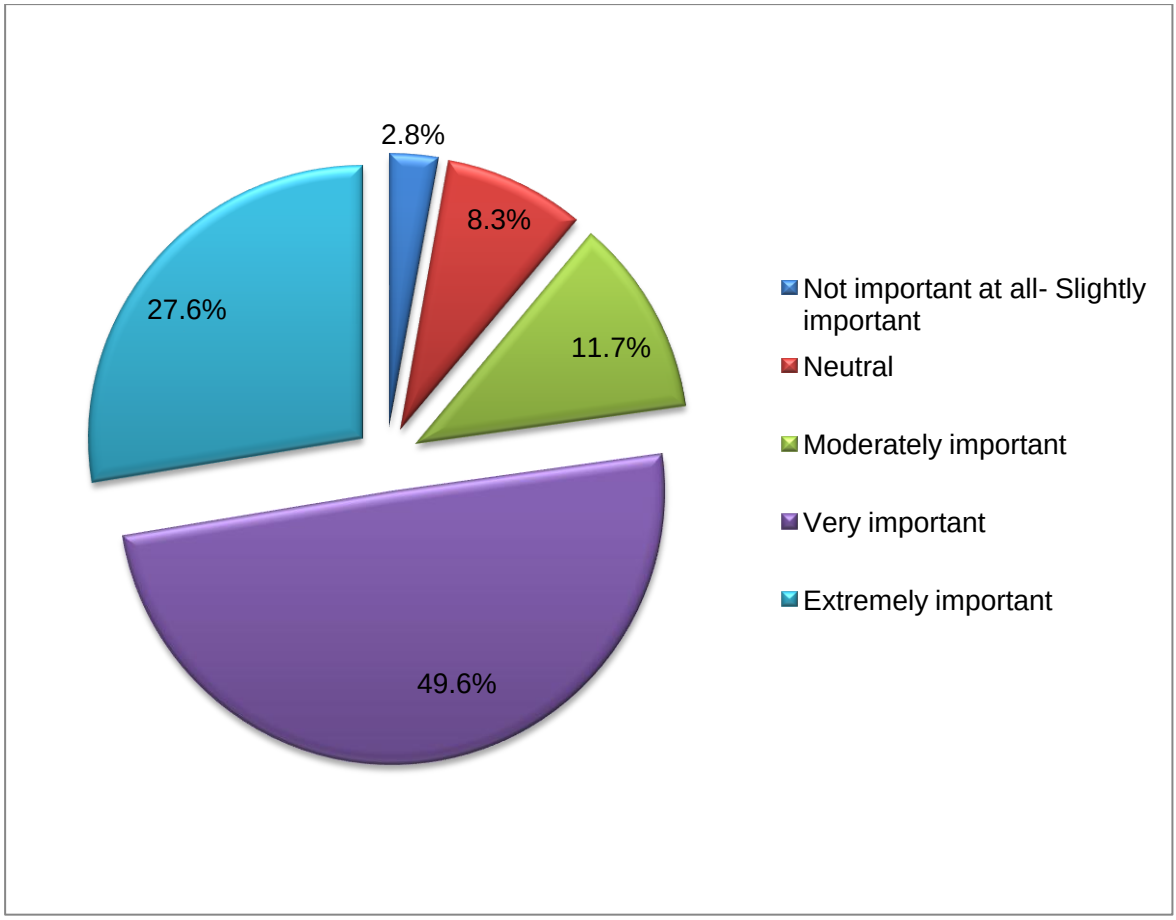

Figure 5.3: Career opportunities as reason for choice of industrial design

The advice of family and/or friends was an important factor in the choice of industrial design as a career; with 51.7% participants reporting that it was moderately important – extremely important, as reflected in Figure 5.4. Group 1 participants regarded the career opportunity (F01) as more important than the advice of family and friends (F02).

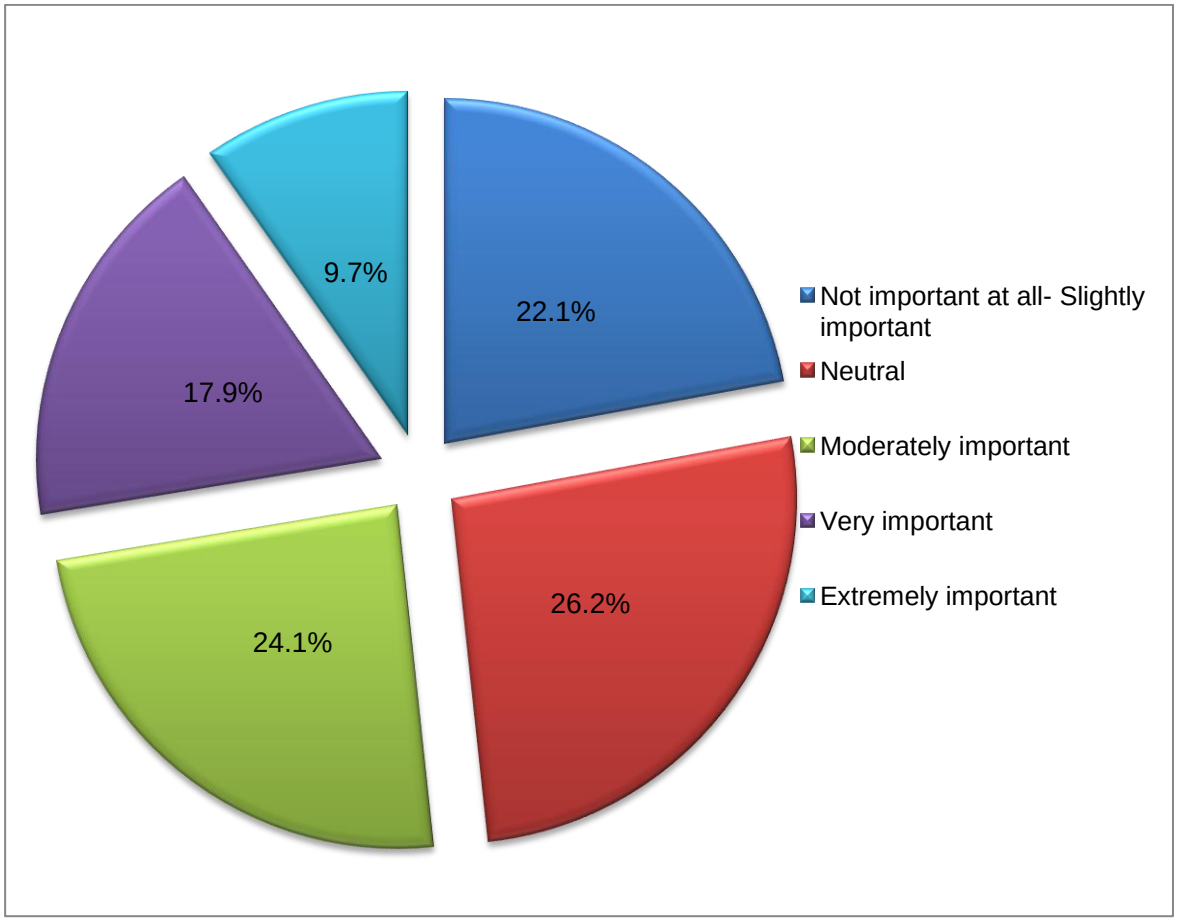

Figure 5.4: Importance of family and friends' advice in choosing industrial design

Entrepreneurial opportunities were important as a reason to choose industrial design to both TUT and CPUT participants, as indicated in Figure 5.5 (F03). An average of 40% of participants perceived the existence of entrepreneurial opportunities as very important; 27.6% as extremely important; and 14.4% as moderately important in choosing industrial design as a career.

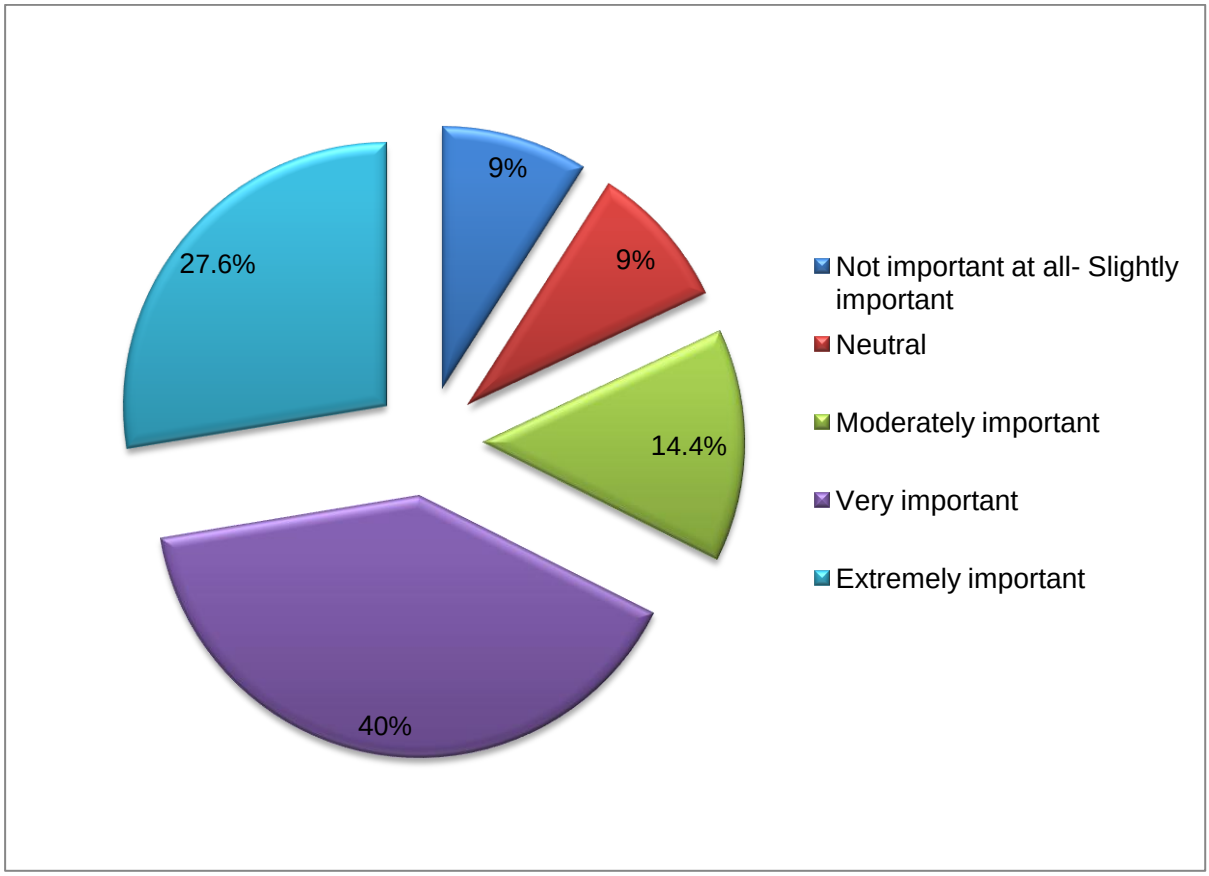

Figure 5.5: Importance of entrepreneurial opportunities in choosing industrial design

In the next section, the entrepreneurial objectives will be discussed.

5.2.11 Entrepreneurial objectives

Participants were asked, if ever starting a business, what employment size they would like it to ultimately achieve (number of employees) (I). Figure 5.6 shows that 53.2% of the participants envision owning a business falling into the general category of a small business (micro enterprise, very small business and small business).

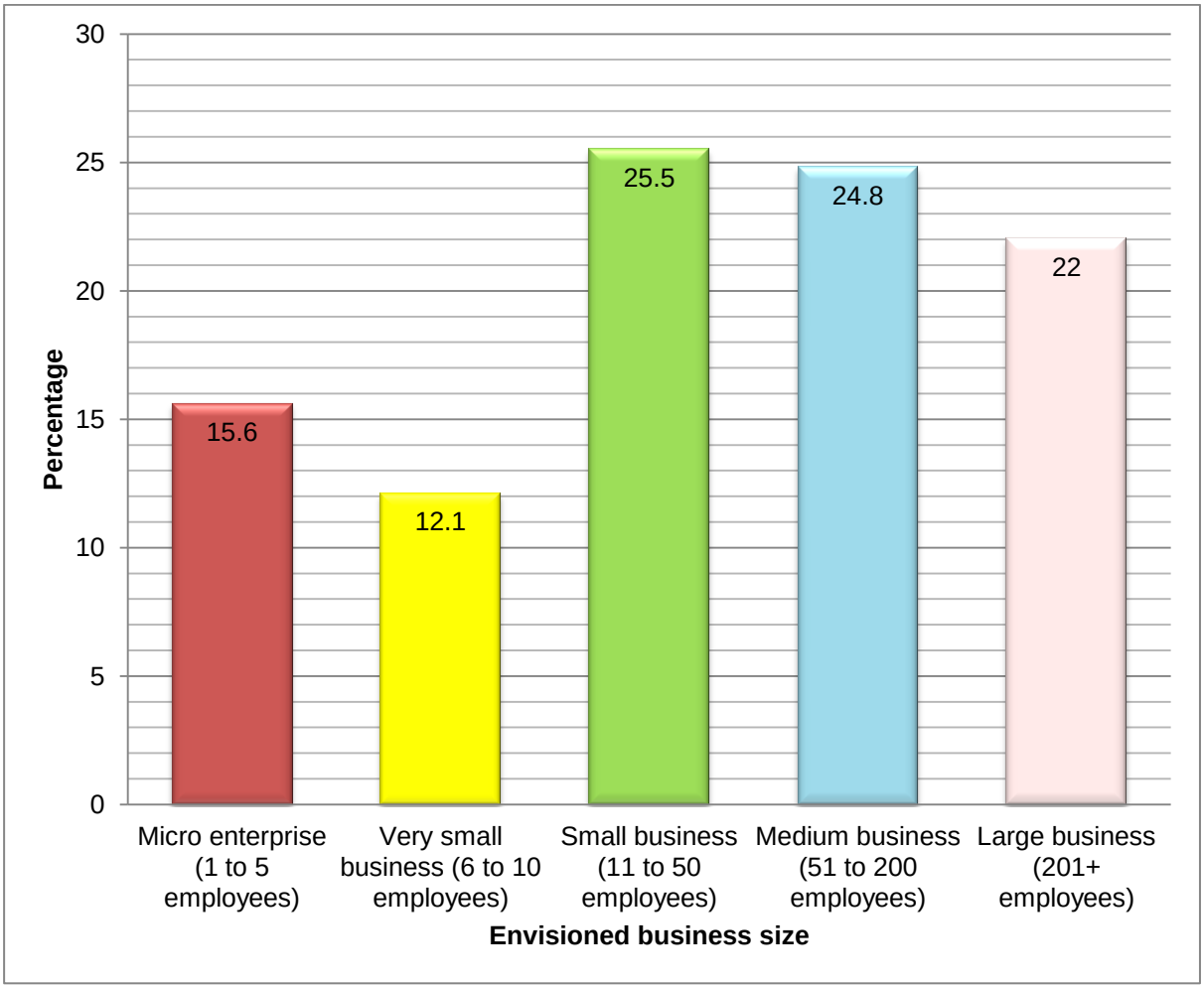

Figure 5.6: Envisioned business size

5.2.12 Preferred industry/service to start a business

Industrial design encompasses more than just studying engineering principles, innovation or creativity, as discussed in Chapter 2. It is important to determine the industry/service that the industrial designer intends to contribute to. The participants were asked: “Which industry/service would you like to start your business in”? This was not a ranking question and participants could select more than one option. Figure 5.7 indicates the industry/service where the Group 1 participants intend to start businesses. Group 1 participants indicated in the “other” category the following industries, namely: aviation; architecture; design and manufacturing; entertainment; events and hospitality; furniture; future technologies; insurance; logistics; military;

marine industry; outdoor sports (extreme sports); sports equipment including prostheses; packaging; and working with animals in relation to design.

Group 1 participants' first choice of industry to work in was industrial manufacturing and household goods, followed by the automotive industry, leisure goods, and electronic and electrical equipment and industrial engineering. The chemicals, mining and technology: software and computer services industry, are least attractive to participants.

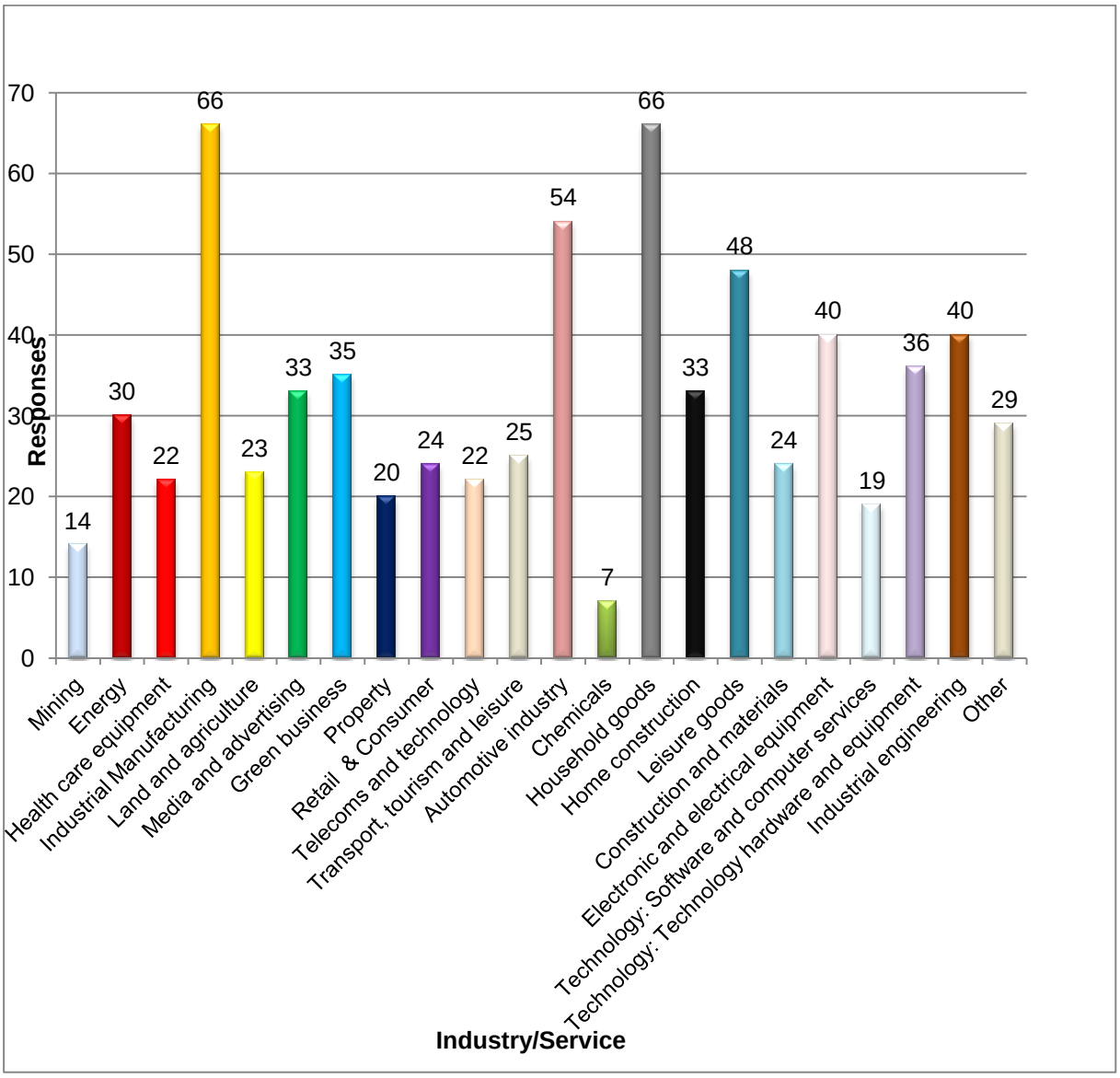

Figure 5.7: Industry/service where Group 1 participants intent to start a business

5.3 DESCRIPTIVE ANALYSIS OF VARIABLES

The descriptive analysis of the variables studied using quantitative data for Group 1 participants is discussed in this section. The variables derived from the research model of entrepreneurial intentions. The questions were developed to assist in the testing of the hypotheses. The questions in the Group 1 questionnaire (A01-A14; B1-B2; C01-C06; F01-F03; G01-G04; GG01-GG07; H01-H06; I01-I08; I001-I007; K01-K03; K001-K003; KK01-KK05; L01-L04; L001-L005; and LL01-LL05), were captured according to codified responses from the participants, using a 7-point Likert scale, in accordance with the categories in the questionnaire.

The detailed descriptive analysis of all question responses is contained in Appendix D. Question numbers will be indicated in brackets, for example (A01). The responses to the Group 1 questionnaire questions were grouped together in this chapter, and the detailed responses are in Appendix D.

5.3.1 Personal attitude (PA)

Personal attitude is the level of positive or negative feeling a person has to the intended behaviour (Ajzen, 1991:188). Personal attitude in the context of this research influences the individual's perception whether entrepreneurship is an appropriate career choice. When participants in Group 1 were asked to specify their personal attitude towards entrepreneurship, most had a positive attitude towards it. Participants perceived entrepreneurship as a positive career, indicated by 78.5% of the participants rejecting the statement in question A01 that a career in entrepreneurship is unattractive. For question A09, 123 (84.8%) of the participants responded positively that being an entrepreneur will give them great satisfaction. Participants had a positive attitude towards starting a business and more than 60% were ready to do anything to become an entrepreneur (A03=66.7%) and their professional goal is to be an entrepreneur (A11=57.9%). To question A04, most participants perceived themselves as creative and could therefore start a business (83.4%). For question A13, few participants had a low intention of ever starting a

business (7.6%). For the participants, being an entrepreneur has more advantages than disadvantages (A12=71.3%).

5.3.2 Perceived social norms (PSN)

Perceived social norms is the perceived social pressure on a person to perform a certain activity or not (Ajzen, 1991:188). Group 1 participants felt their friends would approve of their decision to start a business (A02=84.7%), and that their immediate family would approve of their decision to start a business (A05=86.8%). On question A08, 86.9% indicated that they perceived themselves to be successful if they start a business.

5.3.3 Self-efficacy (SE)

Self-efficacy is the belief of a person to be capable and to have the ability to accomplish a planned behaviour (Bandura, 1994:2). Participants felt that they were creative and could control the creation process of starting a new business (H03=78.5%) (Table 5.2). Only 16.8% of participants felt it would be difficult for them to create a business idea (A10). A total of 57.6% (H04) of the participants felt they know all the practical procedures to start a business. Some 57.9% of participants responded positively to question A14 about the practical requirements needed to start a business, for example registering a business.

Group 1 participants indicated (Table 5.2) that they were prepared to start a profitable business (H02=69.4%) and perceived to be successful in the business (H06=67.4%). Participants felt they had knowledge to develop an entrepreneurial project (H05=56.9%). Just more than 50% of participants felt it would be easy to start a business (H01=50.7%).

Table 5.2: Entrepreneurial activity and entrepreneurial capacity

Question	Grouping: Somewhat agree Agree Strongly agree (%)
Start a business and keep it operational would be easy for me (H01)	50.7
I am prepared to start a profitable business (H02)	69.4
I am creative and can control the creation process of starting a new business (H03)	78.5
I know the necessary practical procedures to start a business (H04)	57.6
I know how to develop an entrepreneurial project (H05)	56.9
If I tried to start a business, I would have a high probability of succeeding (H06)	67.4

Group 1 participants perceived themselves as very creative (C02=95.2%), able to recognise an opportunity (C01=86.9%), solve problems (C03=92.4%), possessing leadership and communication skills (C04=83.5%), and being able to develop new products/services (C05=89.7%) as indicated in Table 5.3. Group 1 participants felt they possessed intermediate, advanced and expert entrepreneurial abilities and skills, as reported in this Table.

Table 5.3: Entrepreneurial ability and skill

Question	Grouping: Intermediate Advanced Expert (%)
Recognition of opportunity (C01)	86.9
Creativity (C02)	95.2
Problem solving skills (C03)	92.4
Leadership and communication skills (C04)	83.5
Development of new products and services (C05)	89.7
Networking skills, and making professional contacts (C06)	70.3

Group 1 participants were less confident on their networking skills and their ability to make professional contacts, with a positive response of 70.3% (C06). Participants were generally confident about being creative and having entrepreneurial ability, skill activity and capacity as reported in Table 5.3.

5.3.4 Entrepreneurial knowledge (EK)

According to Politis and Gabrielsson (2016:104), entrepreneurial knowledge is "knowledge that facilitates the ability to recognise new venture opportunities and to cope with liabilities of newness when organising and managing new ventures". Entrepreneurial knowledge was tested in the study with questions on knowledge regarding business associations, support bodies and other sources of assistance for entrepreneurs (G01-G04).

A total of 90.9% of participants responded in the affirmative to the question whether they personally know an entrepreneur or entrepreneurs. Table 5.4 reports that 69% of the participants knew about a family member's activity as an entrepreneur, and 79.8% of the participants perceived the family member as a "successful entrepreneur" (G01).

Table 5.4: Knowledge about entrepreneurial activity and consideration of success of others

Question	Grouping: Well Very well Extremely well (%)
Family (G01) To what extent do you know about his/her activity as entrepreneur? To what extent may he/she be considered a "successful entrepreneur"?	69.0 79.8
Friend (G02) To what extent do you know about his/her activity as entrepreneur? To what extent may he/she be considered a "successful entrepreneur"?	56.2 71.3
Employer/Manager (G03) To what extent do you know about his/her activity as entrepreneur? To what extent may he/she be considered a "successful entrepreneur"?	56.5 65.2
Other (G04) To what extent do you know about his/her activity as entrepreneur? To what extent may he/she be considered a "successful entrepreneur"?	54.5 64.3

The percentage is still over 50% with knowledge of friends and employers'/managers' activities as entrepreneurs (G02 and G03). Of Group 1 participants, 71.3% perceived

friends as “successful entrepreneurs” (G02), and 65.2% perceived employers/managers as “successful entrepreneurs” (G03). Participants responded to question G04, but did not elaborate on the “other” in the question.

Table 5.5 reports that few participants (between 21% and 34%) were aware of private associations, support bodies, specific training for young entrepreneurs, loans at favourable interest rates, technical aid for business start-ups, and business centres and consulting services at discounted rates to assist entrepreneurs. It was discovered that participants are not sufficiently aware of business associations, support bodies and sources of assistance for entrepreneurs.

Table 5.5: Knowledge of sources of assistance for entrepreneurs

Question	Grouping: Moderate knowledge Complete knowledge Extremely knowledgeable (%)
Private associations (e.g. Business Partners, etc.) (GG01)	33.6
Public support bodies, for example the National Youth Development Agency (NYDA) (GG02)	21.0
Specific training for young entrepreneurs (GG03)	27.3
Loans at favourable interest rates (GG04)	30.1
Technical aid for business start-ups, for example the SABS Design Institute (GG05)	25.2
Business Centres (GG06)	25.2
Consulting services at discounted rates (GG07)	21.7

The researcher observed that participants considered the following factors to contribute to entrepreneurial success: competing effectively in world markets; reaching a high level of income; doing the kind of job that I really enjoy; achieving social recognition; helping to solve the problems of my community; keeping the business alive; keeping a path of positive growth; and, continuous development and growth of your business, as reported in Table 5.6. Participants are generally aware of the factors to contribute to entrepreneurial success.

Table 5.6: Factors contributing to entrepreneurial success

Question	Grouping: Moderately important Very important Extremely important (%)
Competing effectively in world markets (I01)	86.2
Reaching a high level of income (I02)	88.3
Doing the kind of job that I really enjoy (I03)	95.9
Achieving social recognition (I04)	79.3
Helping to solve the problems of my community (I05)	87.6
Keeping the business alive (I06)	97.2
Keeping a path of positive growth (I07)	97.9
How important would it be for you to continuously develop and grow your business? (I08)	98.6

In the following section, the participants' knowledge of how to expand the business is reported, for example how to export, and to launch new products on the market. Participants were requested to respond to the question: "To what extent would you use the following strategies to expand your business?" The results are reported in Table 5.7. Participants indicated that growing a business was important with 97.3% (I007) as a strategy to expand a business, followed by developing research and development of projects (I004=88.9%). The participants indicated reaching cooperative agreements or partnerships with other businesses as important (I005=86.1%), regularly introducing new processes or systems of production (I003=83.4%), followed by regularly introducing new products/services for customers (I002=83.3%) and specialised training for employees (I006=81.3%) as strategies to expand the business. Exporting a significant share of production was listed the lowest (I001=64.6%), as reported in Table 5.7.

Table 5.7: Strategies to expand the business

Question	Grouping: Somewhat likely Likely Extremely likely (%)
Exporting a significant share of production (I001)	64.6
Regularly introduce new products/services for my customers (I002)	83.3
Regularly introduce new processes or systems of production (I003)	83.4
Developing research and development projects (I004)	88.9
Reaching cooperative agreements or partnerships with other businesses (I005)	86.1
Offering specialised training for employees (I006)	81.3
Growing your business (personnel, premises, etc.) (I007)	97.3

In the next section, business education will be discussed.

5.3.5 Business education (BE)

Participants were asked to what extent was it possible to offer entrepreneurship education subjects that developed the following aspects (L01-L04):

a. Entrepreneurial environment (L01): 83.4% felt it was moderately to extremely possible;
b. Greater recognition of the entrepreneur's role (L02): 84.1% felt it was moderately to extremely possible;
c. Acquires the required abilities to be an entrepreneur (L03): 89% felt it was moderately to extremely possible; and
d. The intention to be an entrepreneur (L04): 77.9% felt it was moderately to extremely possible to learn this, as indicated in Table 5.8.

Table 5.8: Aspects entrepreneurship education subjects (courses) can develop

Question	Grouping: Moderately possible Very possible Extremely possible (%)
Knowledge about the entrepreneurial environment (L01)	83.4
Greater recognition of the entrepreneur's role (L02)	84.1
The necessary abilities to be an entrepreneur (L03)	89.0
The intention to be an entrepreneur (L04)	77.9

Group 1 participants perceived the business management (TUT) and business studies (CPUT) subjects as entrepreneurial education (L05). A total of 45.6% (L05) of the CPUT participants and 60.4% (L05) of the TUT participants acknowledged exposure to entrepreneurship education, as reported in Table 5.9. Some participants agreed that the business studies and business management subjects amounted to entrepreneurship education. These results of Group 1 participants affirmed the learning of the theory of the business subject and the performing of practical assignments are assisting in the creation of an entrepreneurial environment.

Table 5.9: Have you taken any subject (course) that could be considered entrepreneurship education?

Response	CPUT		TUT		Total (CPUT and TUT)	
	Responses	%	Responses	%	Responses	%
Yes	41	45.6	32	60.4	73	51
No	49	54.4	21	39.6	70	49
Total	90	100.0	53	100.0	143	100

Participants specified that the business subject related to industrial design (L002=72.9%), dealt with the theory of business management (L001=82.6%) and that there were practical assignments (L003=63.2%). Participants indicated that they would prefer more guest speakers/lectures, with only 46.5% satisfied with the situation (L004). Only 36.1% of the Group 1 participants felt that there was sufficient exposure to the business world and to competitions (L005), as indicated in Table 5.10.

Table 5.10: Aspects covered in the business subject

Question	Grouping: Somewhat agree Agree Strongly agree (%)
Theory of business management (L001)	82.6
Relating the business subject to industrial design (L002)	72.9
Practical assignments (L003)	63.2
Guest speakers/lectures (L004)	46.5
Competitions and exposure to business world (L005)	36.1

Table 5.11 indicates that Group 1 participants were able to identify a business opportunity (LL01), spot the market potential for a product (LL02), able to determine the cost of a product (LL03), and write a business plan (LL04). Only 40.8% (LL05) of the participants thought they were able to set up a factory.

Table 5.11: Role of business education

Question	Grouping: Somewhat agree Agree Strongly agree (%)
I can identify a business opportunity (LL01)	84.8
I can see the market potential for a product (LL02)	86.9
I can do the costing of a product (LL03)	72.4
I can write a business plan (LL04)	59.2
I can set up a factory (LL05)	40.8

5.3.6 Entrepreneurial intentions (EI)

The Global Entrepreneurship Monitor (GEM) Report of 2013 describes entrepreneurial intentions as the percentage of persons that will start a business in the next three years (Amorós & Bosma, 2014:29; Herrington, *et al*; 2017:18). Many Group 1 participants felt ready and intended starting an own business (questions A06, A07 and A13). On question A13, 79.9% participants responded that they disagreed with the question, namely having a low intention of ever starting a business, and similarly disagreed that, amongst options, would rather be anything but an entrepreneur at first (A07=11.9%). Participants responded that they did not have serious doubts about ever starting an own business (A06=68.3%).

Participants considered advantages and disadvantages (economic, personal, social recognition, job stability) to indicate their level of attraction towards the following options: 35.4% (B1) of participants were attracted, much attracted to extremely attracted about working as an employee, and 81.9% (B2) of participants indicated that they were attracted, much attracted to extremely attracted to be an entrepreneur.

Entrepreneurship was seriously considered by 81.1% (D01) of the participants. They were also asked to indicate their level of attraction to the following professional options: 69.2% (K001) indicated working as a salaried employee in the attracted, much attracted and extremely attracted, 83.3% (K002) would like to work as a consultant, and 94.4% (K003) would like to be an entrepreneur/starting an own business, respectively.

A total of 94.4% of the participants indicated that they would like to continue with post graduate studies (K03). Some 83.8% (K02) would like to start-up a business after completing the TDD diploma, and 49% (K01) would like to work as an employee, as reported in Table 5.12.

Table 5.12: Career plans after study

Question	Grouping: Moderate priority High priority Essential priority (%)
Working as an employee (K01)	49.0
Starting-up a business (K02)	83.8
Continue with post graduate studies (K03)	94.4

Table 5.13 indicates that participants were attracted to entrepreneurship and perceive entrepreneurship as having more advantages than disadvantages (KK01=69.3%), perceive entrepreneurship as an attractive career (KK02=83.3%), agreed that, if given the opportunity and resources, would like to start a business (KK03=94.5%), agree that being an entrepreneur would entail great satisfaction (KK04=81.9%), and amongst other options, would rather be an entrepreneur (KK05=75%). It could therefore be argued that the participants would like to be entrepreneurs.

Table 5.13: Group 1 participants' attraction to entrepreneurship

Statement	Grouping: Somewhat agree Agree Strongly agree (%)
Being an entrepreneur implies more advantages than disadvantages to me (KK01)	69.3
A career as entrepreneur is attractive for me (KK02)	83.3
If I had the opportunity and resources, I'd like to start a business (KK03)	94.5
Being an entrepreneur would entail great satisfaction for me (KK04)	81.9
Among various options, I'd rather be an entrepreneur (KK05)	75.0

The descriptive analysis of data collected on the research variables indicate that Group 1 participants were all attracted to a career as an entrepreneur, even though they were not explicitly studying towards a qualification in entrepreneurship, but rather in industrial design.

5.4 TESTS FOR RELIABILITY AND VALIDITY

Since the quality of any study relies on accurately measuring the constructs under study, it was important to determine the reliability and validity of the measurement items used for the data collected. In order to establish high levels of validity of the scales used in this study, an extensive literature review as well as consultation with academics were conducted (Maxim, 1999:208; Salkind, 2012). The researcher ensured further validity by adapting validated scales in addition to using an appropriate sampling method (Liñán & Chen, 2009; Liñán, *et al*; 2011b). All participants in Group 1 were students enrolled for the TDD programme at Universities of Technology in South Africa. To determine the validity of the independent variable and the dependent variables, factor analysis was utilised (Weisberg, *et al*; 1996:174; Bryman, 2008:161; Neuman, 2011:540; Salkind, 2012:191). In particular, principal components analysis (PCA), with Oblimin rotation, determine not only the loading of items to their factors, but also the inter-correlation of factors themselves, were used (Mazzocchi, 2011:229). Requirements to proceed with the PCA were determined via the sample size – ratio of cases to items, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity (Shiu, Hair, Bush & Ortinau, 2009:138).

Firstly, the ratio of the number of cases to items in the questionnaire exceeded the prescribed minimum of 5 cases (or respondents) to each item or question (Pallant, 2010:183). Secondly, the range of the KMO index fell between 0 and 1; ideally an index (>0.6) is required for factor analysis. However, a scale with less than 5 items might have a lower index. Regardless, an index (>0.5) is considered as the absolute minimum tolerance for proceeding with factor analysis. Lastly, the Bartlett's test, in all cases, yielded highly significant p-values ($p<0.05$).

The resultant factors were retained, subject to satisfying the pre-conditions of attaining Eigen values greater than 1 (Mazzocchi, 2011:236), parallel analysis tests and screen plot tests (Pallant, 2010:198). The minimum cut-off loading for items within factors was set at 0.40 (Field, 2009:645). Thus, requirements of convergent validity were assessed and fully satisfied by the former. In the latter, the tests for discriminant validity were also satisfied. The factor structures for all scales loaded as expected and were explained in theory. Sub-scales loaded highly and distinctly within factors, thereby supporting the assumptions of construct validity (Blumberg, Cooper & Schindler, 2011).

Furthermore, for reliability, the researcher used Cronbach's alpha to test for internal consistency of the multi-item scales of the questionnaire. While Cronbach's alpha coefficient values of 0.7 and higher are indicative of high consistency (Liao, 2012), values of $0.5 \leq \alpha < 0.6$ are acceptable (Field, 2009). A Cronbach's alpha of at least 0.7 indicated that the items were reliable; testing the envisaged latent construct for the data collected from the Group 1 participants. Accordingly, the standard practice of setting the minimum alpha threshold of 0.7 was considered with the absolute minimums of 0.6. The commonly accepted rule for describing internal consistency using Cronbach's alpha is presented in Table 5.14.

Table 5.14: Accepted threshold for internal consistency

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

Source: Liao (2012:34)

With the exception of perceived social norms (PSN) (Table 5.15), whose reliability score was 0.639, all remaining scales were observed to have acceptable measures of reliability, exceeding 0.70. Table 5.15 summarises the PCA results and illustrates the Cronbach's alpha associated with each of the six scales comprising the questionnaire as it relates to the Group 1 participants. Detailed outputs are included in Appendix F.

Besides items measuring demographic characteristics, the process of construction and validation of the entrepreneurial intention questionnaire used in this study has been explained (Liñán & Chen, 2009; Liñán, *et al*; 2011b). To perform the factor analysis, sections pertaining to entrepreneurial activity (Section A of the questionnaire – Appendix B) and entrepreneurial capacity ("H" of the questionnaire – Appendix B) that have been linked in the literature (see Chapter 3) were combined. Furthermore, mean scores (averages) instead of individual scores were utilised when computing the variables for personal attitude (PA), perceived social norms (PSN), self-efficacy (SE), entrepreneurial knowledge (EK), business education (BE) and entrepreneurial intention (EI).

Table 5.15: Principal Component Analysis of variables and Cronbach's alpha

Variables	Factors retained	Cronbach's alpha
Personal Attitude	Seven items AO1, AO3, AO4, AO9, AO11, AO12, AO13	0.858
Perceived Social Norms	Three items A02, A05, A08	0.639
Self-Efficacy	Eight items AO10, AO14, HO1-HO6	0.881
Entrepreneurial Knowledge	Seven items GG01-GG07	0.923
Business Education	Five items LL01-LL05	0.851
Entrepreneurial Intention	Three items AO6, AO7, AO13	0.731

5.5 TESTING THE RESEARCH MODEL

Quantitative data collected from Group 1 participants were designed to test a research model of entrepreneurial intentions. To test the model requires identifying the best model fit and testing the hypothesis using structural equation modelling (SEM). STATA v13 was employed to test the model. SEM is a second generation multivariate analysis tool that goes beyond regression models by providing coefficients that estimate the statistical significance and magnitude of the structural relationship between theoretical constructs (Bagozzi & Fornell, 1983:24; Mayhew, *et al*; 2009:453). SEM enables the evaluation of the measurement and structural models in a single systematic and comprehensive analysis (Acock, 2013). The fit indices were used to provide information on the paths between the six main constructs for the structural model, being the independent variables: personal attitude (PA), perceived social norms (PSN), self-efficacy (SE), entrepreneurial knowledge (EK), business education (BE), and the dependent variable: Entrepreneurial intentions (EI), to adjust to paths that failed to converge, and to evaluate the overall model's goodness of fit index. Figure 5.8 shows the research model with the six main constructs (variables) and associated hypotheses.

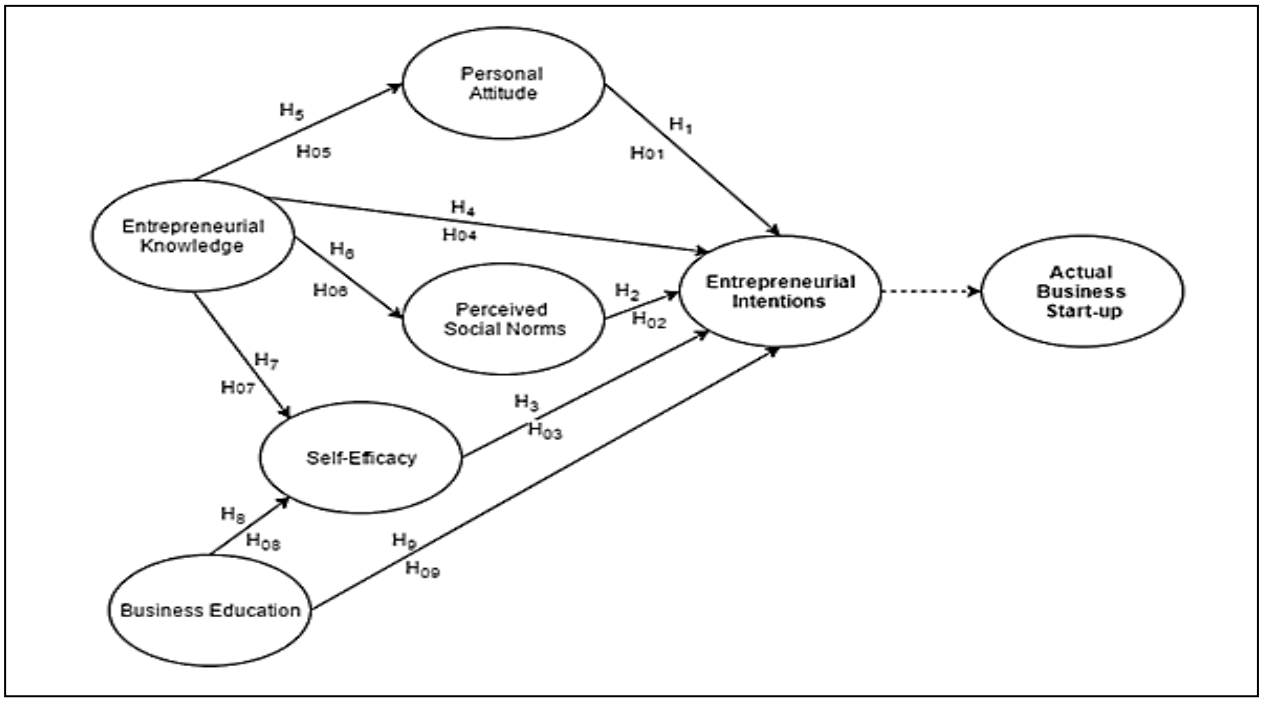

Figure 5.8: Research model of entrepreneurial intentions

Source: Adapted from Liñán and Chen (2009); Liñán, *et al*; (2011b)

The goodness of fit is the decision to see if the model fits into the variance-covariance matrix of the dataset. The model fit was assessed by Chi-square and Normed X^2/df value, coupled with other model fit indices like the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). The recommended cut-off value for the goodness of fit indices was based on Hu and Bentler (1999) and later Hair, *et al's*; (2010) recommendations. Following common practice, acceptable model fit is indicated by value greater than 0.90 for CFI and TLI, and a value of less than 0.08 for RMSEA. However, a cut-off value close to 0.95 for TLI and CFI, and a cut-off value close to 0.06 for RMSEA are needed to support that there is a relatively good fit between the hypothesised model and the observed data (Hu & Bentler, 1999; Hair, *et al*; 2010).

The initial proposed research measurement model (CFI=0.689, TLI=0.131, RMSEA=0.323, Chi-Square: 80.714 (prob>chi^2:0.0000), coefficient of determination (CD) (R^2): 0.530) yielded an unacceptable model fit; thus, some modification was made to determine a model that better fit the data, as indicated in Table 5.16 and Figure 5.9. A total of ten indicators were eliminated based on modification indices as

indicated in Appendix G (see page 383). These indicators recommends alternative relationships between variables such as (a) Personal Attitude with EI, SE, SN and BE; (b) Self-efficacy with PA and EI; and (c) Perceived Social Norms with PA, EI, SE, and BE. It is worth noting that the model fit was improved using a conservative strategy, that is, none of the error terms was allowed to covary. Furthermore, the freeing of cross-loadings was also not allowed since the existence of significant cross-loading indicated a lack of construct validity (Hair, *et al*; 2010).

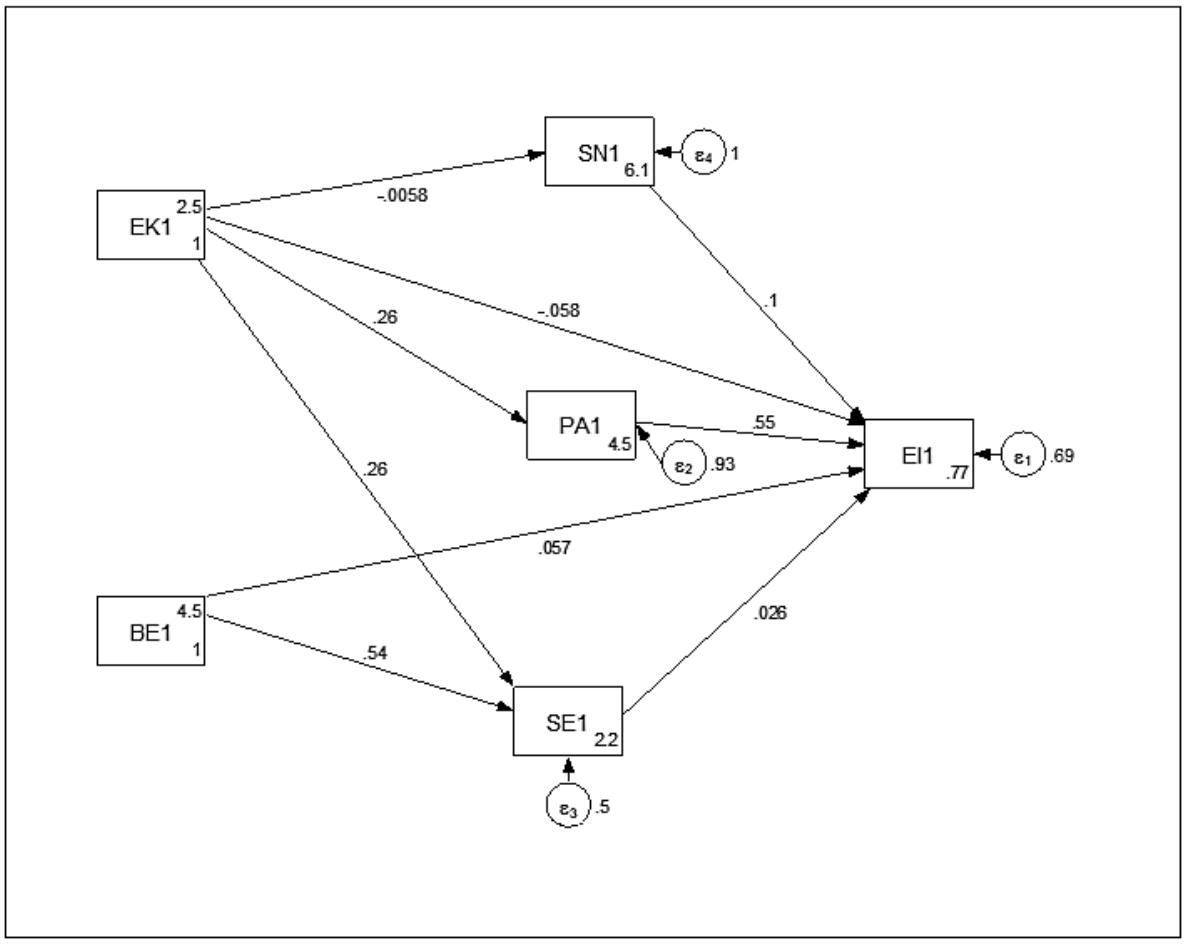

Figure 5.9: Initial proposed research model based on quantitative data

Table 5.16: Structural equation model: Proposed research model

	OIM			
	Coef.	Std.Err	Z	P>|z|
PA1 <-				
EK1	.2051458	.0640293	3.20	0.001
_cons	4.809922	.2285293	21.05	0.000
EI1 <-				
PA1	.6150949	.1010965	6.08	0.000
SE1	.0353679	.1480429	0.24	0.811
SN1	.1293848	.0994705	1.30	0.193
EK1	-.05136	.0761756	-0.67	0.500
BE1	.0615424	.1046192	0.59	0.556
_cons	.9202081	.6207849	1.48	0.138
SE1 <-				
EK1	.1715184	.0445044	3.85	0.000
BE1	.4240031	.053547	7.92	0.000
_cons	1.894421	.2392671	7.92	0.000
SN1 <-				
EK1	-.0041477	.0594816	-0.07	0.944
_cons	5.902227	.2124031	27.79	0.000

LR test of model vs. saturated: chi2(**5**)=**80.71**, Prob > chi2=**0.0000**

Fit statistic	Value	Description
Likelihood ration		
chi2_ms(**5**)	80.714	Model vs saturated
p > chi2	0.000	
chi2_bs(14)	257.837	Baseline vs saturated
p > chi2	0.000	
Population error		
RMSEA	0.323	Root mean squared error of approximation
90% CI, lower bound	0.263	
Upper bound	0.387	
Pclose	0.000	Probability RMSEA <- 0.05
Information criteria		
AIC	2440.216	Akaike's information criterion
BIC	2505.704	Bayesian information criterion
Baseline comparison		
CFI	0.689	Comparative fit index
TLI	0.131	Tucker-Lewis index
Size of residuals		
CD	0.530	Coefficient of determination

According to all fit indices, the revised model (Table 5.17) and research output (Figure 5.10) exhibit satisfactory measures of goodness of fit compared to the initial proposed model. Although both models accounted for sizeable covariation, the revised model is significantly different in terms of its ability to account for covariation

when compared to the research model. The chi-square tests of difference as well as the reported fit indices demonstrate convincingly that the revised model is superior. The revised model (Table 5.17) resulted in Chi-square: 7.370 (prob>chi^2:0.3914), p<0.05. With TLI of 0.997, RMSEA=0.019 and CD (R^2): 0.600, the CFI (comparative fit index) was 0.998, which indicates that 99.8% of the covariation in the data could be reproduced by the revised model (Refer to Appendix H).

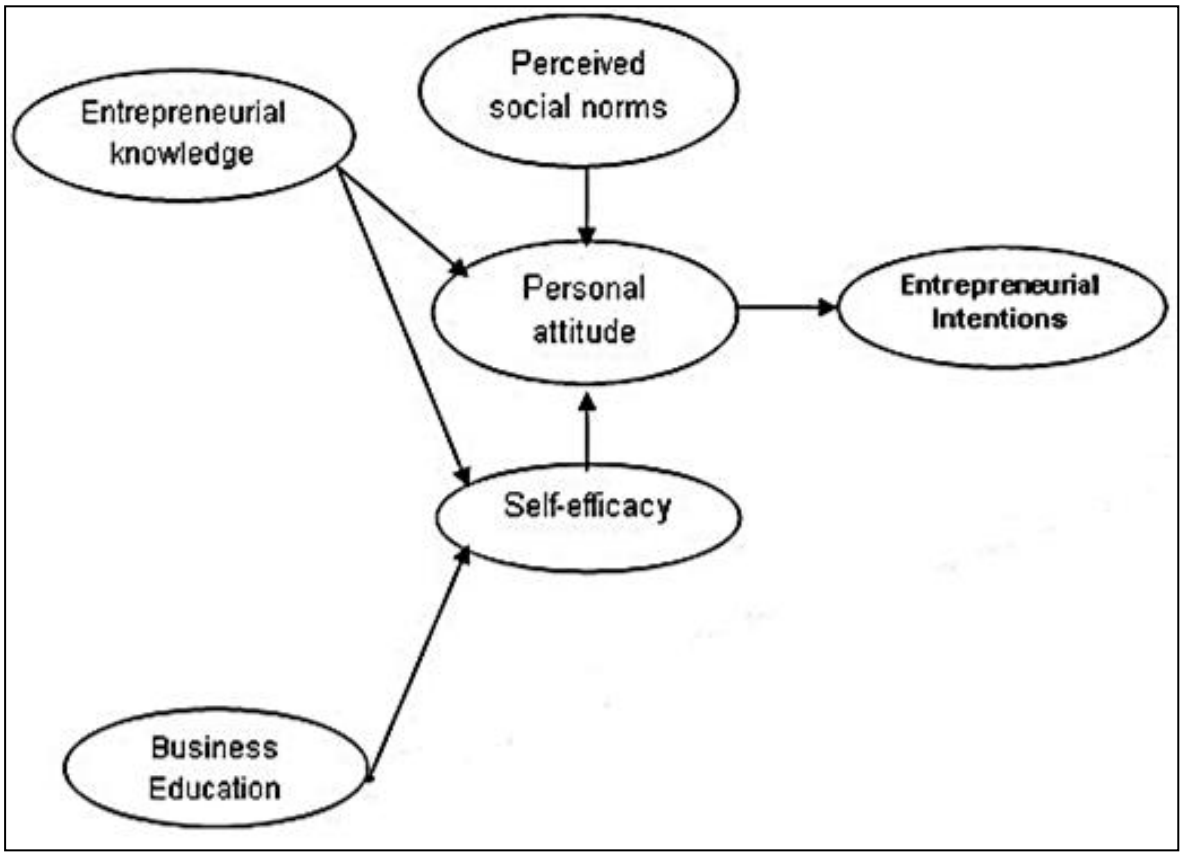

Figure 5.10: Revised research model based on quantitative data (Group 1)

Table 5.17: Structural equation model: Revised research model

	OIM			
	Coef.	Std.Err	Z	P>|z|
PA1 <-				
SE1	.551546	.0790557	6.98	0.000
SN1	.421169	.072192	5.83	0.000
_cons	.4652904	.5096716	0.91	0.361
EI1 <-				
PA1	.6879522	.0776521	8.86	0.000
_cons	1.587344	.4342555	3.66	0.000
SE1 <-				
EK1	.1710642	.0445498	3.84	0.000
BE1	.4248006	.0535174	7.94	0.000
_cons	1.89137	.2393682	7.90	0.000

LR test of model vs. saturated: chi2(7) =**7.37**, Prob > chi2=**0.3914**

Fit statistic	Value	Description
Likelihood ration		
chi2_ms(**7)**	7.370	Model vs saturated
p > chi2	0.391	
chi2_bs(**12**)	248.586	Baseline vs saturated
p > chi2	0.000	
Population error		
RMSEA	0.019	Root mean squared error of approximation
90% CI, lower bound	0.000	
Upper bound	0.105	
Pclose	0.620	Probability RMSEA <-0.05
Information criteria		
AIC	2362.872	Akaike's information criterion
BIC	2422.406	Bayesian information criterion
Baseline comparison		
CFI	0.998	Comparative fit index
TLI	0.997	Tucker-Lewis index
Size of residuals		
CD	0.600	Coefficient of determination

In the next section the implications of the results on entrepreneurial intentions will be discussed.

5.5.1 Implications of results on entrepreneurial intentions

The primary objective of this thesis was to establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme TDD in South Africa. The empirical evidence partially supports the effectiveness of the

Theory of Planned Behaviour (TPB) in predicting entrepreneurial intentions. In total, the results from the structural equation model against the research model (Table 5.16) suggest that personal attitude (PA) *(Coef. 0.615; p<0.001)* is positively related to (predict) the entrepreneurship intention of TDD students at TUT and CPUT, while self-efficacy (SE) *(Coef. 0.035; p<0.811)* and perceived social norms *(Coef. 0.129; p<0.193)* fail to reach statistical significance. Although the positive relationship between self-efficacy and entrepreneurship intention is well established, few studies (Vancouver, Thompson & William, 2001; Wilson, Kickul & Marlion, 2007) have challenged this finding. The former argued that self-efficacy would act as an obstacle to entrepreneurship intention. Furthermore, there is no direct relationship between perceived social norms and entrepreneurial intention, which corresponds with findings in past research (Autio, *et al*; 2001; Krueger, *et al*; 2000; Liñán & Chen, 2009).

This study also established whether business education (BE) (composed of subjects on business management/business studies and practical industrial projects), and the variable entrepreneurial knowledge (EK), stimulate and impact on entrepreneurial intentions (EI). Overall, results observed in this study indicate that entrepreneurial knowledge is positively related to higher levels of personal attitude *(Coef. 0.205; p<0.001)* and self-efficacy *(Coef. 0.172; p<0.001).* This suggests entrepreneurial knowledge as indeed an important determinant for entrepreneurial intention, as it has a positive influence on personal attitudes and self-efficacy. Therefore, to increase the level of entrepreneurial initiative among industrial design students, it is necessary to increase their entrepreneurial knowledge. Lastly, business education (which is correlated to entrepreneurial knowledge and perceived social norms) was observed to positively influence students' self-efficacy *(Coef. 0.424; p<0.001)*, thus increasing their personal attitude and entrepreneurship intentions. In the next section, the research hypotheses will be discussed.

5.6 RESEARCH HYPOTHESES

In this section, the hypotheses as identified in Table 5.18 are measured and discussed. The coefficient (coef) indicates the strength of the relationship, and the probability value (p>) the significance.

A correlation coefficient of 0.70 indicates a strong and negative linear relationship; +0.30 indicates a weak but positive relationship; +0.50 indicates a moderate and positive relationship; and +0.70 indicates a strong and positive relationship. Zero indicates no linear relationship and +1 indicates a perfect and positive linear relationship. If the probability value is less than 0.050 (p<0.050), then there is a relationship – the closer the value to zero the more significant is the p value. The revised model (Table 5.17) suggests that personal attitude mediates the relationship between perceived social norms, self-efficacy and entrepreneurial intentions, while self-efficacy further moderates the relationship between entrepreneurial knowledge, business education and personal attitude. Based on the above results, hypotheses 1, 5, 7, and 8 can be accepted at a $p<0.001$ significance level, while hypotheses 2, 3, 4, 6, and 9 (including its null) are rejected.

Table 5.18: Research questions and hypotheses

Research questions	Hypotheses	Accept or reject
Research question 1: What are the entrepreneurial intentions of TDD students?	Personal Attitude H_{01}: Personal attitudes *negatively influence* entrepreneurial intention H_1: Personal attitudes *positively influence* entrepreneurial intention	Reject Accept (Coef. 0.615 P<0.001)
	Perceived social norms H_{02}: Perceived social norms *negatively influence* entrepreneurial intention H_2: Perceived social norms *positively influence* entrepreneurial intention	Reject Reject (Coef. 0.129 P<0.193)
	Self-efficacy H_{03}: Self-efficacy *negatively influences* entrepreneurial intention H_3: Self-efficacy *positively influences* entrepreneurial intention	Reject Reject (Coef. 0.035 P<0.811)
	Entrepreneurial knowledge H_{04}: Entrepreneurial knowledge is *negatively related to higher levels of* entrepreneurial intention H_4: Entrepreneurial knowledge is *positively related to higher levels of* entrepreneurial intention	Reject (Coef. -0.051 P<0.500) Reject
	Entrepreneurial knowledge H_{05}: Entrepreneurial knowledge is *negatively related to higher levels of* personal attitudes H_5: Entrepreneurial knowledge *is positively related to higher levels of* personal attitudes	Reject Accept (Coef. 0.205 P<0.001)
	Entrepreneurial knowledge H_{06}: Entrepreneurial knowledge *is negatively related to higher levels of* perceived social norms H_6: Entrepreneurial knowledge *is positively related to higher levels of* perceived social norms	Reject (Coef. -0.004 P<0.944) Reject
	Entrepreneurial knowledge H_{07}: Entrepreneurial knowledge is *negatively* related to higher levels of self-efficacy H_7: Entrepreneurial knowledge *is positively related to higher levels of* self-efficacy	Reject Accept (Coef. 0.172 P<0.001)
Research question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions?	H_{08}: Business education *is negatively related* to *higher levels of* self-efficacy H_8: Business education is *positively related* to *higher levels of* self-efficacy	Reject Accept (Coef. 0.424 P<0.001)
	H_{09}: Business education *negatively influences higher levels of* entrepreneurial intentions H_9: Business education *positively influences higher levels of* entrepreneurial intentions	Reject Reject (Coef. 0.062 P<0.556)

In the next section the quantitative analysis will be concluded.

5.7 CONCLUSION

This chapter presented the results of the statistical analysis performed on the primary quantitative data collected, designed to test a research model of entrepreneurial intentions. Descriptive statistics, chi square and several multivariate statistical tests, including tests for validity and reliability, factor analysis and structural equation modelling (for testing hypotheses), were performed on the collected data. For the most part, results conformed to findings in past research. The trends emerging from the analysis can be summarised as follows: (a) personal attitude is positively related to entrepreneurial intentions; (b) although perceived social norms and self-efficacy is positively related to entrepreneurial intentions, results failed to reach statistical significance. However, they moderate the relationship between personal attitude and entrepreneurial intentions; (c) entrepreneurial knowledge is positively related to higher levels of personal attitude and self-efficacy, and (d) entrepreneurial education is positively related to self-efficacy.

Chapter 6 presents the results from the analysis of the qualitative data from Group 2 participants.

CHAPTER 6: QUALITATIVE DATA ANALYSIS

6.1 INTRODUCTION

This study assesses the entrepreneurial intentions of industrial design students, and evaluates past graduates at the Tshwane University of Technology (TUT) to determine whether business education and entrepreneurial intentions translated into actual start-up of businesses. The researcher did not have access to students who completed the Three-Dimensional Design (TDD) programme at Cape Peninsula University of Technology (CPUT); and acknowledges this as a limitation of the study. The researcher observed that most studies measure entrepreneurial intentions; but not whether entrepreneurial intentions transform into an actual business. This research study contributes to the body of knowledge because no study on these aspects of industrial design students was carried out previously in South Africa.

In the chapter, the research carried out on past graduates at TUT, or Group 2 participants are presented. It examined whether entrepreneurial intentions and entrepreneurship knowledge transformed into actual business start-ups, using qualitative data obtained from interviews. This part of the research is designed to address the secondary research objective 2:

To investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

This part of the research also answers research question 3:

To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?

The researcher endeavoured to establish whether the learning of the business subject (business management) stimulates entrepreneurial intentions; whether the subject (business management) assisted students in their career and/or business; and whether there was evidence of tangible businesses started by these participants.

The qualitative approach was employed to generate rich data. Thematic analysis was used for this study, which is defined as “a method for identifying, analysing and reporting patterns (themes) within data” (Braun & Clarke, 2006:79). The data was broken into small component fragments (codes) and grouped into units or themes. The data were transcribed and coded; and the coding was revised and refined. Thereafter, themes were assembled and grouped into meaningful units. The aim was to find meaningful patterns from the themes. The researcher only had access to the TUT graduates. The total graduates that successfully completed the TDD programme at TUT for the period 2011 to 2014 was 51, and 22 (43.1%) of these students participated in this study (Table 4.6).

The qualitative data from the graduates who successfully completed the TDD programme were analysed using ATLAS.ti version 7.5.9. Themes were identified and the data were described within this framework. A pilot study was executed in the form of personal interviews with two past graduates to discuss the interview guide and to establish any problems with understanding what was being asked and any other challenges. The questions included in the interview guide (Appendix C) consisted of 48 quantitative (close-ended), 16 qualitative (open-ended) and ten demographic and other questions. Email responses were employed as the primary means of gathering data and telephonic interviews were also conducted.

6.2 TRUSTWORTHINESS

For a qualitative study, it is imperative to validate and determine that the data collection process was acceptable and conclusions drawn are valid. Silverman (2014:105) points out that it is important that the reader is convinced that the correct research methods were used, were reliable and valid. Lincoln and Guba (1985:316) identify credibility, transferability, dependability and confirmability as processes to accomplish trustworthiness in a qualitative study. The techniques employed in this study to establish trustworthiness are depicted in Table 6.1.

Table 6.1: Trustworthiness techniques used in the qualitative study

Criteria	Technique	Application in study
Credibility	Activities that increase credibility	
	Prolonged engagement	There was a prolonged engagement between the observer and the participants. There was exposure to some participants from 2015.
	Persistent observations	Participants were exposed to the researcher over several years as the researcher is a lecturer at TUT.
	Referential adequacy	The study collected demographic and employment, own business and education descriptives via the quantitative method and interviews by means of open-ended questions.
	Peer debriefing	There were constant discussions with colleagues and other stakeholders like industrial designers in practice.
	Negative case analysis	Data were recorded as is and was not “cleaned” or sanitised to ensure truthful reporting. There was an in-depth analysis of one participant that decided to leave the country.
	Member checks	There were follow-up discussions with participants to verify if the researcher’s understanding was correct.
Transferability	Thick description	The study endeavoured to describe the responses of participants and added demographics and descriptive data. This was done to create a clear understanding to the reader about the Group 2 participants.
Dependability	The dependency audit, including the audit trail	This means that all raw data, like notes and emails as well as materials relating to coding and theming will be kept in safe storage. Any reader may thus request to audit the data if required from the author.
Confirmability	The confirmability audit, including the audit trail	All records, notes and emails are kept in safe storage.
All of the above	The reflexive journal	The notes relating to the decisions made as well as intentions and dispositions of the researcher throughout the process are available upon request.

Source: Adapted from Lincoln and Guba (1985)

In the next section, the demographics and other data of Group 2 participants are presented (see Appendix I for detail data). When questions from the questionnaire are referred to, the question number will be indicated in brackets.

6.3 DEMOGRAPHICS AND OTHER DATA

This information is presented in Table 6.2 (Section B of the interview guide - Appendix C).

a. **Age:** A total of 22 participants participated and responded. A total of 21 of the participants were in the age group 17–29. This age group was expected and confirmed as these students graduated during the period 2011 to 2014 and the data were collected in 2015.

b. **Gender:** There were more males participating in the study than females. A total of 81.8% of Group 2 participants were male; and the female students represented 18.2%.

c. **Ethnic group:** A total of 18.2% African participants and 81.8% white participants responded, respectively for the period 2011 to 2014. It seems that the ethnic composition of the TDD graduates was not representative of the population when the programme commenced at TUT in 2008.

d. **Place of birth:** Most participants were born in Gauteng (70%), followed by the North-West province (15%), Mpumalanga (10%) and Limpopo (5%).

e. **Current place of residence:** Most participants (82%) were based in Gauteng.

f. **Education level of parents:** A total of 65% of the parents had tertiary or post graduate qualifications; and 35% of the parents had completed secondary education.

g. **Sector of employment of parents:** Most parents worked in the private sector (41%); 23.1% worked in the public sector; 23.1% were self-employed or entrepreneurs and 7.6% were retired; 2.6% were unemployed; and 2.6% were indicated as “other” (home executive). The researcher observed that 23.1% of the parents were self-employed or entrepreneurs. Lindquist, Sol and Van Praag (2015:269) found in a study using data from Sweden on adoptees and the Swedish population: “that parental entrepreneurship increases the probability of children’s entrepreneurship by about 60%”. A limitation of the study was that the influences from parents that were self-employed or entrepreneurs on their children starting businesses were not measured.

h. **People living in your household:** Most participants (57.9%) lived in a household with one to two members. It could be suggested that participants possibly left home and are now living in an own house or apartment.

i. **Estimated monthly income in your household:** A limitation of this question was that the household income reflects the total income of the household, and not the income of the participant. The income is observed being more than R10 000 per month for most participants; however, it cannot be claimed to be the sole monthly income of the Group 2 participant.

Table 6.2 presents a summary of the Group 2 participants’ demographics and other data.

Table 6.2: Demographics and other data of Group 2 participants

Demographics and other data	Description	Frequency	Percentage
Age	17-29 years 30-39 years	21 1	95.5 4.5
Total		22	100.0
Gender	Male Female	18 4	81.8 18.2
Total		22	100.0
Ethnic group	African	4	18.2
	White	18	81.8
Total		22	100.0
Place of birth	Gauteng	14	70.0
	North-West	3	15.0
	Mpumalanga	2	10.0
	Limpopo	1	5.0
Total		20	100.0
Current place of residence	Gauteng	18	82.0
	KwaZulu-Natal	1	4.5
	Limpopo	1	4.5
	Northern Cape	1	4.5
	United Kingdom (UK)	1	4.5
Total		22	100.0
Educational level of parents	Secondary education	14	35.0
	Tertiary education	17	42.5
	Post graduate	9	22.5
Total		40	100.0
Sector of employment of parents	Private sector	16	41.0
	Public sector	9	23.1
	Self-employed or entrepreneur	9	23.1
	Retired	3	7.6
	Unemployed	1	2.6
	Other	1	2.6
Total		39	100.0
People living in your household	1-2	11	57.9
	3-4	5	26.3
	5-7	3	15.8
Total		19	100.0
Estimated monthly income in your household	R5 001 and R10 000	1	5.3
	R10 001 and R20 000	7	36.8
	R20 001 and R40 000	4	21.1
	R40 001 and R70 000	3	15.7
	R70 001 and R100 000	4	21.1
Total		19	100.0

In the next section, the descriptive analysis of the Group 2 participants is discussed (Section A – Appendix C). Group 2 participants' responses, were verbatim recorded. English is not the first language of many of these participants; therefore, there could be some language errors.

6.4 GROUP 2 PARTICIPANTS: DESCRIPTIVE ANALYSIS

In this section, the following are discussed: completion of the TDD programme and the institution, location, employment, business-start-ups, and achievement of career goals.

6.4.1 Year of completion of study

Figure 6.1 presents the year of completion of the Group 2 participants that responded and participated (M001). The year 2011 had a 37.5% response rate of the total graduates for that year; 2012 a response rate of 36.5%; 2013 a response rate of 33.3% and 2014 a response rate of 64.3%.

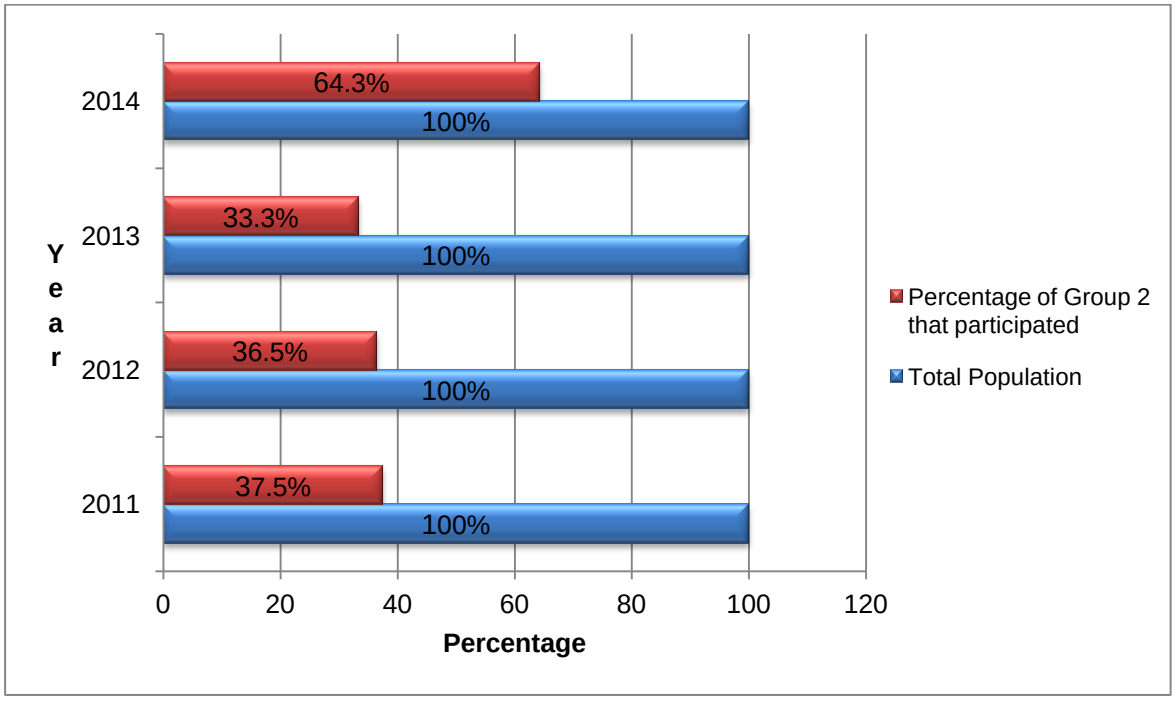

Figure 6.1: Group 2 participation ratio

The researcher endeavoured to secure participation of all students in South Africa who had successfully completed the TDD programme, but only TUT graduates participated (in this part of the study) due to access to past graduates who completed the TDD programme at CPUT.

Group 2 particpants granted permission to use the images and screenshots provided by them, and as presented in Chapter 6 (Figure 6.2, Figure 6.7, Figure 6.8, Figure 6.9, Figure 6.11 and Figure 6.12). Due to ethical implications, these participants remained anonymous; and therefore the sources are not acknowledged with these Figures.

6.4.2 Location

The location of 21 of the Group 2 participants was South Africa and one participant is based in the UK (M002, M003). A total of 82% of the participants were residing in Gauteng, 4.5% were based in Limpopo, 4.5% in KwaZulu-Natal, 4.5% in the Northern Cape and 4.5% in the UK (M0001 to M0009).

The case of the student leaving South Africa was particularly interesting (M003). The reason the participant indicated for leaving South Africa was that location in the UK created better opportunities in the technology sector, saying: "*Well not only is it more available it's more accessible. The Imakr store in London is a shop where you can buy 3D printer. Ones from £400 to £5 000 and they all build for home use. I was able to design and print my own prosthetic hand*" (Participant 10), as shown in Figure 6.2.

Participant 10 also described the environment in the UK as design supportive: **"***You have also (sic) the London makers' space called "Fab Lab" which has access to new technologies like 3D printing, Computer Numeric Control Machines (CNC), and laser cutting. They also have space for programming Arduino and Raspberry Pi printed circuit boards (PCBs). All for free on Fridays or you pay a membership fee and you can go any time; all you pay for is material*".

PCBs Pi is simple programmable computer boards where you can add attachments, such as screens, inputs and a huge variety of other attachments. Most drones and some 3D printers run on them. The designer has access to the latest technology by paying a membership fee or attend on Fridays free. This is an incredible advantage for industrial designers to develop their products because this initiative makes it possible to design a product. In this case, location provided opportunities and resources to support and encourage entrepreneurial activities that were not available in South Africa.

Figure 6.2: Prosthetic hand built by Group 2 participant
(Permission was granted by participant to use image)

6.4.3 Employment

In this section, Group 2 participants were asked if they were employed (N001); the duration of time from completion of studies till employment was found (N002); and their employment status (N). All participants indicated that they were employed (full-time or self-employed).

Participants were asked: “If you are employed, what was the duration from the time you completed your studies till you found employment?” (N002). Figure 6.3 illustrates that 22.7% of participants immediately started an own business, 50.2% of participants had found employment within 1 to 12 weeks, and 27.1% had found employment within 16 to 52 weeks.

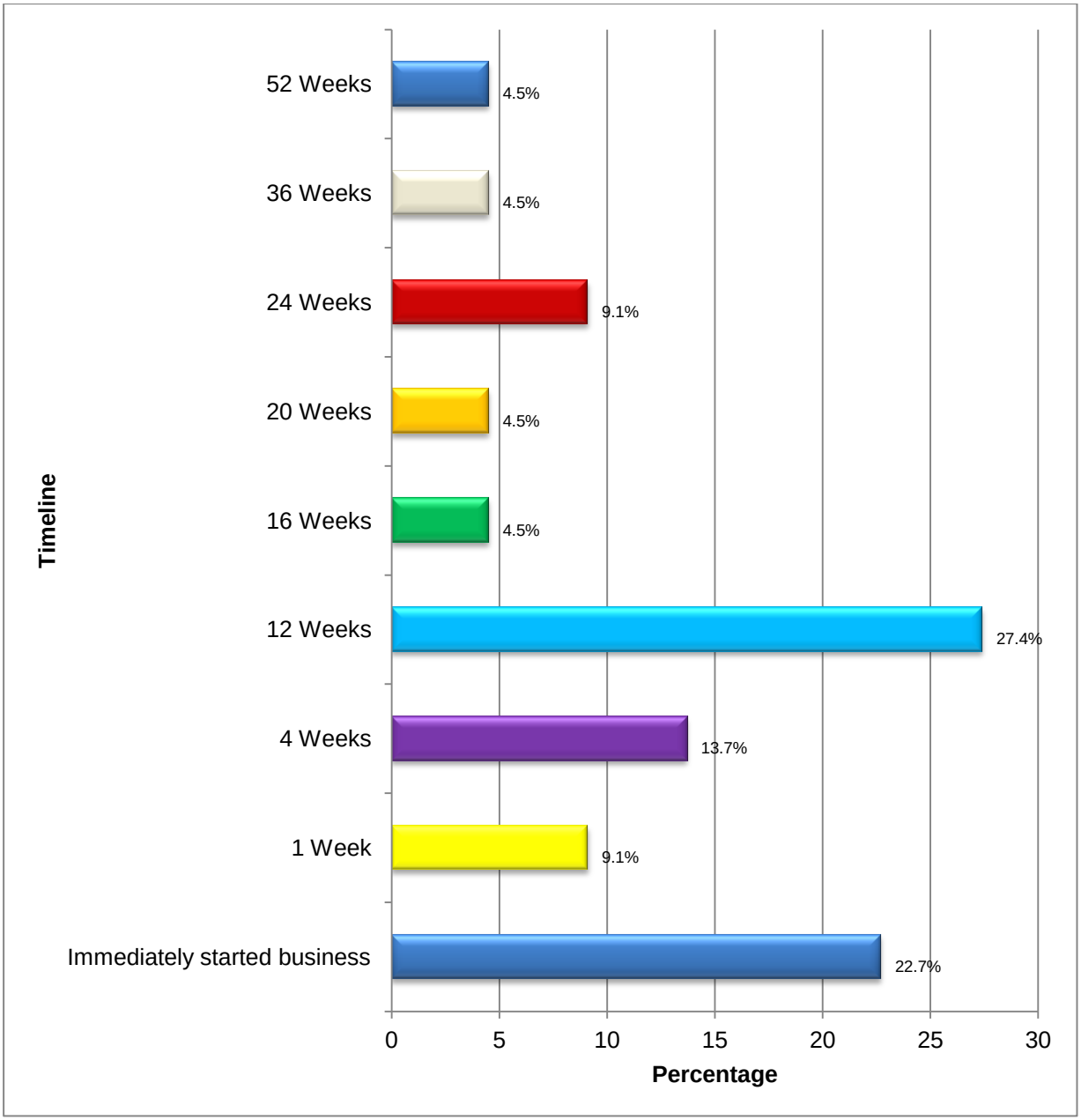

Figure 6.3: Duration from completion of studies to finding employment (Group 2 participants)

Participants were asked what their employment status was. A total of 11 of the participants worked for a business/an organisation (N02=50.0%); 4.6% worked for the government; and 45.4% had an own business, or worked and had an own business, as reported in Figure 6.4 (N01, N04). Four (18.2%) participants indicated that although they do not own a business, they would like to start a business.

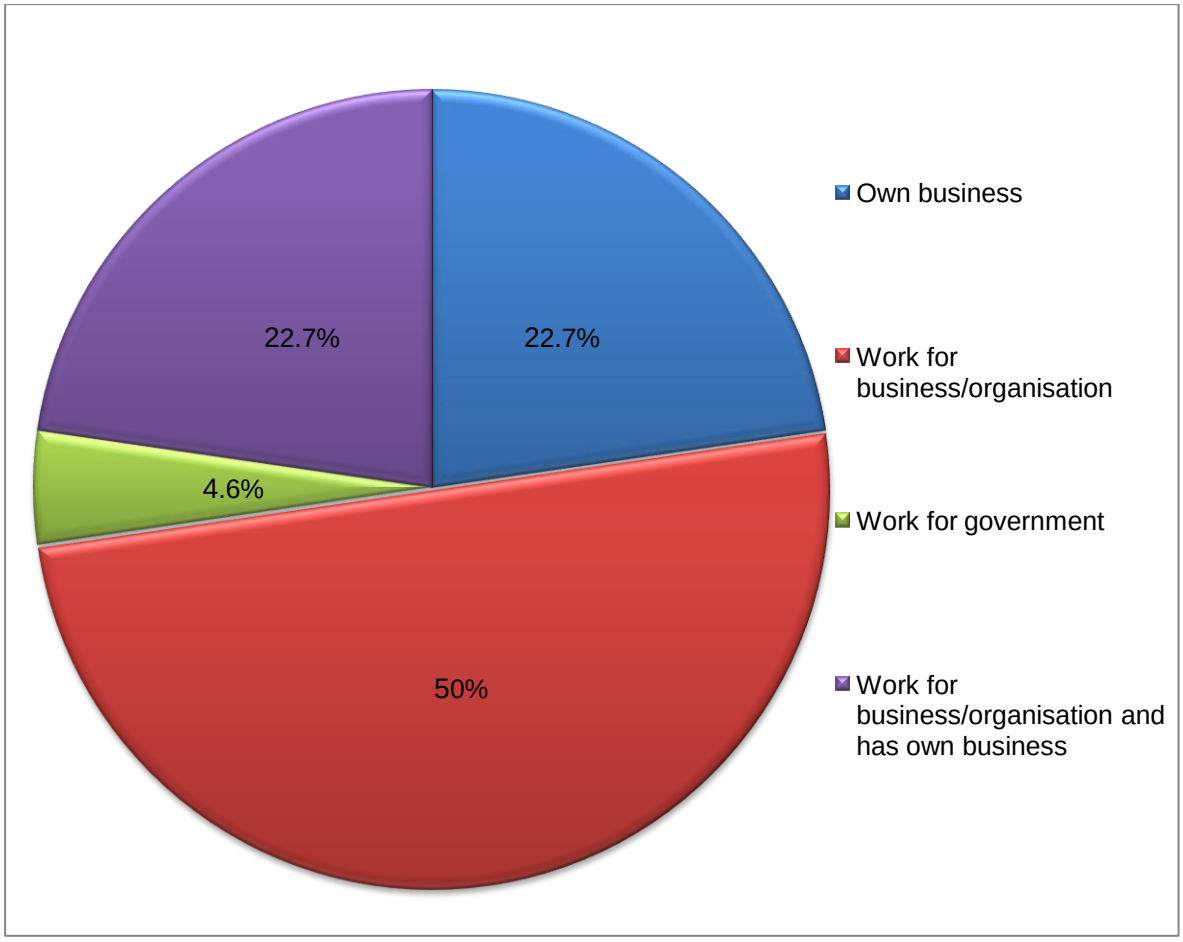

Figure 6.4: Employment status

It may derive from the above that even though employed as an employee, some participants still owned a business part-time (22.7%).

Figure 6.5 indicates the industry/service in which participants (R) work or has their businesses in. Group 2 participants worked in more than one industry and/or provided a service. The industry/service where most participants were employed (self-employed or employed), was household goods (R14); industrial manufacturing (R04); leisure goods (R16), home construction (R15); technology: software and

computer services (R19); home construction (R15); and electronic and electrical equipment (R18). Figure 6.5 indicates that Group 2 participants are active in most industries/sectors of the economy. One participant indicated “other”, being in the home décor industry.

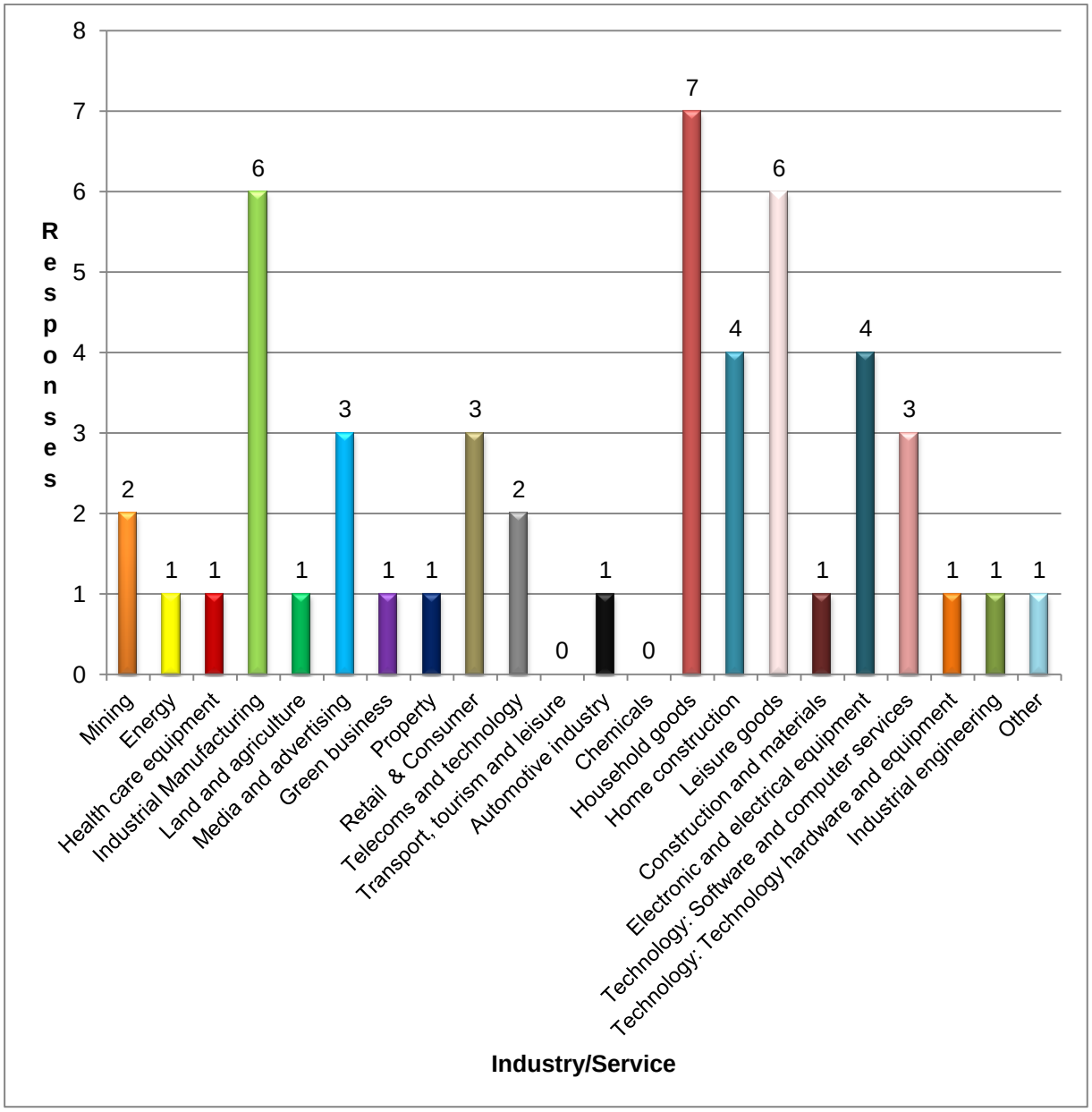

Figure 6.5: Industry or service where Group 2 participants started businesses

6.4.4 Business start-ups

Entrepreneurship and the creation of businesses are drivers of the economy and contribute to job creation. It is therefore important to determine the duration it took to start an own business (N003), what are the core functions of these businesses (N004), are jobs created (N005) and where do these participants operate their businesses from (P).

Ten participants had started their own businesses, full-time or part-time. Participants, who owned a business, were asked to complete the following question: "What was the duration from the time you completed your studies till you started your business?" (N003). The responses from participants were: started whilst studying (20%), immediately after completion of studies (10%), one month (10%), 1.5 months (10%), six months (10%), one year (20%), and 18 months (20%).

One participant responded that he/she started a business*: "Immediately, I finished my studies in November and started my business (sic) in December"* (Participant 21).

Funding was identified as a key challenge to the starting of an own business. The reasons why some participants did not start a business were: *"Financing is the issue; I do not have enough funds to start"* (Participant 4), and*: "…the (sic) biggest challenge of all is having enough support and capital behind you to carry you until the business becomes profitable, which means at least one year"* (Participant 3). Securing investors and creating an agreeable proposal to investors can be difficult, as indicated by participant 9*: "Depending on what one focuses on to design change or innovate. It's difficult to get investors to bite the cake or to prevent them from walking away with it".*

Most participants experienced it as difficult to start a business (71.4%), compared to 28.6% who found it easy to start a business (S004). Group 2 participants identified several challenges to start a business, for example, the marketing of a product (S004): *"… marketing yourself to get buyers for your product is a huge challenge"* (Participant 3). Red-tape from the government was acknowledged as another complexity in starting a business: "*I do not want any business relationship with the*

government. The (sic) government has (sic) too much forms et cetera and wants to control (sic) your business" (Participant 7).

Some Group 2 participants have started their own businesses (N01). Not all participants had the money, or access to money, to start-up a business; however, it remains a goal to start an own business, as specified by Participant 14: "*I am still in the process of doing so. Starting-off with little funding is hard, and getting a gap in the market is even harder. I believe with persistence and self-motivation I will achieve this in due time".*

The ten Group 2 participants that started own businesses maintained their core functions in their businesses (N004). The core functions of the businesses were:

a. Design and manufacture of furniture (2 participants);
b. Design and prototyping (1 participant);
c. Design, laser cutting and furniture (1 participant);
d. Industrial design (2 participants);
e. Product and graphics design (1 participant);
f. Design of videos for special occasions and couching clinic (1 participant); and
g. Design and development of products for the South African market (2 participants).

Two participants had factories, 7 participants worked from home, while 1 participant did not indicate where he/she is working from, as reported in Figure 6.6 and Figure 6.7 (P).

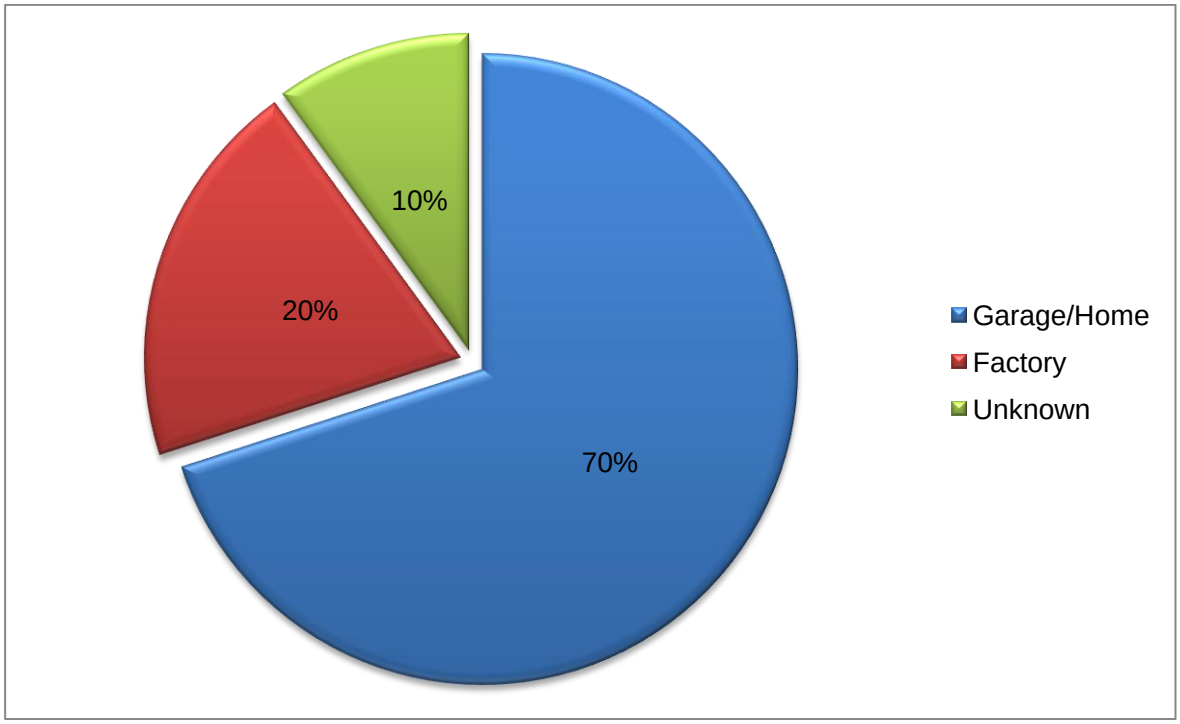

Figure 6.6: Place of business operation

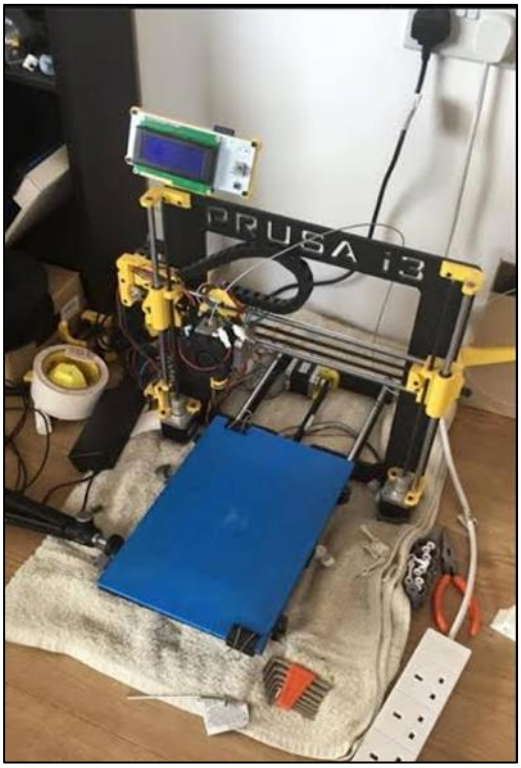

Figure 6.7: Group 2 participant working from home

(Permission was granted by participant to use this image)

Participants who indicated that they started businesses (full-time) employed a total of 5 full-time and 4 part-time employees (N005). The 9 jobs were created by full-time business owners, and excluded the industrial designer. Group 2 participants' businesses are growing. An example is Figure 6.8 where a participant was advertising via social media for the hiring of an employee. Participants know how to use social media to optimise their businesses, and this position was filled shortly after the post on Facebook.

Another example of a participant's business is given in Figure 6.9, using social media to advertise his/her business products (Participant 8). This participant originally started working in a business, and then started an own business in a garage. His/her first contract was to design furniture for a restaurant. This assignment was successfully completed, while the participant is in the process to design more furniture.

Figure 6.8: Screenshot of participant advertising for an employee

(Permission granted by participant to use screenshot)

Figure 6.9: Screenshot of participant's product(s)
(Permission granted by participant to use screenshot)

6.4.5 Achievement of career goals

Participants were asked: "When you started your studies you had career goals that you set out to achieve for your future after your diploma. Did you achieve your goals?" (S001). A total of 60% of participants felt they achieved their goals set out, whilst 40% felt they did not achieve their goals. Participant 5 reported: *"My goal was to open my own manufacturing company and also be (sic) a design consultant, so for now it is working in progress because I want to work closely with the government".* This participant did not achieve his/her goal, but is still pursuing it. Participant 3 stated*: "When I started studying I had a very narrow view of the design industry in South Africa. Now I know the design industry and have more achievable goals which I'll admit are different from the ones I had when I started, but they are just more aligned to industry standards and not lower goals".* This participant completed his/her studies in 2011 and is now a successful industrial designer in the mining industry. Participant 9 stated that achievement of his/her goal was: *"...still in the making….".*

This participant completed the TDD diploma in 2013; and is still working towards attaining his/her goals. Likewise, participant 16 stated that, with regard to the achievement of his/her career goals: "*Not yet, but I see myself getting there soon"*. It is suggested that if participants did not achieve their goals, they should adjust their goals and work towards achieving the redefined goals.

In the next section, the research themes identified will be discussed.

6.5 RESEARCH THEMES

The qualitative data was analysed using ATLAS.ti version 7.5.9 to identify themes (see Appendix J for detailed responses). The following themes were identified:

a. Business subjects' influence on finding employment.
b. Business subjects' stimulation of entrepreneurial intentions.
c. Translation of entrepreneurial intentions into actual business start-ups.

6.5.1 Theme 1: Business subjects' influence on finding employment

It was important to determine whether the business subject (business management) assisted participants to find employment, and the type of challenges that were experienced to find employment. Figure 6.10 indicates participants' responses for theme 1. (Refer to Appendix J for more information on Group 2 participants' responses).

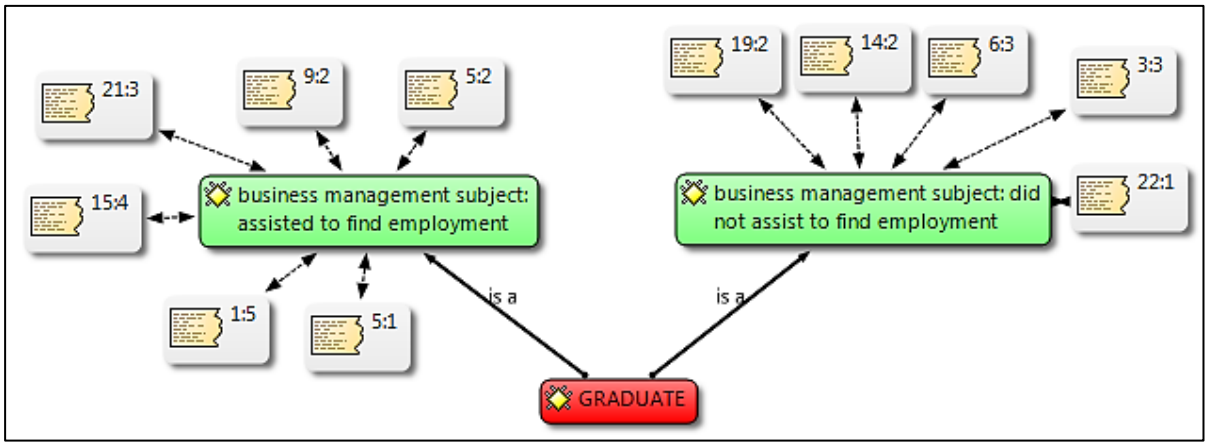

Figure 6.10: Theme 1: Business subjects' influence on finding employment
ATLAS.ti version 7.5.9 analysis

A total of 63.2% of participants reported that they found employment easily (S003): Participant 5 found a job in "*one week".* Participant 9 reported: "*I (sic) got a job in 2 weeks as soon as I started to look for one".* These participants provided evidence that it was relatively easy to find a job as an industrial designer.

A total of 90% of participants agreed that the business subject assisted them in their careers and/or businesses (S002). The past graduates are all employed. Participants were asked: "If you are employed, what was the duration from the time you completed your studies till you found employment?" (N002). Figure 6.3 illustrates that 22.7% of participants immediately started an own business, 50.2% of participants found employment within 1 to 12 weeks, and 27.1% found employment within 16 to 52 weeks.

Some participants experienced challenges in finding a position as an industrial designer: *"Four months without employment. NOTE: I am not employed in my field of study"* (Participant 14). This participant won several competitions at TUT, for example at Innovation Day, but failed to secure employment in the industrial design sector. Another participant experienced the same problem and started a business with one of his/her fellow students*: "I was not able to find work in my field, thus resorted to self-employment as of September 2014"* (Participant 22). They have started a business and are expanding. Figure 6.11 is a screenshot of participant 22's website.

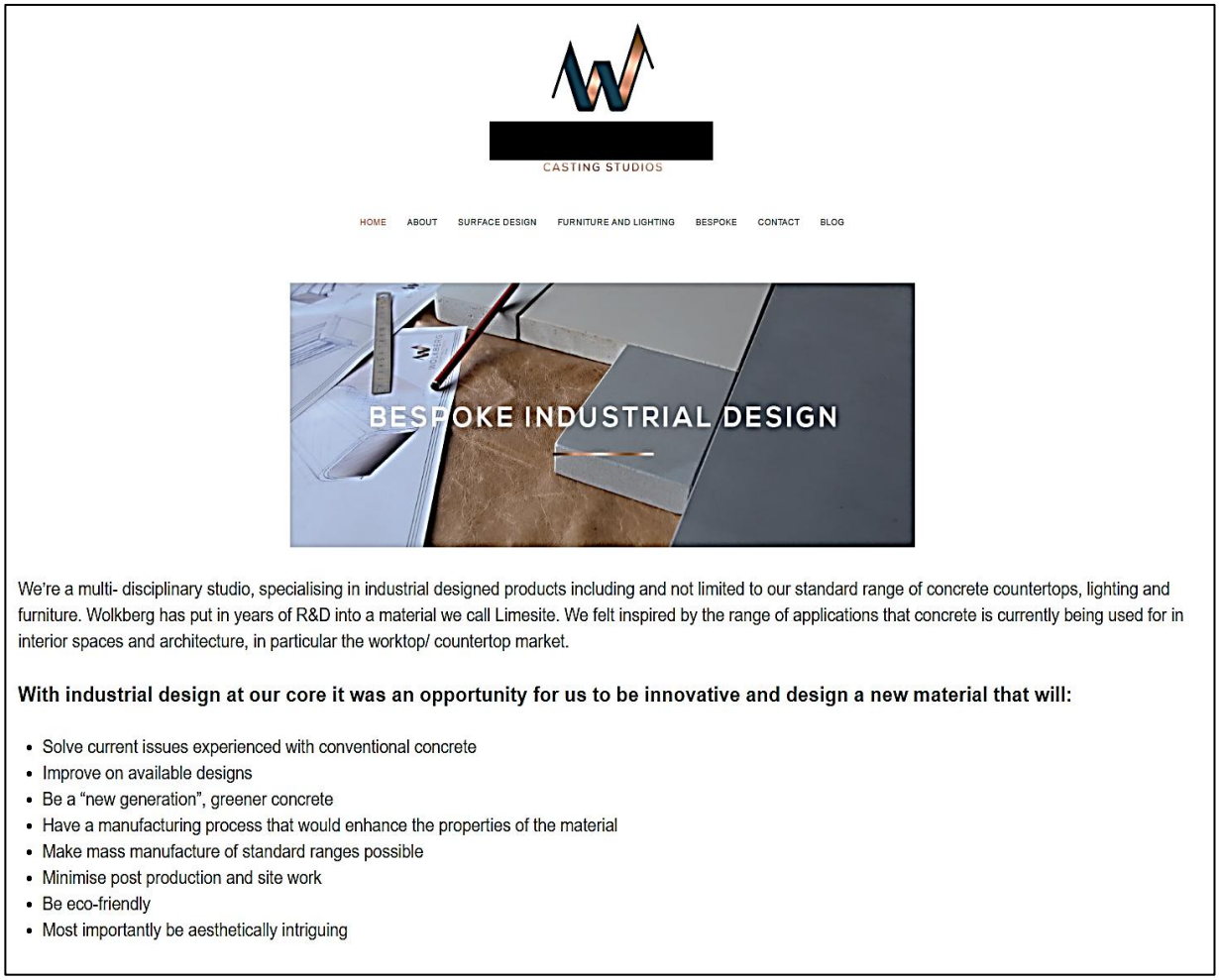

Figure 6.11: Website of a participant

(Permission was granted by participant to use image)

Participants marketed themselves; some were already known in the industry and others chose self-employment by starting a business. The TDD students are therefore aware of using technology to find employment: *"It was posted on our Facebook group from when I was in third year, so I just applied from the companies that posted"* (Participant 15). This participant's response confirms the ease of finding employment.

Some of the past graduates created Facebook pages to market him-/herself, their projects and services. Figure 6.12 shows some designs of one of the past graduates on one of his/her projects for a mixer/blender.

Figure 6.12: Designs of one of the past graduates on a project for a mixer/blender

(Permission was granted by participant to use screenshot)

One participant who completed his/her study in 2011 responded: *"Yes, very easy, (sic) I receive job offers a few times a year, all in my field. It would appear that once you choose your direction and spend time in it and deal with people in similar fields, doors start opening"* (Participant 1). This participant is the owner of a business but it does not stop employers from contacting the participant with employment offers. This participant chose to start a business immediately after completing his/her diploma in 2011. It could be extrapolated from this participant's response that the marketplace does respond positively to known industrial designers in the field.

Comparatively, 36.8% of participants experienced it as difficult to find employment. Group 2 participants experienced that employers did not understand their value and contribution*: "People do not know what industrial designers are used for. In South Africa, there are a few companies that specialise in industrial design, making jobs harder to come by"* (Participant 6); and: "*Industrial design is very new so the jobs are not advertised correctly. Some people are looking for designers but do not know the functions or job descriptions*" (Participant 3).

Employers and stakeholders are not aware of the contribution these past graduates are capable of. A lack of job opportunities in the marketplace is perceived by one participant as a reason for employers seeking under-qualified candidates: *"Unemployment is a problem in South Africa, and employers are looking for under-qualified applicants"* (Participant 19). It could be reasoned that businesses do not want to pay for skilled industrial designers. It could also be argued that possible employers are not aware of the benefits that industrial designers may offer in a business; thus, the reluctance of employing qualified industrial designers. As participant 6 stated: *"There is a lack of knowledge on the industrial design movement in most of Africa".* This response suggests that specialised businesses would use industrial designers, but the broader business sector is not aware of industrial designers and what they can offer to the business.

From the above, it is clear, that there is still a lack of knowledge of the role that industrial designers can play in South Africa, even though all participants in Group 2 were employed. A lack of understanding by employers, the public, stakeholders and the government could deny South Africa the full potential that this sector could contribute to the economy, including job creation and poverty alleviation.

6.5.2 Theme 2: Business subjects' stimulation of entrepreneurial intentions

This theme looked at whether the business subject (business management), which includes theoretical and practical industrial projects and factory visits, developed, stimulated and impacted on entrepreneurial intention. Figure 6.13 identifies participants' qualitative responses coded under Theme 2. (Refer to Appendix J for more information on Group 2 participants' responses).

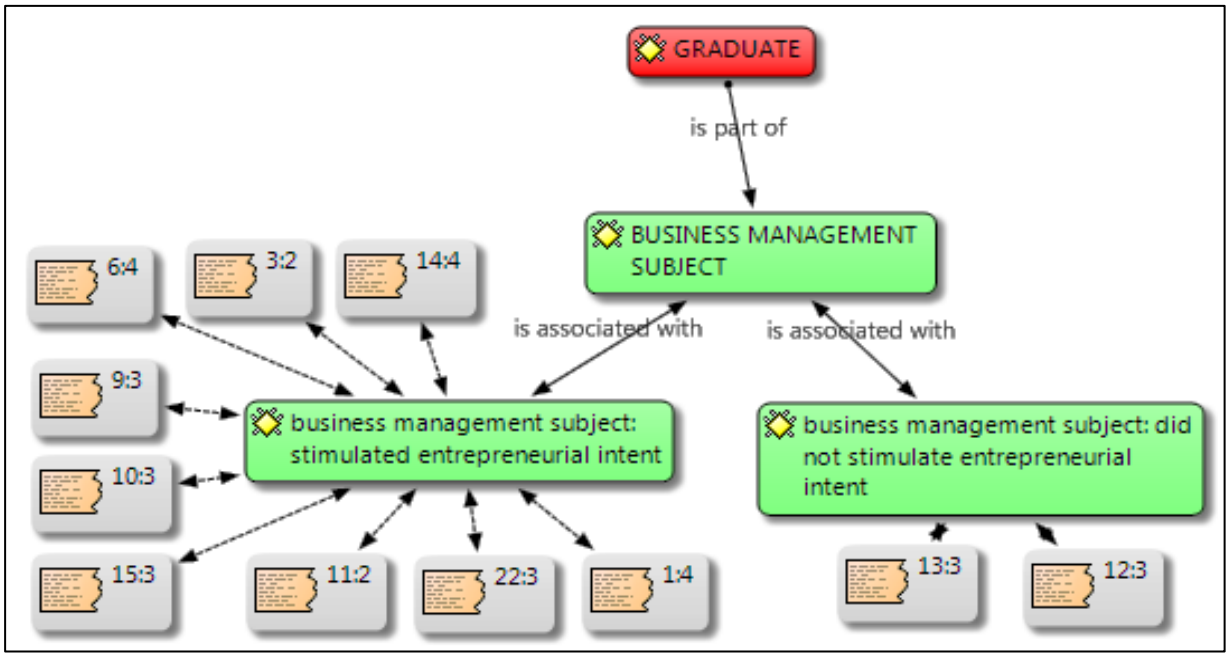

Figure 6.13: Theme 2: Business subjects' stimulation of entrepreneurial intentions ATLAS.ti version 7.5.9 analysis

Of Group 2 participants, 20 participants indicated that the business subject (business management) stimulated entrepreneurial intentions.

This subject gave participants an advantage over other industrial designers, and being able to start-up a business: *"It gives a broad view of what happens in business, showing you the individual organs required to make a business run. I had a good sense of business (sic) before starting to work so I had a starting point where some design practitioners have no clue"* (Participant 3). The business subject also gave participants an understanding of business from an industrial design perspective: "*It helped me understand my projects from a business standing"* (Participant 10). This is imperative because TDD students should understand the value of the subject, business management; and how it can assist them in their careers as industrial designers. Participants expressed that the business subject assisted in making the choice of starting an own business feasible, in relation to regular employment: *"Yes, loads, it is what led me to believe a business, as opposed to employment, is a feasible idea"* (Participant 1).

Participants indicated that the business subject assisted in starting-up a business: "*I understand how a business functions and what is needed to make the business thrive. The marketing aspects, the feasibility and viability of an action/plan/opportunity*" (Participant 14). Participants were educated in the above and other aspects: *"It gave me a better understanding of how to work in a business environment as a designer, an understanding of working with other people's intellectual property, and how to manage my own as well*" (Participant 15). The participant perceived him-/herself as capable of identifying an opportunity; able to perform a viability and feasibility study; and access the environment in which the business operates. This participant is able to protect the intellectual property of products, which is fundamental because as industrial designers, they design original products.

Two participants indicated that the business subject did not assist in their field of employment*: "It assisted me in gaining the diploma, but I have not used the knowledge of those subjects thus far"* (Participant 12). This participant completed the diploma in 2013 and is employed as a technical supporter for a computer software business. Another participant indicated that the business subject could be expanded and that the TDD students could be educated more in business operations: *"It could definitely go more in depth. Particularly quoting potential clients and the whole process of running your own business"* (Participant 13).

It is observed from the above remarks that most participants felt that the business subject (business management) assisted them in their business activities. A total of 90% of the participants indicated that this subject assisted them in their careers, or in starting a business. It may, therefore be concluded that the business subject (business management) of the TDD programme contributed to form entrepreneurial intentions amongst TDD graduates (Group 2 participants).

6.5.3 Theme 3: Translation of entrepreneurial intentions into actual business start-ups

This theme answers the secondary objective 2, namely:

To investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

This part of the research also answers research question 3:

To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?

The researcher determined the extent that entrepreneurial intent in Group 2 participants transformed into actual businesses. The researcher also looked at challenges that these participants experienced in the actual start-up of the business.

A total of 14 participants responded to this theme (S004). Most students found it challenging to start a business (71.4%), while 28.6% found the process easy to start a business. Most participants concurred that it was difficult starting a business, as indicated in Figure 6.14. (Refer to Appendix J for more information on Group 2 participants' responses).

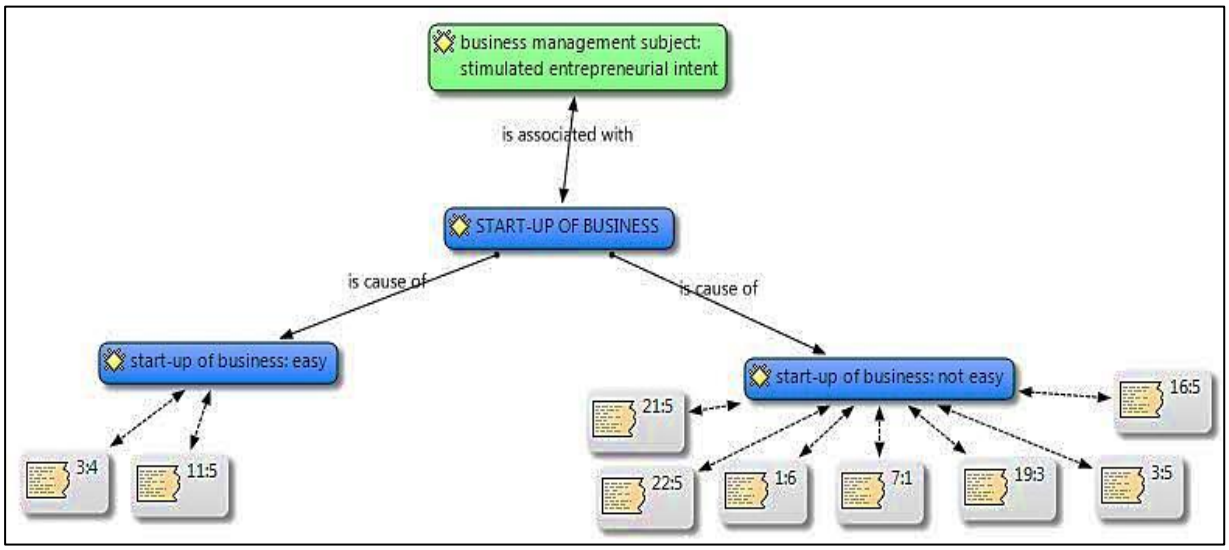

Figure 6.14: Theme 3: Translation of entrepreneurial intentions into actual business start-ups ATLAS.ti version 7.5.9 analysis

One participant started a business whilst being a student. This participant was asked to repair a product and he/she suggested to the potential client the designing of a

new product. *"The business started itself"* (Participant 11). Another participant emphasised that: "*Even with the creativity and skills I acquired as an industrial design student I realised that it is never easy starting a business"* (Participant 16). Participants could create products, design processes and render services, but claimed it is difficult to start a business. South Africa is not designer friendly, and finding a supplier can be difficult, as indicated by participant 3: *"…. finding a supplier is a headache".*

Finance or the lack thereof to start-up a business, was a major challenge identified by participants (S004): *"Lack of financing"* (Participant 19); and: "*Funding is always an issue"* (Participant 22) were some of the responses. The required capital and cash flow were problems identified by participants: *"The challenge lies in accumulating the required capital to start up and for me, the buying (sic) of machines were the challenge. And then generating a cash-flow large enough to live off and grow the business"* (Participant 1). Group 2 participants indicated that there were two major problems in starting a business, namely (a) funding and (b) finding a supplier (S004).

In summary, exposure to the business subject had positively influenced the actual start-up of businesses by Group 2 participants. There seems to be a relationship between entrepreneurial intentions and the actual start-up of a business. However, it was more difficult for these participants to start a business than anticipated, due to challenges around funding, including a lack of understanding in South Africa of the role and value of industrial designers.

In the next section, some of the recommendations to improve the role that designers can play in South Africa, will be discussed.

6.6 RECOMMENDATIONS FOR THE INDUSTRIAL DESIGN PROGRAMME

Participants were asked to respond to the question: "Do you have any recommendations to improve the role that industrial designers can play in South Africa?" (S005). A word content analysis was done as indicated in Figure 6.15. The

larger a word appears in the diagram, the more frequently it was used by the Group 2 participants in response to this question.

Figure 6.15: Word content analysis

Participants were also asked for input on how to improve the industrial design business education (business management) subject. The following themes were identified (S006):

a. **Create awareness for industrial design:** Participants experienced a lack of understanding of what industrial design involved from the industry, and the South African public. The industrial design field is misunderstood and more needs to be done to educate the public, potential investors, stakeholders, the government and employers about the valuable contribution industrial designers can make to the industry and the economy: *"South Africans are not familiar with our field of study, nor the benefits that it could provide for the country"* (Participant 14). Awareness should be created for industrial design: *"awareness and education"* (Participant 21). Education will give an understanding of the benefits of industrial designers.

One participant responded that the Innovation Day project created exposure for industrial design*: "I think the business subject (sic) helped shine the light on design with the competitions"* (Participant 6). Awareness of the benefits of industrial design for employers should also be created: "*We need to get more exposure; even today it's still rare to find someone who at least has an idea of what industrial design is. I've had to literally explain from scratch what industrial design to my employers is before they hired me"* (Participant 16). *"Make the market more aware of the importance for good design"* (Participant 11). It is also important to create an awareness of industrial design and its benefits to the business sector. The government, particularly, needs to be aware of the benefits of industrial design towards the economy, job creation and poverty alleviation: *".... just wish there were more governmental parties associated with this unique career to actually boost the design industry"* (Participant 9).

b. **Education on communication and marketing:** Industrial designers should be taught communication skills: *"Learn to communicate effectively"* (Participant 3). It is important for the industrial designer to communicate effectively; in this way, they can communicate with clients, and be ambassadors in their field of expertise. Participants suggested more education on marketing, particularly via social media, as a mean to improve the employment prospects for students: "*More marketing strategies to get your products seen via social media and forums; this is a huge factor in getting your name out there"* (Participant 10).

c. **Education on funding:** Participants suggested that a section on funding should be included in the syllabus. There was consensus among participants that there is a lack of knowledge on funding opportunities: *"Add funding schemes that are available via the government to the business subject (sic) to educate the designer on possible channels they can follow to get funding for their start-ups"* (Participant 15).
d. **Practical exposure to the industry and opportunities:** Group 2 participants suggested more practical orientation and exposure to the industry and to events, such as competitions: *"More fieldtrips"* (Participant 11). Another suggestion was the opportunity for students on all three levels of study to display their work

annually: *"Maybe an annual exhibition could help students from all levels show innovative new products and put them on the map in terms of aspiring young professionals"* (Participant 6). Group 2 participants visited factories to gain practical experience, but indicated that more of these initiatives are required.

e. **Education on entrepreneurship:** It was proposed that the business subject (business management) should become more important: *"The business element in industrial design should perhaps be a little more pivotal. As industrial design is all about business!"* (Participant 1). Industrial designers could be trained to become entrepreneurs because they can create a product and produce it: *"Train industrial designers to be entrepreneur(s)".* (Participant 5). The research showed that industrial designers can create jobs as nine jobs were created by these participants, which exclude the industrial designers that also work in the business.

f. **Education on manufacturing opportunities:** The manufacturing industry should be made aware of industrial design: *"South Africa has the knowledge and potential to supply the rest of Africa with good quality products"* (Participant 6). The knowledge exists; however, industrial designers should be given an opportunity, especially in the manufacturing industry.

6.7 CONCLUSION

This chapter presented the results of the research carried out on TDD graduates of TUT (Group 2 participants). The research on past graduates examined whether entrepreneurial intentions and entrepreneurship knowledge transformed into actual business start-ups, using qualitative data obtained from interviews with participants. Trends emerging from the research themes can be summarised as follows: participants transformed entrepreneurial intentions into starting actual businesses and created employment opportunities.

Finance, particularly, was a challenge to start a business. The results indicated that the completion of the TDD programme resulted in the building of entrepreneurial knowledge. It led to the creation of entrepreneurial intentions, and resulted in the

start-up of actual businesses. Jobs were also created and participants had a positive experience of entrepreneurship.

The next chapter presents the conclusion and recommendations of the study.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1 INTRODUCTION

In this chapter, the research conclusions are presented. A summary of the research findings is also presented. This includes a summary of the background, problem statement, the results of the two empirical research procedures of: quantitative research of Group 1 participants to test a research model of entrepreneurial intention and address the primary research objective and secondary objective 1, and qualitative research of Group 2 participants to address the secondary research objective 2. The conclusions on the research questions are presented. Thereafter, the conclusions on the research hypotheses are presented. The implications of the study are discussed, relating to the theory, and recommendations for Universities of Technology and for policy makers are made. Finally, the limitations of the study and areas for further research are presented.

7.2 SUMMARY OF RESEARCH

This study was undertaken against the background of the problem of youth unemployment in South Africa. The South African economy is challenged with, the Gross Domestic Product (GDP) at 2.0% in the third quarter of 2017 (South Africa. Department of Statistics, 2017a:9). Unemployment increased from 27.1% in July to September 2016 to 27.7% for the period January to September 2017 for the population group 15-64 years in South Africa (South Africa. Department of Statistics, 2017c:21). The unemployment rate for the age group 15-24 (youth and young adults that are not employed, in training or education) was 52.1% and 33.5% for the age group 25-34 for the period July-September 2017 (South Africa. Department of Statistics, 2017c:25).

Research has shown that, despite the problems of unemployment, South Africa displays very low levels of entrepreneurial intentions (Herrington & Kew, 2016:4). Sixty seven percent of early entrepreneurial activity in South Africa is in the

consumer services sector with only 9% in the business sector that is dependent on more technical knowledge (Herrington & Kew, 2016:4).

Against this background, the research focussed on industrial design students that have unique aptitudes that could stimulate different sectors of the economy, especially the manufacturing and engineering sectors. With this in mind, the study evaluated students in the Three-Dimensional Design (TDD) programme who obtain technical skills and business (business studies and business management) training at Cape Peninsula University of Technology (CPUT) and Tshwane University of Technology (TUT). This research investigated the contribution of the business subjects (business studies and business management) as regard to the entrepreneurial intentions of the student, as well as the nature of implementation of entrepreneurship ideas. This specific group of participants was selected because its members can create their own products or services with their technical skills set; they are not dependent on other sources for a product or service; and are therefore ideal subjects to assess the links between business education, skills, entrepreneurial intentions and the implementation of entrepreneurial knowledge.

Having identified the research gap, the problem statement, research questions and research objectives were as follows:

7.2.1 Problem statement

The problem that this research sought to consider was the twin challenges of a high unemployment rate and very low levels of entrepreneurial intention in South Africa. South Africa has a high rate of youth unemployment and a very low rate of entrepreneurship. The World Bank found that most small and medium enterprises (SMEs) are not hiring or growing their businesses in South Africa (World Bank, 2011:87). According to the Minister of Trade and Industry, (Davies), 70% of all SME's fail in their first year in South Africa (SBP, 2014:2).

As potential entrepreneurs, industrial design students have unique capabilities that can be of value to South Africa in stimulating economic growth and job creation. The

study investigated students in industrial design who obtained technical skills and business management/business studies background at two Universities of Technology, and whether this combination of technical and business skills enables higher entrepreneurship intentions and better entrepreneurship performance. Therefore, the research problem for the study was expressed as:

> *Despite the unique background and capabilities of industrial design students to stimulate economic growth and job creation in South Africa, entrepreneurial intentions of TDD students were not established.*

7.2.2 Research questions

The research questions were formulated as follows:

a. Research Question 1: What are the entrepreneurial intentions of TDD students?

b. Research Question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions?

c. Research Question 3: To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?

7.2.3 Research objectives

The research objectives of the study were to establish the entrepreneurial intent of TDD students (enrolled for the programme in 2015), and to investigate the extent to which entrepreneurial intent in past graduates at TUT (2011 to 2014) transformed into actual businesses.

Primary objective

The primary objective of the study was to establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme TDD in South Africa.

Secondary objectives

The secondary objectives of the study were:

1. To determine the links between business education and entrepreneurial intentions in the undergraduate TDD students for 2015.

2. To investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.

To address the research problem (section 7.2.1), the researcher formulated a research model (Refer to Section 3.8). The model was tested and these tests were reported on in chapter 5 and chapter 6. In the following sections, conclusions and implications of those findings are discussed.

7.3 CONCLUSIONS ON THE RESEARCH QUESTIONS

In this section, the conclusions of the research questions will be discussed.

7.3.1 Research question 1

Research question 1 reads as follows:

What are the entrepreneurial intentions of TDD students?

The study collected quantitative empirical data from Group 1 students. These were students in first, second and third year level of study. This was achieved by using an

adjusted questionnaire from Liñán and Chen (2009) and Liñán, *et al*; (2011b), employing 7-point Likert scale responses. The data was measured against the research model of behavioural intentions based on the TPB (Ajzen, 1985). It was evident that the Group 1 participants were aspiring entrepreneurs, attracted to entrepreneurship as a career, and given the resources, would like to start a business. The study showed that the TPB could be used to measure the entrepreneurial intentions of TDD students at Universities of Technology in South Africa. However, with the exception of personal attitude, the variables of perceived social norms and self-efficacy had no direct relationship with entrepreneurial intentions.

7.3.2 Research question 2

Research question 2 reads as follows:

How does the business subject develop, stimulate and impact on entrepreneurial intentions?

Group 1 participants agreed that the business subjects (business management at TUT and business studies at CPUT) incorporated the theory of business; business relating to industrial design; and practical assignments. Group 1 participants supported that the business subjects (business management and business studies) stimulated entrepreneurial intentions through its effects on self-efficacy. Thus, participants agreed that the business subjects enabled them to identify a business opportunity and the market potential, cost a product, and write a business plan. Ten percent of the Group 2 participants (past graduates from TUT) felt that the business subject (business management) did not stimulate entrepreneurial intentions. Therefore, 90% of the Group 2 participants agreed that the business subject (business management) gave an understanding of what is required to be successful in business; to understand design from a business point of view; to understand intellectual property (IP); and created confidence to start an own business.

Graduates (Group 2 participants) attributed the influence of the completion of the TDD programme and exposure to the business subject (business management) to assisting them to start their own businesses.

7.3.3 Research question 3

Research question 3 reads as follows:

To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?

A total of 45.4% of Group 2 participants started actual businesses, a total of 10 out of 22 (5 are full-time in business and 5 have part-time businesses), and most of the past graduates (Group 2 participants) ascribed the influence of the completion of the TDD programme and exposure to the business subject (business management) to assisting them to start their own businesses. Another 18.2% of Group 2 participants indicated if they had funding, they would start a business.

7.4 CONCLUSIONS ON THE PRIMARY AND SECONDARY OBJECTIVES OF THE RESEARCH

This section presents conclusions on the research objectives.

7.4.1 Primary objective and secondary objective 1

The primary objective aimed to establish the entrepreneurial intent of first, second and third year level industrial design students at Universities of Technology in the programme TDD in South Africa. This objective was tested through the investigation of a research model of entrepreneurial intentions based on Ajzen's (1985) Theory of Planned Behaviour (TPB), and adapted by Liñán and Chen (2009) and Liñán, *et al*; *(*2011b). To test the model, quantitative data were collected from a sample of enrolled students (first, second and third year level students) in the TDD programme at CPUT and TUT, for 2015, which incorporated the business subjects (business

studies and business management). The study observed the links between business education, skills, entrepreneurial intentions and implementation of entrepreneurial knowledge. Particularly, the following were the trends:

a) **Personal attitude (PA):** Participants perceived entrepreneurship as a positive career, indicating a career in entrepreneurship to be attractive to them. Thus, participants had a positive attitude towards starting a business. This suggested that personal attitude (PA) positively related to (predicting) entrepreneurship intention of TDD students at TUT and CPUT. Furthermore, it was also observed that personal attitude mediated the relationship between perceived social norms, self-efficacy, entrepreneurial knowledge and entrepreneurial intention.

b) **Perceived social norms (PSN):** Although perceived social norms were observed to be an insignificant predictor of entrepreneurial intention, participants felt their friends and immediate family would approve of their decision to start a business. Participants also indicated that they would perceive themselves to be successful if they started a business. Perceived social norms moderated the relationship between personal attitudes and entrepreneurial intention.

c) **Self-efficacy (SE):** Participants perceived themselves as very creative, able to recognise an opportunity, solve problems, as possessing leadership abilities and communication skills, and as being able to develop new products and or services. Generally, participants were confident about having entrepreneurial ability, skill activity and capacity. Self-efficacy was observed to mediate the relationship between business education, entrepreneurial knowledge and entrepreneurial intention. This further moderated the relationship between personal attitude and entrepreneurial intention. The above findings suggest the indirect impact of self-efficacy on entrepreneurial intentions. Thus, any increase in perceived self-efficacy might influence students to become entrepreneurs.

d) **Business education subjects:** Business education (that correlated to entrepreneurial knowledge and perceived social norms) was observed to positively influence students' self-efficacy, thus increasing their personal attitude

and entrepreneurship intentions. Participants perceived business education (business management at TUT and business studies at CPUT) as entrepreneurial education. They affirmed the learning of the theory of the business subjects and the performing of practical assignments. Participants perceived it possible to acquire knowledge on the entrepreneurial environment, acquire the required abilities to be an entrepreneur, and the intention to be an entrepreneur from business education (business management and business studies). Participants affirmed that their business management (TUT) and business studies (CPUT) subjects amount to entrepreneurship education. However, they felt that there was insufficient exposure to the business world and to business competitions, as well as to guest speakers.

e) **Entrepreneurial knowledge:** This was tested in the study with questions on knowledge about business associations, support bodies and other sources of assistance for entrepreneurs. It was discovered that participants are not sufficiently aware of business associations, support bodies and the sources of assistance for entrepreneurs. This study indicated that entrepreneurial knowledge is positively related to higher levels of personal attitude and self-efficacy. It suggested entrepreneurial knowledge as indeed an important determinant for entrepreneurial intention, as it has a positive influence on personal attitude and self-efficacy. Therefore, to increase the level of entrepreneurial initiative among industrial design students, it is necessary to increase their entrepreneurial knowledge.

f) **Entrepreneurial intentions:** Participants felt ready and intended to start an own business. They were attracted to entrepreneurship and perceive entrepreneurship as having more advantages than disadvantages. They also perceived entrepreneurship as an attractive career, and agreed that, if given the opportunity and resources, would start a business. Participants agreed that being an entrepreneur would entail great satisfaction; and amongst other options would rather be an entrepreneur. Therefore, it could be argued that participants would like to be entrepreneurs.

Table 7.1 summarises the research objectives, questions, hypotheses and findings.

Table 7.1: Research objectives, questions, hypotheses and findings

Primary objective: To establish the entrepreneurial intent of industrial design students at Universities of Technology in the programme TDD in South Africa.		
Research questions	Hypotheses	Finding
Research question 1: What are the entrepreneurial intentions of TDD students?	Personal attitude H_{01}: Personal attitudes *negatively influence* entrepreneurial intention H_1: Personal attitudes *positively influence* entrepreneurial intention	Personal attitude influenced entrepreneurial intent.
	Perceived social norms H_{02}: Perceived social norms *negatively influence* entrepreneurial intention H_2: Perceived social norms *positively influence* entrepreneurial intention	Perceived social norms did not influence entrepreneurial intent.
	Self-efficacy H_{03}: Self-efficacy *negatively influences* entrepreneurial intention H_3: Self-efficacy *positively influences* entrepreneurial intention	Self-efficacy did not influence entrepreneurial intent.
	Entrepreneurial knowledge H_{04}: Entrepreneurial knowledge is *negatively related to higher levels of* entrepreneurial intention H_4: Entrepreneurial knowledge is *positively related to higher levels of* entrepreneurial intention	Entrepreneurial knowledge did not influence entrepreneurial intent.
	Entrepreneurial knowledge H_{05}: Entrepreneurial knowledge is *negatively related to higher levels of* personal attitudes H_5: Entrepreneurial knowledge is *positively related to higher levels of* personal attitudes	Entrepreneurial knowledge was positively related to personal attitude.
	Entrepreneurial knowledge H_{06}: Entrepreneurial knowledge is *negatively related to higher levels of* perceived social norms H_6: Entrepreneurial knowledge is *positively related to higher levels of* perceived social norms	Entrepreneurial knowledge did not directly influence perceived social norms.

	Entrepreneurial knowledge H_{07}: Entrepreneurial knowledge *is negatively related to higher levels of* self-efficacy H_7: Entrepreneurial knowledge *is positively related to higher levels of* self-efficacy	Entrepreneurial knowledge was positively related to self-efficacy.
Secondary objective 1: To determine the links between business education and entrepreneurial intentions in undergraduate TDD students for 2015.		
Research question 2: How does the business subject develop, stimulate and impact on entrepreneurial intentions?	Business education H_{08}: Business education *is negatively related* to *higher levels of* self-efficacy H_8: Business education is *positively related* to *higher levels of* self-efficacy	Business education is positively related to self-efficacy.
	Business education H_{09}: Business education *negatively influences higher levels of* entrepreneurial intentions H_9: Business education *positively influences higher levels of* entrepreneurial intentions	Business education did not directly influence entrepreneurial intention.
Secondary objective 2: To investigate the extent that entrepreneurial intent in the past graduates transformed into actual business start-ups.		
Research question 3: To what extent did the entrepreneurial intent of past graduates transform into actual business start-ups?	This question was answered with the qualitative method, and for that reason had no hypothesis.	Entrepreneurial intentions transformed into actual businesses. A total of 45.4% of the Group 2 participants started actual businesses.

7.4.2 Secondary objective 2

The revised research model is discussed in section 7.5. Secondary research objective 2 investigated the extent of the translation of entrepreneurial intentions into actual business start-ups. This objective was evaluated by investigating past graduates of the TDD programme at TUT, using qualitative data obtained from interviews with participants. The researcher endeavoured to establish whether exposure to the business subject (business management - TUT) stimulated entrepreneurial intentions; whether the business subject assisted participants in their career and or business; and, whether there was evidence of tangible businesses started by these participants.

It is argued that industrial design students have entrepreneurial intentions that are moderately stimulated by their business subject, providing partial support for the research model of entrepreneurial intentions. Two Group 2 participants started a business whilst still studying towards their TDD diploma. One of the 22 Group 2 participants started a business immediately after completing his/her TDD diploma; three started an own business within six months; two started a business within a year and another two started an own business within 18 months after completing their TDD diploma.

A total of 10 of the 22 Group 2 participants (45.4%) provided support for the translation of entrepreneurial intentions into actual businesses. Their entrepreneurial intentions were stimulated by the exposure to the business subject (business management) as part of the TDD programme (qualification), while also leading to actual business start-ups.

Industrial design is important in a business, and from this study it was concluded that industrial designers start their own businesses.

7.5 CONCLUSIONS ON THE RESEARCH MODEL AND RESEARCH HYPOTHESES

The research model of entrepreneurial intentions was adopted by this research to test the formation of entrepreneurial intentions. The research model incorporated the research hypotheses, which, when tested, provided evidence for support, rejection or modification of the veracity of the research model as an explanatory of entrepreneurial intentions. Sections 1.8 and 3.8 discussed the initial research model which was revised (Figure 7.1), following the hypotheses testing.

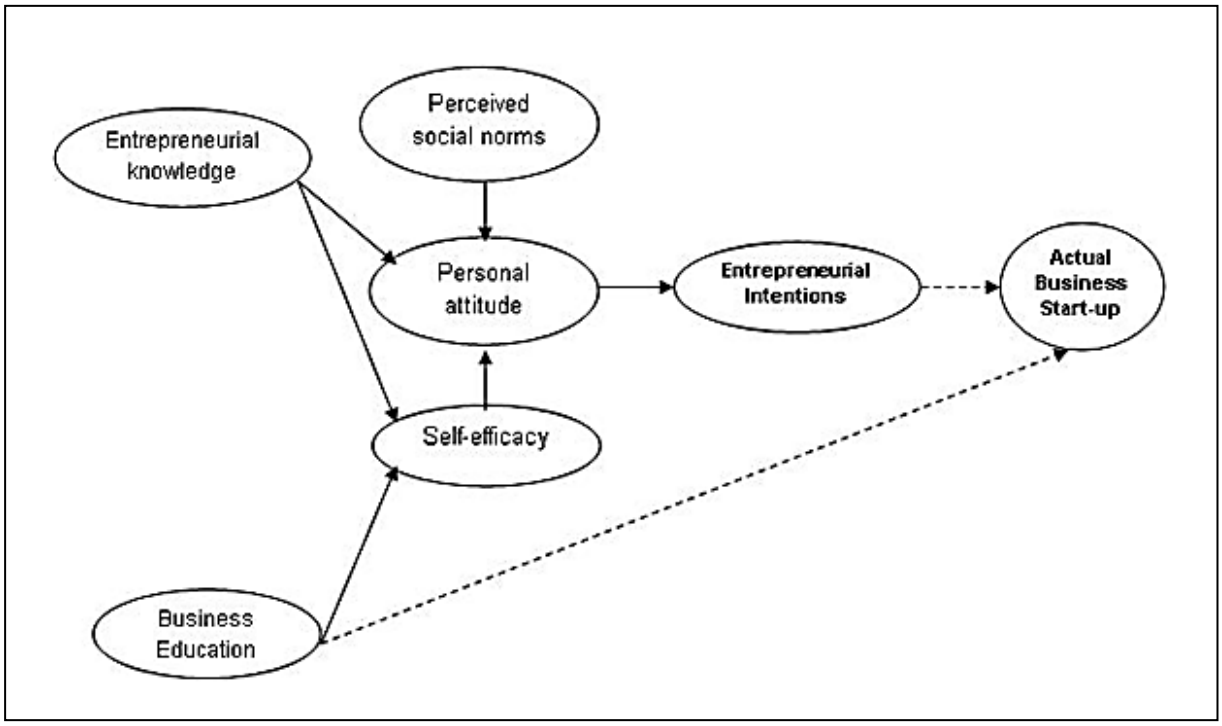

Figure 7.1: Revised research model

The results of the analysis of quantitative empirical data collected from Group 1 participants showed that the variable personal attitude was observed to be positively related to entrepreneurial intention (Coef. 0.615; $p<0.001$). Although perceived social norms and self-efficacy were positively related to entrepreneurial intention, their results failed to reach statistical significance ($p<0.193$ and $p<0.811$) respectively.

Thus, hypothesis 1 (personal attitudes influence entrepreneurial intentions) was accepted and hypotheses 2 (perceived social norms influence entrepreneurial intention), and 3 (self-efficacy influences entrepreneurial intention) were rejected. Entrepreneurial knowledge is positively related to higher levels of personal attitude and self-efficacy with statistical significance ($p<0.001$). On the contrary, it was observed that there was no direct relationship between entrepreneurial knowledge, entrepreneurial intention and perceived social norms. Therefore, hypotheses 4 (entrepreneurial knowledge is related to higher levels of entrepreneurial intention), and 6 (entrepreneurial knowledge is related to higher levels of perceived social norms) were rejected, while hypotheses 5 (entrepreneurial knowledge is related to higher levels of personal attitudes) and 7 (entrepreneurial knowledge is related to higher levels of self-efficacy) were accepted. Lastly, it was observed that business

education is only directly related to higher levels of self-efficacy ($p<0.001$). Hence, hypothesis 8 (business education is related to higher levels of self-efficacy) was accepted, and hypothesis 9 (business education influences higher levels of entrepreneurial intentions) was rejected.

The results suggested that personal attitude towards entrepreneurship directly influences entrepreneurial intentions of students. It also mediated the relationship between perceived social norms and self-efficacy with entrepreneurial intention. This corroborates that attitudes can be observed as the springboard to entrepreneurial intentions. Thus, to increase the level of entrepreneurial projects among students, it is essential to increase positive attitudes towards entrepreneurship.

7.6 IMPLICATIONS AND RECOMMENDATIONS OF THE STUDY

In the next section the implications for the theory of planned behaviour (TPB), Universities of Technology and policy makers will be discussed.

7.6.1 Implications for theory

The empirical evidence partially supported the effectiveness of the TPB in predicting entrepreneurial intentions of TDD students at the Universities of Technology that presented the TDD programme, specifically CPUT and TUT. It must be noted that the model variables perceived social norms and self-efficacy to have no direct relationship with entrepreneurial intention. However, the revised model suggests that personal attitude towards entrepreneurship mediates the relationship between perceived social norms and self-efficacy with entrepreneurial intentions.

Furthermore, this study contributes to the literature around the TPB by concluding that exposure to business education is positively related to self-efficacy, and entrepreneurial knowledge is positively related to higher levels of personal attitude and self-efficacy.

Lastly, the study provided evidence that there is a relationship between entrepreneurial intentions and the actual start-up of a business, as 45.4% of TDD graduates started businesses. Furthermore, the exposure to business education positively influenced the actual start-up of businesses.

7.6.2 Implications for Universities of Technology

Group 1 participants in the study responded positively to the teaching and exposure to business (business management and business studies) subjects. Some Group 1 participants perceived the subject as amounting to entrepreneurship education. CPUT and TUT include both theory and practical components in the TDD programme. Group 1 participants expressed that more practical training is required.

Group 1 participants indicated that the business subjects assisted them to identify the market potential of a product, and to identity a business opportunity. Thus, the business subjects (business management and business studies) equip TDD students to understand the business, identify opportunities, market a product, identify the market potential of a product, writing a business plan, and start a business.

This research supports the viewpoint that universities need to adjust, and be more nurturing of students' entrepreneurial mind-sets and their entrepreneurial actions by developing relevant programmes and subjects. Universities of Technology should evaluate the curriculums of their business subjects to be more relevant to ensure improved synchronisation, and to include entrepreneurship education. The researcher emphasises that entrepreneurship education should be developed, within the specific discipline of study to include the entire range of business disciplines and which are applicable to the student's field of study. This will give the student a better understanding of entrepreneurship in their field of study. It is important as South Africa needs more sustainable businesses that can create jobs.

Group 1 participants were confident in writing a business plan, identifying a business opportunity, able to see the market potential of products, and costing a product. It is

important to note that 51% of Group 1 participants perceived business education (business management and business studies) as entrepreneurship education.

Furtherance, Group 1 participants were also not aware of funding opportunities, and this could be expanded in the subject offering. Group 2 participants started businesses and some 45.4% started an own business (part-time and/or full-time).

Both Group 1 and Group 2 participants suggested the following to improve the business subject: (a) getting industrial designers from industry as guest speakers; (b) more exhibitions and field trips; and (c) creating an understanding amongst the government, the private sector and the public as to what industrial design is. Group 2 participants also suggested that: (a) TDD students should be taught communication skills; (b) the business subject should be expanded; and (c) more exposure is needed to funding opportunities. It is important for Universities of Technology, the learning community, and lecturers, to consider adopting these requests. These inputs and suggestions will enhance the quality of the content of the business subjects; prepare students to find jobs, and to be better employees and entrepreneurs. Industrial design students are creative, and thus have the potential to start-up own businesses. It is therefore important to nurture their entrepreneurial intent so that it can transform into the start-up of actual businesses.

7.6.3 Implications for policy makers

Most of South Africa's early-stage entrepreneurial activity is in the consumer services sector (Herrington & Kew, 2016:37). Group 1 participants mostly intended to work in the industrial manufacturing industry and household goods, the automotive industry, leisure goods, electronic and electrical equipment, and industrial engineering. Group 2 participants worked mostly in the following industries: household goods, industrial manufacturing, leisure goods, home construction and electronic and electrical equipment. It is therefore evident that industrial designers can actively contribute to these sectors, particularly. The TDD students are well placed to contribute to the South African economy and an understanding and awareness of this field of expertise needs to be created. The graduates experienced that the industrial design

field is poorly understood in South Africa. It is argued that an education process is required to make the necessary role players and stakeholders, such as the government, aware of the role that industrial designers could play in the economy. South Africa has talented industrial designers. Industrial designers can also play a role in creating jobs and thus reduce poverty. South Africa has the industrial designers that can be deployed to design products and services to alleviate poverty, by designing products such as Life Straw (see section 2.5).

Industrial designers are creative, can create an own product or service and are entrepreneurial. These attributes can contribute to poverty alleviation, industrial manufacturing and other economic sectors, and assist in the creation of much needed jobs.

In the next section, the limitations of the study will be stated.

7.7 LIMITATIONS OF THE STUDY

While this research considered the effects of business (and entrepreneurship) education on entrepreneurial intentions generally, it was limited to the analysis of a specific category of students, namely industrial design students, and to students within the particular context of South African Universities of Technology only. Therefore, the conclusions from the research may not be applicable to students generally or to students outside of the particular discipline of industrial design or outside of the South African context.

The quantitative study was based on data and represents the 2015 students' views, which limits the ability to process causal outcomes between the variables. The business subjects (business management and business studies) offered were not assessed in total, and a full assessment of the components of the subject matter was outside the scope of this thesis.

The qualitative research was limited to TUT graduates, that successfully completed the TDD programme. The researcher did not have access to graduates from CPUT.

Consequently, qualitative findings and results may not necessarily be generalisable to the effects of the educational environment on entrepreneurial intentions outside the TDD programme of TUT.

In the longitudinal study, Group 2 participants had an interview guide (Appendix C) and did not complete the first questionnaire (Appendix B), measuring entrepreneurial intent. A total of 23.1% of the parents of these respondents were self-employed or entrepreneurs. The question on the sector of employment of parents could have been expanded to determine whether the parents' career influenced the respondents' choice. A limitation of the study was that the influences from parents that were self-employed, or entrepreneurs on their children starting businesses, were not measured. If this was done, it would have improved the research findings immensely.

7.8 AREAS FOR FURTHER RESEARCH

Various areas for further research were identified, and include:

a. Future studies could investigate the shortcomings in entrepreneurial competency amongst university graduates in South Africa and suggest the best ways of addressing them. This can help to design an appropriate pedagogy for business education subjects and programmes that can be integrated coherently into a broad range of curricula and agendas in the existing system in South African Universities of Technology. The business subjects should include entrepreneurship as well, with application of the subject to the relevant field of study of the student.

b. A total of 40.9% of the past graduates (Group 2 participants) completed their TDD programme in 2014, and this study was conducted in 2015. It would also be beneficial to conduct a longitudinal study on the graduates to determine how their businesses had performed.

c. It would be useful to conduct research of a similar nature to this research that draws samples from technical students in South Africa in general, to determine whether there is a sequence and to test the revised model.
d. Studying different sample groups including unemployed graduates, entrepreneurs and professionals might also provide valuable insights. This would be particularly important to educators, practitioners and policy-makers in formulating policy in preparation for a unified entrepreneurship programme.

e. Further research is required on how to improve the actual starting of businesses by students enrolled for entrepreneurship and other programmes.

7.9 CONCLUSION

This research investigated the entrepreneurial intentions of industrial design students enrolled for the TDD programme at two Universities of Technology in South Africa. These students have compulsory subjects in business education (business management and business studies) as part of their qualification. The subjects include entrepreneurship training and business aspects relevant for the industrial designer in a business context. The primary objective of the study was to establish the entrepreneurial intent of industrial design students at Universities of Technology in the TDD programme in South Africa. This specific group of participants was selected, as they can create their own products and/or services with their technical skills, and are therefore ideal subjects to assess the links between the business subject, skills, entrepreneurial intentions and the implementation of entrepreneurial knowledge.

Investigating the research topic contributes to the body of knowledge for a new curriculum for design in entrepreneurship training. Investigating entrepreneurial intentions in technically skilled students could change the thinking regarding entrepreneurial education with important impacts on economic growth and employment. Industrial design is still an unexplored field of study in South Africa, and therefore this study contributes to knowledge in this area. Research on the industries/services that industrial designers operate in South Africa is lacking, and this research aimed to collect data to address this gap in knowledge.

To test the links between entrepreneurship education and entrepreneurial intentions, a research model based on the TPB was adopted and tested using quantitative empirical data collected from students in industrial design at two Universities of Technology. For the most part, results conformed to findings in past research. The empirical evidence partially supported the effectiveness of the TPB in predicting entrepreneurial intentions. Although in the research model variables of perceived social norms and self-efficacy were positively related to entrepreneurial intentions, results failed to reach statistical significance. However, the variable of personal attitude was found to mediate the relationship between these variables and entrepreneurial intention. Whilst business education was positively related to self-efficacy, entrepreneurial knowledge was positively related to higher levels of personal attitude and self-efficacy. It is therefore important not only to teach students, but also to change their attitudes towards entrepreneurship.

The transformation of entrepreneurial intentions into actual business start-ups were described using qualitative empirical data collected from past graduates of the TDD programme. The researcher provided evidence that there is a relationship between entrepreneurial intentions and the actual start-up of a business. Furthermore, business education positively influenced the actual start-up of businesses. However, graduates experienced some challenges in the creation of new businesses, with implications for the teaching of business subjects and for policy-makers. The researcher provided evidence that the completion of the TDD programme result in the building of entrepreneurial knowledge, which lead to the creation of entrepreneurial intentions, and result in the formation of actual businesses.

In the light of the dire problems that are encountered in the South African economy regarding employment, the TDD programme must be recognised as a possible solution to assist in creating jobs in South Africa. In its own way the success that is being generated through this programme could kick-start something much bigger in the South African economy.

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APPENDICES

APPENDIX A: PERMISSION TO USE THE QUESTIONNAIRE

From: Francisco Liñán [flinan@us.es]
Sent: 02 September 2013 12:55 PM
To: Althea Mvula
Subject: Re: entrepreneurial intention questionnaire
Dear,

Thank you for your interest in our work. Please find attached 2 versions of the EIQ and the papers in which they were used. We have developed a more recent version of the questionnaire, but the validation process is not yet finished (should you be interested, please contact me towards the end of the year).

You can use them as you feel is best, but do please acknowledge your source.

Best regards,

--
Prof. Francisco Liñán
Universidad de Sevilla // University of Seville
Av. Ramon y Cajal, 1. 41018 - Sevilla (Spain)
Tel.: +34.954554487. Fax: +34.954551636
Mobile: +34.654982383
Skype: franciscolinanalcalde
Web: http://personal.us.es/flinan
http://institucional.us.es/vie
http://www.master.us.es/masterdemp

APPENDIX B: QUESTIONNAIRE FOR GROUP 1 PARTICIPANTS

Dear Student

Thank you for participating in this study.

This questionnaire is a component of a D Com study at the University of South Africa, **Entrepreneurial intentions and start-up realities: The case of industrial design students in South Africa.** The questionnaire should only take approximately thirty minutes to complete.

Copy right of the English version of the questionnaire vests with Profs F. Liñán, N. Bradley, W. Basuki & D.T. Redford. Some adjustments were made to the questionnaire to accommodate South African circumstances.

Your collaboration will be much appreciated.

Special instructions:

a. When evaluating the questions, please respond from your own viewpoint.
b. Please complete all sections.
c. Please note that your name is not required, hence anonymity is assured.
d. Apply the scale provided where applicable for the relevant questions.
e. Please answer questions honestly.

Thanking you for taking time to participate in this study.

Althea Mvula
Cell number: 079 078 3975
Email: Mvulaae@tut.ac.za

SECTION A

You may indicate your answer by placing a cross (x) in your selected response.

A. Indicate your level of agreement with the following statements about the **Entrepreneurial Activity** from 1 (Strongly disagree) to 7 (Strongly agree).		**Strongly disagree (1)**	**Disagree (2)**	**Somewhat disagree (3)**	**Neutral (4)**	**Somewhat agree (5)**	**Agree (6)**	**Strongly agree (7)**
A01	A career as an entrepreneur is totally unattractive to me	1	2	3	4	5	6	7
A02	My friends would approve of my decision to start a business	1	2	3	4	5	6	7
A03	I am ready to do anything to be an entrepreneur	1	2	3	4	5	6	7
A04	I am creative and can therefore start a new business	1	2	3	4	5	6	7
A05	My immediate family would approve of my decision to start a business	1	2	3	4	5	6	7
A06	I have serious doubts about ever starting my own business	1	2	3	4	5	6	7
A07	Amongst various options, I would rather be anything but an entrepreneur	1	2	3	4	5	6	7
A08	If I start a business, I perceive that I will be successful	1	2	3	4	5	6	7
A09	Being an entrepreneur would give	1	2	3	4	5	6	7

	me great satisfaction							
A10	It would be very difficult for me to create a business idea	1	2	3	4	5	6	7
A11	My professional goal is to be an entrepreneur	1	2	3	4	5	6	7
A12	Being an entrepreneur implies more advantages than disadvantages to me	1	2	3	4	5	6	7
A13	I have a very low intention of ever starting a business	1	2	3	4	5	6	7
A14	I know all about the practical requirements needed to start a business, for example register a business	1	2	3	4	5	6	7

B. Considering all advantages and disadvantages (economic, personal, social recognition, job stability), indicate your level of **attraction towards each of the following** options from 1 (No attraction) to 7 (Extremely attracted).		**No attraction (1)**	**Little attraction (2)**	**Somewhat attracted (3)**	**Neutral (4)**	**Attracted (5)**	**Much attracted (6)**	**Extremely attracted (7)**
B1	Employee	1	2	3	4	5	6	7
B2	Entrepreneur	1	2	3	4	5	6	7

C. How do you rate yourself towards the following **entrepreneurial abilities/skill sets?** Entrepreneurial ability/skills are the abilities you have to create a business. Indicate from 1 (None) to 7 (Expert).		**None** (1)	**Very little** (2)	**Basic** (3)	**Neutral** (4)	**Intermediate** (5)	**Advanced** (6)	**Expert** (7)
C01	Recognition of opportunity	1	2	3	4	5	6	7
C02	Creativity	1	2	3	4	5	6	7
C03	Problem solving skills	1	2	3	4	5	6	7
C04	Leadership and communication skills	1	2	3	4	5	6	7
C05	Development of new products and services	1	2	3	4	5	6	7
C06	Networking skills, and making professional contacts	1	2	3	4	5	6	7

D01	D. Have you ever seriously considered becoming an entrepreneur?	**Yes** (1)	**No** (2)

E. Employment experience		**(1)**	**(2)**	**(3)**
E01	Do you have any employment experience?	**Yes**	**No**	**If Yes, specify** ……

F. Indicate the importance of the following reasons to choose industrial design from 1 (Not at all important) to 7 (Extremely important).		Not at all important (1)	Low important (2)	Slightly important (3)	Neutral (4)	Moderately important (5)	Very important (6)	Extremely important (7)
F01	Career opportunities	1	2	3	4	5	6	7
F02	Advice from family or friends	1	2	3	4	5	6	7
F03	Entrepreneurial opportunity	1	2	3	4	5	6	7

G. Entrepreneurial knowledge	**Do you personally know an entrepreneur or entrepreneurs?**	**Yes (1)**	**No (2)**

If your answer in G was Yes, indicate your **relationship to the person above**, and evaluate the following questions from 1 (Not at all) to 7 (Extremely well).		Not at all (1)	Little bit (2)	Some-what (3)	Partly (4)	Well (5)	Very well (6)	Extremely well (7)
G01	**Family**							
	To what extent do you know about his/her activity as entrepreneur?	1	2	3	4	5	6	7
	To what extent may he/she be considered a 'successful entrepreneur'*?	1	2	3	4	5	6	7
G02	**Friend**							
	To what extent do you know about his/her activity as entrepreneur?	1	2	3	4	5	6	7
	To what extent may he/she be considered a 'successful	1	2	3	4	5	6	7

	entrepreneur'*?							
G03	**Employer / Manager**							
	To what extent do you know about his/her activity as entrepreneur?	1	2	3	4	5	6	7
	To what extent may he/she be considered a 'successful entrepreneur'*?	1	2	3	4	5	6	7
G04	**Other**							
	To what extent do you know about his/her activity as entrepreneur?	1	2	3	4	5	6	7
	To what extent may he/she be considered a 'successful entrepreneur'*?	1	2	3	4	5	6	7

***Successful entrepreneur is an entrepreneur that owns a profitable business**

Indicate your level of knowledge about business associations, support bodies and other **sources of assistance for entrepreneurs** from 1 (No knowledge) to 7 (Extremely knowledgeable).		**No knowledge (1)**	**Little knowledge (2)**	**Some knowledge (3)**	**Basic knowledge (4)**	**Moderate knowledge (5)**	**Complete knowledge (6)**	**Extremely knowledgeable (7)**
GG01	Private associations (e.g. Business Partners, etc.)	1	2	3	4	5	6	7
GG02	Public support bodies for example the National Youth Development Agency (NYDA)	1	2	3	4	5	6	7
GG03	Specific training for young entrepreneurs	1	2	3	4	5	6	7
GG04	Loans at favourable interest rates	1	2	3	4	5	6	7

GG05	Technical aid for business start-ups, for example the SABS Design Institute	1	2	3	4	5	6	7
GG06	Business centres	1	2	3	4	5	6	7
GG07	Consulting services at discounted rates	1	2	3	4	5	6	7

H. To what extent do you agree with the following statements regarding your **entrepreneurial capacity**, indicate from 1 (Strongly disagree) to 7 (Strongly agree).		**Strongly disagree (1)**	**Disagree (2)**	**Somewhat disagree (3)**	**Neutral (4)**	**Somewhat agree (5)**	**Agree (6)**	**Strongly agree (7)**
H01	Start a business and keep it operational would be easy for me	1	2	3	4	5	6	7
H02	I'm prepared to start a profitable business	1	2	3	4	5	6	7
H03	I am creative and can control the creation process of starting a new business	1	2	3	4	5	6	7
H04	I know the necessary practical procedures to start a business	1	2	3	4	5	6	7
H05	I know how to develop an entrepreneurial project	1	2	3	4	5	6	7
H06	If I tried to start a business, I would have a high probability of succeeding	1	2	3	4	5	6	7

I. Entrepreneurial objectives	If you ever start a business, what size would you like it to ultimately achieve (number of employees)?	Self-employed (No employees) (1)	Micro-enterprise (1 to 5 employees) (2)	Very small business (6 to 10 employees) (3)	Small business (11-50 Employees) (4)	Medium business (51 to 200 employees) (5)	Large business (201+ employees) (6)

To what extent do you consider the following factors to contribute to entrepreneurial success? Indicate from 1 (Not at all important) to 7 (Extremely important).		Not at all important (1)	Low important (2)	Slightly important (3)	Neutral (4)	Moderate-ly important (5)	Very important (6)	Extremely important (7)
I01	Competing effectively in world markets	1	2	3	4	5	6	7
I02	Reaching a high level of income	1	2	3	4	5	6	7
I03	Doing the kind of job I really enjoy	1	2	3	4	5	6	7
I04	Achieving social recognition	1	2	3	4	5	6	7
I05	Helping to solve the problems of my community	1	2	3	4	5	6	7
I06	Keeping the business alive	1	2	3	4	5	6	7
I07	Keeping a path of positive growth	1	2	3	4	5	6	7
I08	How important would it be for you to continuously develop and grow your business?	1	2	3	4	5	6	7

To what extent would you use the following strategies to expand your business? Indicate from 1 (Extremely unlikely) to 7 (Extremely likely).		Extremely unlikely (1)	Somewhat unlikely (2)	Unlikely (3)	Neutral (4)	Somewhat likely (5)	Likely (6)	Extremely likely (7)
I001	Exporting a significant share of production	1	2	3	4	5	6	7
I002	Regularly introduce new products/services for my customers	1	2	3	4	5	6	7

I003	Regularly introduce new processes or systems of production	1	2	3	4	5	6	7
I004	Developing research and development projects	1	2	3	4	5	6	7
I005	Reaching cooperative agreements or partnerships with other businesses	1	2	3	4	5	6	7
I006	Offering specialised training for employees	1	2	3	4	5	6	7
I007	Growing your business (personnel, premises, etc.)	1	2	3	4	5	6	7

J. Which industry or service would you like to start your business in? (You may choose more than one option)		
J01	Mining	1
J02	Energy	2
J03	Health care equipment	3
J04	Industrial manufacturing	4
J05	Land and agriculture	5
J06	Media and advertising	6
J07	Green business	7
J08	Property	8
J09	Retail & consumer	9
J10	Telecoms and technology	10
J11	Transport, tourism and leisure	11
J12	Automotive industry	12
J13	Chemicals	13
J14	Household goods	14
J15	Home construction	15
J16	Leisure goods	16
J17	Construction and materials	17
J18	Electronic and electrical equipment	18

J19	Technology: Software and computer services	19
J20	Technology: Hardware and equipment	20
J21	Industrial engineering	21
J22	Other, specify ……	22

K. What would you like to do immediately after completing the diploma? Value the following options from 1 (Not a priority) to 7 (Essential priority).		**Not a priority (1)**	**Low priority (2)**	**Somewhat priority (3)**	**Neutral (4)**	**Moderate priority (5)**	**High priority (6)**	**Essential priority (7)**
K01	Working as an employee	1	2	3	4	5	6	7
K02	Starting-up a business	1	2	3	4	5	6	7
K03	Continue with post graduate studies	1	2	3	4	5	6	7

In the medium and longer term, considering all advantages and disadvantages (economic, personal, social recognition, labour stability), indicate your level of attraction towards each of the following professional options from 1 (No attraction) to 7 (Extremely attracted).		**No attraction (1)**	**Little attraction (2)**	**Somewhat attracted (3)**	**Neutral (4)**	**Attracted (5)**	**Much attracted (6)**	**Extremely attracted (7)**
K001	Working as a salaried employee	1	2	3	4	5	6	7
K002	Working as a consultant	1	2	3	4	5	6	7
K003	Entrepreneur/Starting your own business	1	2	3	4	5	6	7

Indicate your level of agreement with the following statements from 1 (Strongly disagree) to 7 (Strongly agree).		**Strongly disagree (1)**	**Disagree (2)**	**Somewhat disagree (3)**	**Neutral (4)**	**Somewhat agree (5)**	**Agree (6)**	**Strongly agree (7)**
KK01	Being an entrepreneur implies more advantages than disadvantages to me	1	2	3	4	5	6	7
KK02	A career as entrepreneur is attractive for me	1	2	3	4	5	6	7
KK03	If I had the opportunity and resources, I'd like to start a business	1	2	3	4	5	6	7
KK04	Being an entrepreneur would entail great satisfaction for me	1	2	3	4	5	6	7
KK05	Among various options, I'd rather be an entrepreneur	1	2	3	4	5	6	7

L. To what extent do you think it is possible to offer **entrepreneurship education** courses which develop the following aspects? Indicate from 1 (Not possible) to 7 (Extremely possible).		**Not possible (1)**	**Low possibility (2)**	**Slightly possible (3)**	**Neutral (4)**	**Moderately possible (5)**	**Very possible (6)**	**Extremely possible (7)**
L01	Knowledge about the entrepreneurial environment	1	2	3	4	5	6	7
L02	Greater recognition of the entrepreneur's role	1	2	3	4	5	6	7
L03	The necessary abilities to be an entrepreneur	1	2	3	4	5	6	7
L04	The intention to be an entrepreneur	1	2	3	4	5	6	7

L05	**Have you taken any course or module that could be considered as entrepreneurship education?**	**Yes (1)**	**No (2)**	**Indicate which course/module** ……

Do you have the following in your business subject?		Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neutral (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
L001	Theory of business management	1	2	3	4	5	6	7
L002	Relating the business subject to Industrial Design	1	2	3	4	5	6	7
L003	Practical assignments	1	2	3	4	5	6	7
L004	Guest speakers / lectures	1	2	3	4	5	6	7
L005	Competitions and exposure to business world	1	2	3	4	5	6	7

Business Education		Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neutral (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
LL01	I can identify a business opportunity	1	2	3	4	5	6	7
LL02	I can see the market potential for a product	1	2	3	4	5	6	7
LL03	I can do the costing of a product	1	2	3	4	5	6	7
LL04	I can write a business plan	1	2	3	4	5	6	7
LL05	I can set up a factory	1	2	3	4	5	6	7

SECTION B: DEMOGRAPHICS AND OTHER QUESTIONS

1. How old are you?

17 – 29 years	**1**
30 – 39 years	**2**
40 – 49 years	**3**
50 + years	**4**

2. What is your gender?

Male	**1**
Female	**2**

3. What is your level of study?

First year	**1**
Second year	**2**
Third year	**3**

4. What is your ethnic group?

African	**1**
Indian	**2**
Coloured	**3**
White	**4**
Other, Specify.....	**5**

5. Which place were you born?

Town	
Province	

6. Current place of residence?

Town	
Province	

7. What level of education have your parents achieved?

7.1 Father

Primary	**1**
Secondary	**2**
Tertiary	**3**
Postgraduate	**4**
Other, specify.....	**5**

7.2 Mother

Primary	**1**
Secondary	**2**
Tertiary	**3**
Postgraduate	**4**
Other, specify.....	**5**

8. In which sector are your parents employed?

8.1 Father

Private sector	**1**
Public sector	**2**
Self-employed or entrepreneur	**3**
Retired	**4**
Unemployed	**5**
Other, specify.....	**6**

8.2 Mother

Private sector	**1**
Public sector	**2**
Self-employed or entrepreneur	**3**
Retired	**4**
Unemployed	**5**
Other, specify.....	**6**

9. How many people are living in your household?

10. Estimate the total monthly income in your household
(adding up all revenues from any person living in the household)

Up to R5 000	**1**
Between R5 001 and R10 000	**2**
Between R10 001 and R20 000	**3**
Between R20 001 and R40 000	**4**
Between R40 001 and R70 000	**5**
Between R70 001 and R100 000	**6**
More than R100 001	**7**

The End! Thank you!

APPENDIX C: INTERVIEW GUIDE FOR GROUP 2 PARTICIPANTS

Dear Student

Thank you for participating in this study.

This interview guide is a component of a D Com study at the University of South Africa, **Entrepreneurial intentions and start-up realities: The case of industrial design students in South Africa.** The interview should only take approximately thirty minutes to complete.

Your collaboration will be much appreciated.

Special Instructions:

a. When evaluating the questions, please respond from your own viewpoint.
b. Please complete all sections.
c. Please note that your name is not required, hence anonymity is assured.
d. Apply the scale provided where applicable for the relevant questions.
e. Please answer questions honestly.

Thanking you for taking time to participate in this study.

Althea Mvula
Cell number: 079 078 3975
Email: Mvulaae@tut.ac.za

SECTION A

M001	**When did you complete your studies? (year)**	

M. At which institution did you study for your programme in Three-Dimensional Design?		
M01	CPUT	1
M02	TUT	2
M03	UJ	3

M002	**Are you based in South Africa?**	**Yes** **(1)**	**No** **(2)**	**If No, specify country** ……

M003	**If not situated in South Africa – why did you leave the country?**	**Please specify reason(s)** ..…… ……...

M. If you are based in South Africa – indicate in which province are you based?		
M0001	Gauteng	1
M0002	Western Cape	2
M0003	Northern Cape	3
M0004	Free State	4
M0005	Mpumalanga	5
M0006	Limpopo	6
M0007	North West	7
M0008	Eastern Cape	8
M0009	KwaZulu Natal	9

N. What is your current employment status? You can select more than one answer in this section		
N01	Own business	1
N02	Work for a business / an organisation	2
N03	Work for government	3
N04	Work for a business / an organisation and has an own business	4
N05	Unemployed	5
N06	Other, please specify ……	6

N001	Are you currently employed?	Yes (1)	No (2)	Other (Specify), for example, are you part-time or full-time employed ……

N002	If you are employed, what was the duration from the time you completed your studies till you found employment? (Estimate in weeks, months and/or years)	....

N003	What was the duration from the time you completed your studies till you started your business? (Estimate in weeks, months and/or years)	....

N004	What are the core functions of your business?	

N005	How many people do you employ?	Full-time employees	Part-time employees

P. Where do you operate your business from?		
P01	Garage/Home	1
P02	Office	2
P03	Factory	3
P04	Other, specify	4

R. Which industry or service did you start your business in? (You may choose more than one option)		
R01	Mining	1
R02	Energy	2
R03	Health care equipment	3
R04	Industrial manufacturing	4
R05	Land and agriculture	5
R06	Media and advertising	6
R07	Green business	7
R08	Property	8
R09	Retail & consumer	9
R10	Telecoms and technology	10
R11	Transport, tourism and leisure	11
R12	Automotive industry	12
R13	Chemicals	13
R14	Household goods	14
R15	Home construction	15
R16	Leisure goods	16
R17	Construction and materials	17
R18	Electronic and electrical equipment	18
R19	Technology: Software and computer services	19
R20	Technology: Hardware and equipment	20
R21	Industrial engineering	21
R22	Other, specify ………………………………………………………………… …………………………………………………………………	22

S001	**When you started your studies you had your career goals that you set out to achieve for your future after your diploma. Did you achieve your goals?**	**Yes** **(1)**	**No** **(2)**	**If No, please specify** ………………………… ………………………… …………………………

S002	**Did the business subjects assist you in your career and/or business?**	**Yes** **(1)**	**No** **(2)**	**Please motivate your answer.** …………………………… ……………………………

S003	**Did you find employment easy?**	**Yes** **(1)**	**No** **(2)**	**Please motivate your answer.** …… ……

S004	**Did you find it easy to start a business?**	**Yes** **(1)**	**No** **(2)**	**Please motivate your answer.** …….. …….....

S005	**Do you have any recommendation(s) to improve the role that industrial designers can play in SA?**	…… …….....

S006	**Do you have any input on how to improve the industrial design business education subject?**	…….. .....…….....

SECTION B: DEMOGRAPHICS AND OTHER QUESTIONS

1. How old are you?

17 – 29 years	**1**
30 – 39 years	**2**
40 – 49 years	**3**
50 + years	**4**

2. What is your gender?

Male	**1**
Female	**2**

3. What is your level of study?

First year	**1**
Second year	**2**
Third year	**3**

4. What is your ethnic group?

African	**1**
Indian	**2**
Coloured	**3**
White	**4**
Other, specify.....	**5**

5. Which place were you born?

Town	
Province	

6. Current place of residence?

Town	
Province	

7. What level of education have your parents achieved?

7.1 Father

Primary	**1**
Secondary	**2**
Tertiary	**3**
Postgraduate	**4**
Other, specify.....	**5**

7.2 Mother

Primary	**1**
Secondary	**2**
Tertiary	**3**
Postgraduate	**4**
Other, specify.....	**5**

8. In which sector are your parents employed?

8.1 Father

Private sector	**1**
Public sector	**2**
Self-employed or entrepreneur	**3**
Retired	**4**
Unemployed	**5**
Other, specify.....	**6**

8.2 Mother

Private sector	**1**
Public sector	**2**
Self-employed or entrepreneur	**3**
Retired	**4**
Unemployed	**5**
Other, specify.....	**6**

9. How many people are living in your household?

10. Estimate the total monthly income in your household
(adding up all revenues from any person living in the household)

Up to R5 000	**1**
Between R5 001 and R10 000	**2**
Between R10 001 and R20 000	**3**
Between R20 001 and R40 000	**4**
Between R40 001 and R70 000	**5**
Between R70 001 and R100 000	**6**
More than R100 001	**7**

The End! Thank you!

APPENDIX D: TEST FOR ASSOCIATION OF GROUP 1 PARTICIPANTS

AO1	Institution TUT	CPUT	Total
Strongly disagree	31	34	65
	47.69	52.31	100.00
Disagree	14	25	39
	35.90	64.10	100.00
Somewhat disagree	2	7	9
	22.22	77.78	100.00
neutral	3	13	16
	18.75	81.25	100.00
Somewhat agree	0	6	6
	0.00	100.00	100.00
Agree	1	2	3
	33.33	66.67	100.00
Strongly agree	2	4	6
	33.33	66.67	100.00
Total	53	91	144
	36.81	63.19	100.00

Pearson chi2(6) = 9.9327 Pr = 0.128

Institution and AO1 are not significantly associated (p = 0.128). That is, the proportions of participants in TUT to the proportion of participants in CPUT are not significantly different. Thus, TUT and CPUT did not differ significantly as to how they responded to AO1.

	Institution	
AO2	TUT	CPUT	Total
strongly disagree	2	2	4
	50.00	50.00	100.00
disagree	3	1	4
	75.00	25.00	100.00
somewhat disagree	0	1	1
	0.00	100.00	100.00
neutral	4	9	13
	30.77	69.23	100.00
somewhat agree	5	6	11
	45.45	54.55	100.00
agree	11	38	49
	22.45	77.55	100.00
strongly agree	28	34	62
	45.16	54.84	100.00
Total	53	91	144
	36.81	63.19	100.00

Pearson chi2(6) = 10.1513 Pr = 0.118

Institution and AO2 are not significantly associated (p = 0.118).

	Instituion	
AO3	TUT	CPUT	Total
strongly disagree	1	3	4
	25.00	75.00	100.00
disagree	1	5	6
	16.67	83.33	100.00
somewhat disagree	1	6	7
	14.29	85.71	100.00
neutral	10	21	31
	32.26	67.74	100.00
somewhat agree	9	20	29
	31.03	68.97	100.00
agree	11	18	29
	37.93	62.07	100.00
strongly agree	20	18	38
	52.63	47.37	100.00
Total	53	91	144
	36.81	63.19	100.00

Pearson chi2(6) = 7.6109 Pr = 0.268

	Institution	
AO4	TUT	CPUT	Total
strongly disagree	1	0	1
	100.00	0.00	100.00
disagree	0	4	4

```
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          4 |         5
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
          neutral |         3         11 |        14
                  |     21.43      78.57 |    100.00
------------------+----------------------+----------
   somewhat agree |         3         18 |        21
                  |     14.29      85.71 |    100.00
------------------+----------------------+----------
            agree |        15         30 |        45
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
   strongly agree |        30         25 |        55
                  |     54.55      45.45 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =  18.3803   Pr = 0.005
```

Institution and AO4 are significantly associated (p = 0.005). The proportions of TUT to the proportions of CPUT are significantly different in the levels of AO4. Therefore, TUT and CPUT responded differently.

```
->  tab AO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+
```

```
                  |      Instituion
              AO5 |       TUT       CPUT |     Total
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         4          4 |         8
                  |     50.00      50.00 |    100.00
------------------+----------------------+----------
          neutral |         6          4 |        10
                  |     60.00      40.00 |    100.00
------------------+----------------------+----------
   somewhat agree |         7         12 |        19
                  |     36.84      63.16 |    100.00
------------------+----------------------+----------
            agree |        13         27 |        40
                  |     32.50      67.50 |    100.00
------------------+----------------------+----------
   strongly agree |        22         44 |        66
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(5) =   4.1589   Pr = 0.527

->  tab AO6 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              AO6 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |        14         16 |        30
                  |     46.67      53.33 |    100.00
------------------+----------------------+----------
         disagree |        16         32 |        48
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
somewhat disagree |         7         14 |        21
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
          neutral |         7         14 |        21
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
   somewhat agree |         6          6 |        12
                  |     50.00      50.00 |    100.00
------------------+----------------------+----------
            agree |         2          8 |        10
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
   strongly agree |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   3.8560   Pr = 0.696

->  tab AO7 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              AO7 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |        24          16 |        40
                  |     60.00      40.00 |    100.00
------------------+----------------------+----------
         disagree |         7          33 |        40
                  |     17.50      82.50 |    100.00
------------------+----------------------+----------
somewhat disagree |         6           8 |        14
                  |     42.86      57.14 |    100.00
------------------+----------------------+----------
          neutral |         7          25 |        32
                  |     21.88      78.13 |    100.00
------------------+----------------------+----------
   somewhat agree |         2           4 |         6
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
            agree |         3           4 |         7
                  |     42.86      57.14 |    100.00
------------------+----------------------+----------
   strongly agree |         2           2 |         4
                  |     50.00      50.00 |    100.00
------------------+----------------------+----------
            Total |        51          92 |       143
                  |     35.66      64.34 |    100.00

          Pearson chi2(6) =  19.5741   Pr = 0.003

->  tab AO8 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              AO8 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
          neutral |         2         11 |        13
                  |     15.38      84.62 |    100.00
------------------+----------------------+----------
   somewhat agree |         7         19 |        26
                  |     26.92      73.08 |    100.00
------------------+----------------------+----------
            agree |        21         40 |        61
                  |     34.43      65.57 |    100.00
------------------+----------------------+----------
   strongly agree |        22         17 |        39
                  |     56.41      43.59 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =  11.6839   Pr = 0.069

->  tab AO9 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              AO9 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         0          3 |         3
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          neutral |         4         11 |        15
                  |     26.67      73.33 |    100.00
------------------+----------------------+----------
   somewhat agree |         9         14 |        23
                  |     39.13      60.87 |    100.00
------------------+----------------------+----------
            agree |        12         30 |        42
                  |     28.57      71.43 |    100.00
------------------+----------------------+----------
   strongly agree |        28         30 |        58
                  |     48.28      51.72 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   9.3216   Pr = 0.156

->  tab AO10 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             AO10 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |        16         15 |        31
                  |     51.61      48.39 |    100.00
------------------+----------------------+----------
         disagree |        19         32 |        51
                  |     37.25      62.75 |    100.00
------------------+----------------------+----------
somewhat disagree |         6         11 |        17
                  |     35.29      64.71 |    100.00
------------------+----------------------+----------
          neutral |         3         17 |        20
                  |     15.00      85.00 |    100.00
------------------+----------------------+----------
   somewhat agree |         4         10 |        14
                  |     28.57      71.43 |    100.00
------------------+----------------------+----------
            agree |         1          6 |         7
                  |     14.29      85.71 |    100.00
------------------+----------------------+----------
   strongly agree |         2          1 |         3
                  |     66.67      33.33 |    100.00
------------------+----------------------+----------
            Total |        51         92 |       143
                  |     35.66      64.34 |    100.00

          Pearson chi2(6) =  10.1739   Pr = 0.118

->  tab AO11 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             AO11 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |         2          3 |         5
                  |     40.00      60.00 |    100.00
------------------+----------------------+----------
         disagree |         1          9 |        10
                  |     10.00      90.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         3          6 |         9
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
          neutral |        14         23 |        37
                  |     37.84      62.16 |    100.00
------------------+----------------------+----------
   somewhat agree |         6         17 |        23
                  |     26.09      73.91 |    100.00
------------------+----------------------+----------
            agree |        13         23 |        36
                  |     36.11      63.89 |    100.00
------------------+----------------------+----------
   strongly agree |        14         11 |        25
                  |     56.00      44.00 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   8.2985   Pr = 0.217

->  tab AO12 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             AO12 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
         disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          4 |         5
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
          neutral |         8         22 |        30
                  |     26.67      73.33 |    100.00
------------------+----------------------+----------
   somewhat agree |        13         22 |        35
                  |     37.14      62.86 |    100.00
------------------+----------------------+----------
            agree |        10         23 |        33
                  |     30.30      69.70 |    100.00
------------------+----------------------+----------
   strongly agree |        20         14 |        34
                  |     58.82      41.18 |    100.00
------------------+----------------------+----------
            Total |        53         90 |       143
                  |     37.06      62.94 |    100.00

          Pearson chi2(6) =  10.9900   Pr = 0.089

->  tab AO13 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             AO13 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |        23          22 |        45
                  |     51.11      48.89 |    100.00
------------------+----------------------+----------
         disagree |        18          37 |        55
                  |     32.73      67.27 |    100.00
------------------+----------------------+----------
somewhat disagree |         7           8 |        15
                  |     46.67      53.33 |    100.00
------------------+----------------------+----------
          neutral |         3          15 |        18
                  |     16.67      83.33 |    100.00
------------------+----------------------+----------
   somewhat agree |         2           5 |         7
                  |     28.57      71.43 |    100.00
------------------+----------------------+----------
            agree |         0           2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
   strongly agree |         0           2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
            Total |        53          91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  10.6523   Pr = 0.100

->  tab AO14 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             AO14 |       TUT       CPUT |     Total
------------------+----------------------+----------
```

```
strongly disagree |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
         disagree |         3         15 |        18
                  |     16.67      83.33 |    100.00
------------------+----------------------+----------
somewhat disagree |         3         12 |        15
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
          neutral |         6         19 |        25
                  |     24.00      76.00 |    100.00
------------------+----------------------+----------
   somewhat agree |         8         22 |        30
                  |     26.67      73.33 |    100.00
------------------+----------------------+----------
            agree |        21         12 |        33
                  |     63.64      36.36 |    100.00
------------------+----------------------+----------
   strongly agree |        11         10 |        21
                  |     52.38      47.62 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =  20.5239   Pr = 0.002

->  tab B1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                   |      Instituion
                B1 |       TUT       CPUT |     Total
-------------------+----------------------+----------
```

```
        No traction |         6          2 |         8
                    |     75.00      25.00 |    100.00
--------------------+----------------------+----------
   Litte attraction |        12         10 |        22
                    |     54.55      45.45 |    100.00
--------------------+----------------------+----------
 Somewhat attracted |         4         16 |        20
                    |     20.00      80.00 |    100.00
--------------------+----------------------+----------
            Neutral |        12         31 |        43
                    |     27.91      72.09 |    100.00
--------------------+----------------------+----------
           Atracted |         9         20 |        29
                    |     31.03      68.97 |    100.00
--------------------+----------------------+----------
     much attracted |         7         11 |        18
                    |     38.89      61.11 |    100.00
--------------------+----------------------+----------
extremely attracted |         2          2 |         4
                    |     50.00      50.00 |    100.00
--------------------+----------------------+----------
              Total |        52         92 |       144
                    |     36.11      63.89 |    100.00

          Pearson chi2(6) =  12.7079   Pr = 0.048

->  tab B2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                    |      Instituion
                 B2 |       TUT       CPUT |     Total
--------------------+----------------------+----------
```

```
   Litte attraction |         0          3 |         3
                    |      0.00     100.00 |    100.00
-------------------+----------------------+----------
 Somewhat attracted |         0          2 |         2
                    |      0.00     100.00 |    100.00
-------------------+----------------------+----------
            Neutral |         5         16 |        21
                    |     23.81      76.19 |    100.00
-------------------+----------------------+----------
           Atracted |        10         20 |        30
                    |     33.33      66.67 |    100.00
-------------------+----------------------+----------
     much attracted |        17         28 |        45
                    |     37.78      62.22 |    100.00
-------------------+----------------------+----------
extremely attracted |        20         23 |        43
                    |     46.51      53.49 |    100.00
-------------------+----------------------+----------
              Total |        52         92 |       144
                    |     36.11      63.89 |    100.00

          Pearson chi2(5) =   6.3742   Pr = 0.271

->  tab CO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

             |      Instituion
         CO1 |       TUT       CPUT |     Total
-------------+----------------------+----------
  Very Litte |         0          1 |         1
             |      0.00     100.00 |    100.00
-------------+----------------------+----------
```

```
       Basic |         0          4 |         4
             |      0.00     100.00 |    100.00
-------------+----------------------+----------
     Neutral |         3         11 |        14
             |     21.43      78.57 |    100.00
-------------+----------------------+----------
Intermediate |        24         42 |        66
             |     36.36      63.64 |    100.00
-------------+----------------------+----------
    Advanced |        17         33 |        50
             |     34.00      66.00 |    100.00
-------------+----------------------+----------
      Expert |         9          1 |        10
             |     90.00      10.00 |    100.00
-------------+----------------------+----------
       Total |        53         92 |       145
             |     36.55      63.45 |    100.00

          Pearson chi2(5) =  16.7205   Pr = 0.005

->  tab CO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

             |      Instituion
         CO2 |       TUT       CPUT |     Total
-------------+----------------------+----------
       Basic |         2          0 |         2
             |    100.00       0.00 |    100.00
-------------+----------------------+----------
     Neutral |         0          5 |         5
             |      0.00     100.00 |    100.00
-------------+----------------------+----------
```

```
Intermediate |         3         23 |        26
             |     11.54      88.46 |    100.00
-------------+----------------------+----------
    Advanced |        27         47 |        74
             |     36.49      63.51 |    100.00
-------------+----------------------+----------
      Expert |        21         17 |        38
             |     55.26      44.74 |    100.00
-------------+----------------------+----------
       Total |        53         92 |       145
             |     36.55      63.45 |    100.00

          Pearson chi2(4) =  19.1034   Pr = 0.001

->  tab CO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

             |      Instituion
         CO3 |       TUT       CPUT |     Total
-------------+----------------------+----------
  Very Litte |         1          1 |         2
             |     50.00      50.00 |    100.00
-------------+----------------------+----------
       Basic |         0          1 |         1
             |      0.00     100.00 |    100.00
-------------+----------------------+----------
     Neutral |         3          5 |         8
             |     37.50      62.50 |    100.00
-------------+----------------------+----------
Intermediate |        13         19 |        32
             |     40.63      59.38 |    100.00
-------------+----------------------+----------
```

```
    Advanced |        22         45 |        67
             |     32.84      67.16 |    100.00
-------------+----------------------+----------
      Expert |        14         21 |        35
             |     40.00      60.00 |    100.00
-------------+----------------------+----------
       Total |        53         92 |       145
             |     36.55      63.45 |    100.00

          Pearson chi2(5) =   1.5425   Pr = 0.908

->  tab CO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

             |      Instituion
         CO4 |       TUT       CPUT |     Total
-------------+----------------------+----------
        None |         1          0 |         1
             |    100.00       0.00 |    100.00
-------------+----------------------+----------
  Very Litte |         0          2 |         2
             |      0.00     100.00 |    100.00
-------------+----------------------+----------
       Basic |         2          2 |         4
             |     50.00      50.00 |    100.00
-------------+----------------------+----------
     Neutral |         7         10 |        17
             |     41.18      58.82 |    100.00
-------------+----------------------+----------
Intermediate |        14         29 |        43
             |     32.56      67.44 |    100.00
-------------+----------------------+----------
```

```
    Advanced |        17         38 |        55
             |     30.91      69.09 |    100.00
-------------+----------------------+----------
      Expert |        12         11 |        23
             |     52.17      47.83 |    100.00
-------------+----------------------+----------
       Total |        53         92 |       145
             |     36.55      63.45 |    100.00

          Pearson chi2(6) =   6.8279   Pr = 0.337

->  tab CO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

             |      Instituion
         CO5 |       TUT       CPUT |     Total
-------------+----------------------+----------
  Very Litte |         0          1 |         1
             |      0.00     100.00 |    100.00
-------------+----------------------+----------
       Basic |         1          3 |         4
             |     25.00      75.00 |    100.00
-------------+----------------------+----------
     Neutral |         2          8 |        10
             |     20.00      80.00 |    100.00
-------------+----------------------+----------
Intermediate |        18         29 |        47
             |     38.30      61.70 |    100.00
-------------+----------------------+----------
    Advanced |        20         42 |        62
             |     32.26      67.74 |    100.00
-------------+----------------------+----------
```

```
      Expert |        12          9 |        21
             |     57.14      42.86 |    100.00
-------------+----------------------+----------
       Total |        53         92 |       145
             |     36.55      63.45 |    100.00

          Pearson chi2(5) =   6.3815   Pr = 0.271

->  tab CO6 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

             |      Instituion
         CO6 |       TUT       CPUT |     Total
-------------+----------------------+----------
        None |         1          0 |         1
             |    100.00       0.00 |    100.00
-------------+----------------------+----------
  Very Litte |         2          3 |         5
             |     40.00      60.00 |    100.00
-------------+----------------------+----------
       Basic |         4          6 |        10
             |     40.00      60.00 |    100.00
-------------+----------------------+----------
     Neutral |         8         19 |        27
             |     29.63      70.37 |    100.00
-------------+----------------------+----------
Intermediate |        17         29 |        46
             |     36.96      63.04 |    100.00
-------------+----------------------+----------
    Advanced |        11         23 |        34
             |     32.35      67.65 |    100.00
-------------+----------------------+----------
```

```
      Expert |        10         12 |        22
             |     45.45      54.55 |    100.00
-------------+----------------------+----------
       Total |        53         92 |       145
             |     36.55      63.45 |    100.00

          Pearson chi2(6) =   3.3842   Pr = 0.759

->  tab DO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

           |      Instituion
       DO1 |       TUT       CPUT |     Total
-----------+----------------------+----------
       Yes |        46         70 |       116
           |     39.66      60.34 |    100.00
-----------+----------------------+----------
        No |         7         20 |        27
           |     25.93      74.07 |    100.00
-----------+----------------------+----------
     Total |        53         90 |       143
           |     37.06      62.94 |    100.00

          Pearson chi2(1) =   1.7698   Pr = 0.183

->  tab EO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
```

```
+----------------+

           |      Instituion
       EO1 |       TUT       CPUT |     Total
-----------+----------------------+----------
       Yes |        35         70 |       105
           |     33.33      66.67 |    100.00
-----------+----------------------+----------
        No |        18         22 |        40
           |     45.00      55.00 |    100.00
-----------+----------------------+----------
     Total |        53         92 |       145
           |     36.55      63.45 |    100.00

          Pearson chi2(1) =   1.7000   Pr = 0.192

->  tab FO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                    |      Instituion
                FO1 |       TUT       CPUT |     Total
--------------------+----------------------+----------
Not at all important |         1          0 |         1
                    |    100.00       0.00 |    100.00
--------------------+----------------------+----------
       Low important |         1          1 |         2
                    |     50.00      50.00 |    100.00
--------------------+----------------------+----------
  Slightly important |         0          1 |         1
                    |      0.00     100.00 |    100.00
--------------------+----------------------+----------
             Neutral |         2         10 |        12
```

```
                     |     16.67      83.33 |    100.00
---------------------+----------------------+----------
Moderately important |         5          12 |        17
                     |     29.41      70.59 |    100.00
---------------------+----------------------+----------
      Very important |        21          51 |        72
                     |     29.17      70.83 |    100.00
---------------------+----------------------+----------
 Extremely important |        23          17 |        40
                     |     57.50      42.50 |    100.00
---------------------+----------------------+----------
               Total |        53          92 |       145
                     |     36.55      63.45 |    100.00

          Pearson chi2(6) =  14.1497   Pr = 0.028

->  tab FO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                 FO2 |       TUT       CPUT |     Total
---------------------+----------------------+----------
Not at all important |         6           3 |         9
                     |     66.67      33.33 |    100.00
---------------------+----------------------+----------
       Low important |         3           8 |        11
                     |     27.27      72.73 |    100.00
---------------------+----------------------+----------
  Slightly important |         4           8 |        12
                     |     33.33      66.67 |    100.00
---------------------+----------------------+----------
             Neutral |         8          30 |        38
```

```
                     |     21.05      78.95 |    100.00
---------------------+----------------------+----------
Moderately important |        12         23 |        35
                     |     34.29      65.71 |    100.00
---------------------+----------------------+----------
      Very important |        14         12 |        26
                     |     53.85      46.15 |    100.00
---------------------+----------------------+----------
 Extremely important |         6          8 |        14
                     |     42.86      57.14 |    100.00
---------------------+----------------------+----------
               Total |        53         92 |       145
                     |     36.55      63.45 |    100.00

          Pearson chi2(6) =  11.5883   Pr = 0.072

->  tab FO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                 FO3 |       TUT       CPUT |     Total
---------------------+----------------------+----------
Not at all important |         2          2 |         4
                     |     50.00      50.00 |    100.00
---------------------+----------------------+----------
       Low important |         0          3 |         3
                     |      0.00     100.00 |    100.00
---------------------+----------------------+----------
  Slightly important |         1          5 |         6
                     |     16.67      83.33 |    100.00
---------------------+----------------------+----------
             Neutral |         5          8 |        13
```

```
                    |     38.46      61.54 |    100.00
--------------------+----------------------+----------
Moderately important |         5         16 |        21
                    |     23.81      76.19 |    100.00
--------------------+----------------------+----------
      Very important |        17         41 |        58
                    |     29.31      70.69 |    100.00
--------------------+----------------------+----------
 Extremely important |        23         17 |        40
                    |     57.50      42.50 |    100.00
--------------------+----------------------+----------
               Total |        53         92 |       145
                    |     36.55      63.45 |    100.00

          Pearson chi2(6) =  13.4341   Pr = 0.037

->  tab g Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

           |      Instituion
         g |       TUT       CPUT |     Total
-----------+----------------------+----------
       Yes |        43         87 |       130
           |     33.08      66.92 |    100.00
-----------+----------------------+----------
        No |        10          3 |        13
           |     76.92      23.08 |    100.00
-----------+----------------------+----------
     Total |        53         90 |       143
           |     37.06      62.94 |    100.00

          Pearson chi2(1) =   9.7402   Pr = 0.002
```

```
->  tab GO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
           GO1 |       TUT       CPUT |     Total
---------------+----------------------+----------
    Not at all |         2          2 |         4
               |     50.00      50.00 |    100.00
---------------+----------------------+----------
    Little bit |         0          3 |         3
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
      Somewhat |         2          7 |         9
               |     22.22      77.78 |    100.00
---------------+----------------------+----------
        Partly |         7         13 |        20
               |     35.00      65.00 |    100.00
---------------+----------------------+----------
          Well |        12         21 |        33
               |     36.36      63.64 |    100.00
---------------+----------------------+----------
     Very well |         4         14 |        18
               |     22.22      77.78 |    100.00
---------------+----------------------+----------
Extremely well |        12         17 |        29
               |     41.38      58.62 |    100.00
---------------+----------------------+----------
         Total |        39         77 |       116
               |     33.62      66.38 |    100.00

          Pearson chi2(6) =   4.4827   Pr = 0.612
```

```
->  tab GO1Fam Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
       GO1Fam |       TUT       CPUT |     Total
--------------+----------------------+----------
    Not at all |         1          2 |         3
               |     33.33      66.67 |    100.00
--------------+----------------------+----------
      Somewhat |         2          2 |         4
               |     50.00      50.00 |    100.00
--------------+----------------------+----------
        Partly |         5         11 |        16
               |     31.25      68.75 |    100.00
--------------+----------------------+----------
          Well |         6         18 |        24
               |     25.00      75.00 |    100.00
--------------+----------------------+----------
     Very well |        13         20 |        33
               |     39.39      60.61 |    100.00
--------------+----------------------+----------
Extremely well |        10         24 |        34
               |     29.41      70.59 |    100.00
--------------+----------------------+----------
         Total |        37         77 |       114
               |     32.46      67.54 |    100.00

          Pearson chi2(5) =   2.0502   Pr = 0.842

->  tab GO2 Instituion , chi2 r
```

```
+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
           GO2 |       TUT       CPUT |     Total
---------------+----------------------+----------
    Not at all |         0          1 |         1
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
    Little bit |         2          3 |         5
               |     40.00      60.00 |    100.00
---------------+----------------------+----------
      Somewhat |         3          8 |        11
               |     27.27      72.73 |    100.00
---------------+----------------------+----------
        Partly |         3         19 |        22
               |     13.64      86.36 |    100.00
---------------+----------------------+----------
          Well |         7         11 |        18
               |     38.89      61.11 |    100.00
---------------+----------------------+----------
     Very well |         2         13 |        15
               |     13.33      86.67 |    100.00
---------------+----------------------+----------
Extremely well |         6         11 |        17
               |     35.29      64.71 |    100.00
---------------+----------------------+----------
         Total |        23         66 |        89
               |     25.84      74.16 |    100.00

          Pearson chi2(6) =   6.2094   Pr = 0.400

->  tab GO2Friends Instituion , chi2 r
```

```
+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
    GO2Friends |       TUT       CPUT |     Total
---------------+----------------------+----------
    Not at all |         0          1 |         1
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
    Little bit |         0          1 |         1
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
      Somewhat |         4          1 |         5
               |     80.00      20.00 |    100.00
---------------+----------------------+----------
        Partly |         2         13 |        15
               |     13.33      86.67 |    100.00
---------------+----------------------+----------
          Well |         5         19 |        24
               |     20.83      79.17 |    100.00
---------------+----------------------+----------
     Very well |         7         20 |        27
               |     25.93      74.07 |    100.00
---------------+----------------------+----------
Extremely well |         4         10 |        14
               |     28.57      71.43 |    100.00
---------------+----------------------+----------
         Total |        22         65 |        87
               |     25.29      74.71 |    100.00

          Pearson chi2(6) =  10.0715   Pr = 0.122

->  tab GO3 Instituion , chi2 r
```

```
+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
           GO3 |       TUT       CPUT |     Total
---------------+----------------------+----------
    Not at all |         5          8 |        13
               |     38.46      61.54 |    100.00
---------------+----------------------+----------
    Little bit |         0          3 |         3
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
      Somewhat |         0          4 |         4
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
        Partly |         2          8 |        10
               |     20.00      80.00 |    100.00
---------------+----------------------+----------
          Well |         5          7 |        12
               |     41.67      58.33 |    100.00
---------------+----------------------+----------
     Very well |         3          4 |         7
               |     42.86      57.14 |    100.00
---------------+----------------------+----------
Extremely well |         2         18 |        20
               |     10.00      90.00 |    100.00
---------------+----------------------+----------
         Total |        17         52 |        69
               |     24.64      75.36 |    100.00

          Pearson chi2(6) =   9.1758   Pr = 0.164

->  tab GO3Man Instituion , chi2 r
```

```
+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
        GO3Man |       TUT       CPUT |     Total
---------------+----------------------+----------
    Not at all |         5          8 |        13
               |     38.46      61.54 |    100.00
---------------+----------------------+----------
      Somewhat |         0          2 |         2
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
        Partly |         0          9 |         9
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
          Well |         5          5 |        10
               |     50.00      50.00 |    100.00
---------------+----------------------+----------
     Very well |         4          5 |         9
               |     44.44      55.56 |    100.00
---------------+----------------------+----------
Extremely well |         3         23 |        26
               |     11.54      88.46 |    100.00
---------------+----------------------+----------
         Total |        17         52 |        69
               |     24.64      75.36 |    100.00

          Pearson chi2(5) =  12.7028   Pr = 0.026

->  tab GO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
          GO4 |       TUT       CPUT |     Total
--------------+----------------------+----------
    Not at all |         3          6 |         9
               |     33.33      66.67 |    100.00
--------------+----------------------+----------
    Little bit |         2          1 |         3
               |     66.67      33.33 |    100.00
--------------+----------------------+----------
      Somewhat |         0          3 |         3
               |      0.00     100.00 |    100.00
--------------+----------------------+----------
        Partly |         5          5 |        10
               |     50.00      50.00 |    100.00
--------------+----------------------+----------
          Well |         6          9 |        15
               |     40.00      60.00 |    100.00
--------------+----------------------+----------
     Very well |         1          4 |         5
               |     20.00      80.00 |    100.00
--------------+----------------------+----------
Extremely well |         2          8 |        10
               |     20.00      80.00 |    100.00
--------------+----------------------+----------
         Total |        19         36 |        55
               |     34.55      65.45 |    100.00

          Pearson chi2(6) =   5.6153   Pr = 0.468

->  tab GO4_Other Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
     GO4_Other |       TUT       CPUT |     Total
---------------+----------------------+----------
    Not at all |         3          6 |         9
               |     33.33      66.67 |    100.00
---------------+----------------------+----------
    Little bit |         1          0 |         1
               |    100.00       0.00 |    100.00
---------------+----------------------+----------
      Somewhat |         0          2 |         2
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
        Partly |         3          5 |         8
               |     37.50      62.50 |    100.00
---------------+----------------------+----------
          Well |         0          6 |         6
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
     Very well |         9          7 |        16
               |     56.25      43.75 |    100.00
---------------+----------------------+----------
Extremely well |         3         11 |        14
               |     21.43      78.57 |    100.00
---------------+----------------------+----------
         Total |        19         37 |        56
               |     33.93      66.07 |    100.00

          Pearson chi2(6) =  10.6344   Pr = 0.100

->  tab GGO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                GGO1 |       TUT       CPUT |     Total
---------------------+----------------------+----------
         No knowledge |         3          4 |         7
                      |     42.86      57.14 |    100.00
---------------------+----------------------+----------
     Little knowledge |         4         21 |        25
                      |     16.00      84.00 |    100.00
---------------------+----------------------+----------
       Some knowledge |         7         19 |        26
                      |     26.92      73.08 |    100.00
---------------------+----------------------+----------
      Basic knowledge |        13         24 |        37
                      |     35.14      64.86 |    100.00
---------------------+----------------------+----------
   Moderate knowledge |        16         13 |        29
                      |     55.17      44.83 |    100.00
---------------------+----------------------+----------
   Complete knowledge |         5          7 |        12
                      |     41.67      58.33 |    100.00
---------------------+----------------------+----------
Extremely knowlegeabl |         4          3 |         7
                      |     57.14      42.86 |    100.00
---------------------+----------------------+----------
               Total |        52         91 |       143
                      |     36.36      63.64 |    100.00

          Pearson chi2(6) =  11.5185   Pr = 0.074

->  tab GGO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                GGO2 |       TUT       CPUT |     Total
---------------------+----------------------+----------
         No knowledge |         6         19 |        25
                      |     24.00      76.00 |    100.00
---------------------+----------------------+----------
     Little knowledge |        11         25 |        36
                      |     30.56      69.44 |    100.00
---------------------+----------------------+----------
       Some knowledge |         9         15 |        24
                      |     37.50      62.50 |    100.00
---------------------+----------------------+----------
      Basic knowledge |        12         16 |        28
                      |     42.86      57.14 |    100.00
---------------------+----------------------+----------
   Moderate knowledge |         5         15 |        20
                      |     25.00      75.00 |    100.00
---------------------+----------------------+----------
   Complete knowledge |         7          1 |         8
                      |     87.50      12.50 |    100.00
---------------------+----------------------+----------
Extremely knowlegeabl |         2          0 |         2
                      |    100.00       0.00 |    100.00
---------------------+----------------------+----------
               Total |        52         91 |       143
                      |     36.36      63.64 |    100.00

          Pearson chi2(6) =  16.3561   Pr = 0.012

->  tab GGO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                GGO3 |       TUT       CPUT |     Total
---------------------+----------------------+----------
         No knowledge |         6         12 |        18
                      |     33.33      66.67 |    100.00
---------------------+----------------------+----------
     Little knowledge |         6         21 |        27
                      |     22.22      77.78 |    100.00
---------------------+----------------------+----------
       Some knowledge |         5         18 |        23
                      |     21.74      78.26 |    100.00
---------------------+----------------------+----------
      Basic knowledge |        13         23 |        36
                      |     36.11      63.89 |    100.00
---------------------+----------------------+----------
   Moderate knowledge |         8         11 |        19
                      |     42.11      57.89 |    100.00
---------------------+----------------------+----------
   Complete knowledge |        11          5 |        16
                      |     68.75      31.25 |    100.00
---------------------+----------------------+----------
Extremely knowlegeabl |         3          1 |         4
                      |     75.00      25.00 |    100.00
---------------------+----------------------+----------
               Total |        52         91 |       143
                      |     36.36      63.64 |    100.00

          Pearson chi2(6) =  14.6348   Pr = 0.023

->  tab GGO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+
```

GGO4	Instituion TUT	CPUT	Total
No knowledge	8	11	19
	42.11	57.89	100.00
Little knowledge	9	26	35
	25.71	74.29	100.00
Some knowledge	5	17	22
	22.73	77.27	100.00
Basic knowledge	11	13	24
	45.83	54.17	100.00
Moderate knowledge	9	16	25
	36.00	64.00	100.00
Complete knowledge	7	7	14
	50.00	50.00	100.00
Extremely knowlegeabl	3	1	4
	75.00	25.00	100.00
Total	52	91	143
	36.36	63.64	100.00

```
          Pearson chi2(6) =   8.3907   Pr = 0.211

->  tab GGO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                GGO5 |       TUT       CPUT |     Total
---------------------+----------------------+----------
         No knowledge |         4         16 |        20
                      |     20.00      80.00 |    100.00
---------------------+----------------------+----------
     Little knowledge |        12         28 |        40
                      |     30.00      70.00 |    100.00
---------------------+----------------------+----------
       Some knowledge |         6         16 |        22
                      |     27.27      72.73 |    100.00
---------------------+----------------------+----------
      Basic knowledge |        11         14 |        25
                      |     44.00      56.00 |    100.00
---------------------+----------------------+----------
   Moderate knowledge |         8         12 |        20
                      |     40.00      60.00 |    100.00
---------------------+----------------------+----------
   Complete knowledge |         8          4 |        12
                      |     66.67      33.33 |    100.00
---------------------+----------------------+----------
Extremely knowlegeabl |         3          1 |         4
                      |     75.00      25.00 |    100.00
---------------------+----------------------+----------
                Total |        52         91 |       143
                      |     36.36      63.64 |    100.00

          Pearson chi2(6) =  11.8865   Pr = 0.065

->  tab GGO6 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                GGO6 |       TUT       CPUT |     Total
---------------------+----------------------+----------
         No knowledge |         8         17 |        25
                      |     32.00      68.00 |    100.00
---------------------+----------------------+----------
     Little knowledge |         9         28 |        37
                      |     24.32      75.68 |    100.00
---------------------+----------------------+----------
       Some knowledge |         5         16 |        21
                      |     23.81      76.19 |    100.00
---------------------+----------------------+----------
      Basic knowledge |        13         11 |        24
                      |     54.17      45.83 |    100.00
---------------------+----------------------+----------
   Moderate knowledge |         7         11 |        18
                      |     38.89      61.11 |    100.00
---------------------+----------------------+----------
   Complete knowledge |         8          7 |        15
                      |     53.33      46.67 |    100.00
---------------------+----------------------+----------
Extremely knowlegeabl |         2          1 |         3
                      |     66.67      33.33 |    100.00
---------------------+----------------------+----------
               Total |        52         91 |       143
                      |     36.36      63.64 |    100.00

          Pearson chi2(6) =  10.3475   Pr = 0.111

->  tab GGO7 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                     |      Instituion
                 GGO7 |       TUT       CPUT |     Total
----------------------+----------------------+----------
         No knowledge |        13         22 |        35
                      |     37.14      62.86 |    100.00
----------------------+----------------------+----------
     Little knowledge |         9         29 |        38
                      |     23.68      76.32 |    100.00
----------------------+----------------------+----------
       Some knowledge |         8         11 |        19
                      |     42.11      57.89 |    100.00
----------------------+----------------------+----------
      Basic knowledge |         6         14 |        20
                      |     30.00      70.00 |    100.00
----------------------+----------------------+----------
   Moderate knowledge |        10          9 |        19
                      |     52.63      47.37 |    100.00
----------------------+----------------------+----------
   Complete knowledge |         6          4 |        10
                      |     60.00      40.00 |    100.00
----------------------+----------------------+----------
Extremely knowlegeabl |         0          2 |         2
                      |      0.00     100.00 |    100.00
----------------------+----------------------+----------
                Total |        52         91 |       143
                      |     36.36      63.64 |    100.00

          Pearson chi2(6) =   9.0000   Pr = 0.174

->  tab HO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             HO1 |       TUT       CPUT |     Total
-----------------+----------------------+----------
         disagree |         3          8 |        11
                  |     27.27      72.73 |    100.00
-----------------+----------------------+----------
somewhat disagree |         4         13 |        17
                  |     23.53      76.47 |    100.00
-----------------+----------------------+----------
          neutral |        15         28 |        43
                  |     34.88      65.12 |    100.00
-----------------+----------------------+----------
   somewhat agree |        12         27 |        39
                  |     30.77      69.23 |    100.00
-----------------+----------------------+----------
            agree |        13         15 |        28
                  |     46.43      53.57 |    100.00
-----------------+----------------------+----------
   strongly agree |         5          1 |         6
                  |     83.33      16.67 |    100.00
-----------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(5) =   9.1406   Pr = 0.104

->  tab HO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+
```

```
                  |      Instituion
              HO2 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          7 |         7
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         3         10 |        13
                  |     23.08      76.92 |    100.00
------------------+----------------------+----------
          neutral |        11         12 |        23
                  |     47.83      52.17 |    100.00
------------------+----------------------+----------
   somewhat agree |         7         28 |        35
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
            agree |        17         21 |        38
                  |     44.74      55.26 |    100.00
------------------+----------------------+----------
   strongly agree |        14         13 |        27
                  |     51.85      48.15 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(6) =  14.9102   Pr = 0.021

->  tab HO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+
```

```
                |      Instituion
            HO3 |       TUT       CPUT |     Total
----------------+----------------------+----------
       disagree |         0          3 |         3
                |      0.00     100.00 |    100.00
----------------+----------------------+----------
somewhat disagree |         2          4 |         6
                |     33.33      66.67 |    100.00
----------------+----------------------+----------
        neutral |         7         15 |        22
                |     31.82      68.18 |    100.00
----------------+----------------------+----------
 somewhat agree |        10         29 |        39
                |     25.64      74.36 |    100.00
----------------+----------------------+----------
          agree |        17         30 |        47
                |     36.17      63.83 |    100.00
----------------+----------------------+----------
 strongly agree |        16         11 |        27
                |     59.26      40.74 |    100.00
----------------+----------------------+----------
          Total |        52         92 |       144
                |     36.11      63.89 |    100.00

          Pearson chi2(5) =  10.0155   Pr = 0.075

->  tab HO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                |      Instituion
            HO4 |       TUT       CPUT |     Total
```

```
-----------------+----------------------+----------
strongly disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
-----------------+----------------------+----------
         disagree |         2          8 |        10
                  |     20.00      80.00 |    100.00
-----------------+----------------------+----------
somewhat disagree |         2         14 |        16
                  |     12.50      87.50 |    100.00
-----------------+----------------------+----------
          neutral |         7         24 |        31
                  |     22.58      77.42 |    100.00
-----------------+----------------------+----------
   somewhat agree |        18         24 |        42
                  |     42.86      57.14 |    100.00
-----------------+----------------------+----------
            agree |        10         13 |        23
                  |     43.48      56.52 |    100.00
-----------------+----------------------+----------
   strongly agree |        12          6 |        18
                  |     66.67      33.33 |    100.00
-----------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(6) =  16.3191   Pr = 0.012

->  tab HO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              HO5 |       TUT       CPUT |     Total
```

```
-----------------+----------------------+----------
strongly disagree |         1           2 |         3
                  |     33.33      66.67 |    100.00
-----------------+----------------------+----------
         disagree |         4           9 |        13
                  |     30.77      69.23 |    100.00
-----------------+----------------------+----------
somewhat disagree |         2          11 |        13
                  |     15.38      84.62 |    100.00
-----------------+----------------------+----------
          neutral |         8          25 |        33
                  |     24.24      75.76 |    100.00
-----------------+----------------------+----------
   somewhat agree |        14          21 |        35
                  |     40.00      60.00 |    100.00
-----------------+----------------------+----------
            agree |        14          19 |        33
                  |     42.42      57.58 |    100.00
-----------------+----------------------+----------
   strongly agree |         9           5 |        14
                  |     64.29      35.71 |    100.00
-----------------+----------------------+----------
            Total |        52          92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(6) =  10.2229   Pr = 0.116

->  tab HO6 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              HO6 |       TUT       CPUT |     Total
```

```
-----------------+----------------------+----------
         disagree |         0          3 |         3
                  |      0.00     100.00 |    100.00
-----------------+----------------------+----------
somewhat disagree |         0          8 |         8
                  |      0.00     100.00 |    100.00
-----------------+----------------------+----------
          neutral |         8         28 |        36
                  |     22.22      77.78 |    100.00
-----------------+----------------------+----------
   somewhat agree |        18         26 |        44
                  |     40.91      59.09 |    100.00
-----------------+----------------------+----------
            agree |        16         16 |        32
                  |     50.00      50.00 |    100.00
-----------------+----------------------+----------
   strongly agree |        10         11 |        21
                  |     47.62      52.38 |    100.00
-----------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(5) =  13.5475   Pr = 0.019

->  tab i Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

    Entrepreneurial |      Instituion
         Objectives |       TUT       CPUT |     Total
--------------------+----------------------+----------
   Micro-enterprise |         9         13 |        22
                    |     40.91      59.09 |    100.00
```

```
--------------------+----------------------+----------
Very small business |         3         14 |        17
                    |     17.65      82.35 |    100.00
--------------------+----------------------+----------
     Small business |        14         22 |        36
                    |     38.89      61.11 |    100.00
--------------------+----------------------+----------
    Medium business |        12         23 |        35
                    |     34.29      65.71 |    100.00
--------------------+----------------------+----------
     Large business |        15         16 |        31
                    |     48.39      51.61 |    100.00
--------------------+----------------------+----------
              Total |        53         88 |       141
                    |     37.59      62.41 |    100.00

          Pearson chi2(4) =   4.7147   Pr = 0.318

->  tab IO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                   |      Instituion
              IO1 |       TUT       CPUT |     Total
------------------+----------------------+----------
Strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         Disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
Somewhat disagree |         0          4 |         4
                  |      0.00     100.00 |    100.00
```

```
-----------------+----------------------+----------
         Neutral |          0          14 |        14
                 |       0.00      100.00 |    100.00
-----------------+----------------------+----------
  Somewhat agree |         12          20 |        32
                 |      37.50       62.50 |    100.00
-----------------+----------------------+----------
           Agree |         22          31 |        53
                 |      41.51       58.49 |    100.00
-----------------+----------------------+----------
   Stongly agree |         19          21 |        40
                 |      47.50       52.50 |    100.00
-----------------+----------------------+----------
           Total |         53          92 |       145
                 |      36.55       63.45 |    100.00

          Pearson chi2(6) =  14.1633   Pr = 0.028

->  tab IO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                 |      Instituion
             IO2 |       TUT       CPUT |     Total
-----------------+----------------------+----------
Somewhat disagree |         1           2 |         3
                 |      33.33       66.67 |    100.00
-----------------+----------------------+----------
         Neutral |         3          11 |        14
                 |      21.43       78.57 |    100.00
-----------------+----------------------+----------
  Somewhat agree |        11          24 |        35
                 |      31.43       68.57 |    100.00
```

```
-----------------+----------------------+----------
           Agree |        17          30 |        47
                 |     36.17      63.83 |    100.00
-----------------+----------------------+----------
    Stongly agree |        21          25 |        46
                 |     45.65      54.35 |    100.00
-----------------+----------------------+----------
           Total |        53          92 |       145
                 |     36.55      63.45 |    100.00

          Pearson chi2(4) =   3.4358   Pr = 0.488

->  tab IO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                 |      Instituion
             IO3 |       TUT       CPUT |     Total
-----------------+----------------------+----------
Strongly disagree |         1          0 |         1
                 |    100.00       0.00 |    100.00
-----------------+----------------------+----------
         Disagree |         0          2 |         2
                 |      0.00     100.00 |    100.00
-----------------+----------------------+----------
          Neutral |         2          1 |         3
                 |     66.67      33.33 |    100.00
-----------------+----------------------+----------
   Somewhat agree |         1          9 |        10
                 |     10.00      90.00 |    100.00
-----------------+----------------------+----------
           Agree |         8         20 |        28
                 |     28.57      71.43 |    100.00
```

```
-----------------+----------------------+----------
    Stongly agree |        41          60 |       101
                  |     40.59      59.41 |    100.00
-----------------+----------------------+----------
            Total |        53          92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(5) =   8.5816   Pr = 0.127

->  tab IO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              IO4 |       TUT       CPUT |     Total
------------------+----------------------+----------
Strongly disagree |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
         Disagree |         2          1 |         3
                  |     66.67      33.33 |    100.00
------------------+----------------------+----------
Somewhat disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
          Neutral |         6         14 |        20
                  |     30.00      70.00 |    100.00
------------------+----------------------+----------
   Somewhat agree |         4         19 |        23
                  |     17.39      82.61 |    100.00
------------------+----------------------+----------
            Agree |        12         29 |        41
                  |     29.27      70.73 |    100.00
```

```
-----------------+----------------------+----------
    Stongly agree |        27          24 |        51
                  |     52.94       47.06 |    100.00
-----------------+----------------------+----------
            Total |        53          92 |       145
                  |     36.55       63.45 |    100.00

          Pearson chi2(6) =  12.2727   Pr = 0.056

->  tab IO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              IO5 |       TUT       CPUT |     Total
------------------+----------------------+----------
Strongly disagree |         1          0 |         1
                  |    100.00       0.00 |    100.00
------------------+----------------------+----------
         Disagree |         1          1 |         2
                  |     50.00      50.00 |    100.00
------------------+----------------------+----------
Somewhat disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
          Neutral |         2          9 |        11
                  |     18.18      81.82 |    100.00
------------------+----------------------+----------
   Somewhat agree |         7         21 |        28
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
            Agree |        11         22 |        33
                  |     33.33      66.67 |    100.00
```

```
-----------------+----------------------+----------
    Stongly agree |        30          36 |        66
                  |     45.45       54.55 |    100.00
-----------------+----------------------+----------
            Total |        53          92 |       145
                  |     36.55       63.45 |    100.00

          Pearson chi2(6) =   7.7367   Pr = 0.258

->  tab IO6 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              IO6 |       TUT       CPUT |     Total
------------------+----------------------+----------
Somewhat disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          Neutral |         0          3 |         3
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
   Somewhat agree |         3          7 |        10
                  |     30.00      70.00 |    100.00
------------------+----------------------+----------
            Agree |        13         30 |        43
                  |     30.23      69.77 |    100.00
------------------+----------------------+----------
    Stongly agree |        37         51 |        88
                  |     42.05      57.95 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00
```

```
          Pearson chi2(4) =   4.3750   Pr = 0.358

->  tab IO7 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              IO7 |       TUT       CPUT |     Total
------------------+----------------------+----------
          Neutral |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
   Somewhat agree |         3         13 |        16
                  |     18.75      81.25 |    100.00
------------------+----------------------+----------
            Agree |        10         25 |        35
                  |     28.57      71.43 |    100.00
------------------+----------------------+----------
    Stongly agree |        39         52 |        91
                  |     42.86      57.14 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(3) =   4.7209   Pr = 0.193

->  tab IO8 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
```

```
| row percentage |
+----------------+

                  |      Instituion
              IO8 |       TUT       CPUT |     Total
------------------+----------------------+----------
          Neutral |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
   Somewhat agree |         5         12 |        17
                  |     29.41      70.59 |    100.00
------------------+----------------------+----------
            Agree |        13         25 |        38
                  |     34.21      65.79 |    100.00
------------------+----------------------+----------
    Stongly agree |        35         53 |        88
                  |     39.77      60.23 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(3) =   2.0094   Pr = 0.570

->  tab IOO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO1 |       TUT       CPUT |     Total
------------------+----------------------+----------
Etremely unlikely |         5          1 |         6
                  |     83.33      16.67 |    100.00
------------------+----------------------+----------
```

```
Somewhat unlikely |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         Unlikely |         3          9 |        12
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
          Neutral |         8         24 |        32
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
  Somewhat likely |         7         22 |        29
                  |     24.14      75.86 |    100.00
------------------+----------------------+----------
           Likely |        19         23 |        42
                  |     45.24      54.76 |    100.00
------------------+----------------------+----------
 Extremely likely |        10         12 |        22
                  |     45.45      54.55 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(6) =  12.8700   Pr = 0.045

->  tab IOO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO2 |       TUT       CPUT |     Total
------------------+----------------------+----------
Somewhat unlikely |         1          0 |         1
                  |    100.00       0.00 |    100.00
------------------+----------------------+----------
```

```
         Unlikely |         2          1 |         3
                  |     66.67      33.33 |    100.00
------------------+----------------------+----------
          Neutral |         3         17 |        20
                  |     15.00      85.00 |    100.00
------------------+----------------------+----------
  Somewhat likely |         8         23 |        31
                  |     25.81      74.19 |    100.00
------------------+----------------------+----------
           Likely |        18         34 |        52
                  |     34.62      65.38 |    100.00
------------------+----------------------+----------
 Extremely likely |        20         17 |        37
                  |     54.05      45.95 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(5) =  13.4873   Pr = 0.019

->  tab IOO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO3 |       TUT       CPUT |     Total
------------------+----------------------+----------
Etremely unlikely |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
Somewhat unlikely |         1          1 |         2
                  |     50.00      50.00 |    100.00
------------------+----------------------+----------
```

```
         Unlikely |         2          3 |         5
                  |     40.00      60.00 |    100.00
------------------+----------------------+----------
          Neutral |         3         13 |        16
                  |     18.75      81.25 |    100.00
------------------+----------------------+----------
  Somewhat likely |        14         30 |        44
                  |     31.82      68.18 |    100.00
------------------+----------------------+----------
           Likely |        17         34 |        51
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
 Extremely likely |        15         10 |        25
                  |     60.00      40.00 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(6) =   9.5615   Pr = 0.144

->  tab IOO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO4 |       TUT       CPUT |     Total
------------------+----------------------+----------
         Unlikely |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          Neutral |         3         12 |        15
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
```

```
  Somewhat likely |         8         22 |        30
                  |     26.67      73.33 |    100.00
------------------+----------------------+----------
           Likely |        20         38 |        58
                  |     34.48      65.52 |    100.00
------------------+----------------------+----------
 Extremely likely |        21         19 |        40
                  |     52.50      47.50 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(4) =   8.1362   Pr = 0.087

->  tab IOO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO5 |       TUT       CPUT |     Total
------------------+----------------------+----------
Somewhat unlikely |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         Unlikely |         1          4 |         5
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
          Neutral |         4         10 |        14
                  |     28.57      71.43 |    100.00
------------------+----------------------+----------
  Somewhat likely |        14         24 |        38
                  |     36.84      63.16 |    100.00
------------------+----------------------+----------
```

```
           Likely |        22          34 |        56
                  |     39.29       60.71 |    100.00
-----------------+----------------------+----------
 Extremely likely |        11          19 |        30
                  |     36.67       63.33 |    100.00
-----------------+----------------------+----------
            Total |        52          92 |       144
                  |     36.11       63.89 |    100.00

          Pearson chi2(5) =   1.7302   Pr = 0.885

->  tab IOO6 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO6 |       TUT       CPUT |     Total
------------------+----------------------+----------
Somewhat unlikely |         1          0 |         1
                  |    100.00       0.00 |    100.00
------------------+----------------------+----------
         Unlikely |         2          5 |         7
                  |     28.57       71.43 |    100.00
------------------+----------------------+----------
          Neutral |        10          9 |        19
                  |     52.63       47.37 |    100.00
------------------+----------------------+----------
  Somewhat likely |         6         23 |        29
                  |     20.69       79.31 |    100.00
------------------+----------------------+----------
           Likely |        13         32 |        45
                  |     28.89       71.11 |    100.00
------------------+----------------------+----------
```

```
 Extremely likely |        20         23 |        43
                  |     46.51      53.49 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00

          Pearson chi2(5) =  10.2123   Pr = 0.069

->  tab IOO7 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             IOO7 |       TUT       CPUT |     Total
------------------+----------------------+----------
         Unlikely |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          Neutral |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
  Somewhat likely |         3         17 |        20
                  |     15.00      85.00 |    100.00
------------------+----------------------+----------
           Likely |        21         37 |        58
                  |     36.21      63.79 |    100.00
------------------+----------------------+----------
 Extremely likely |        28         34 |        62
                  |     45.16      54.84 |    100.00
------------------+----------------------+----------
            Total |        52         92 |       144
                  |     36.11      63.89 |    100.00
```

```
          Pearson chi2(4) =   8.3257   Pr = 0.080

->  tab KO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                   |      Instituion
               KO1 |       TUT       CPUT |     Total
-------------------+----------------------+----------
    Not a priority |         4          5 |         9
                   |     44.44      55.56 |    100.00
-------------------+----------------------+----------
      Low priority |         2          6 |         8
                   |     25.00      75.00 |    100.00
-------------------+----------------------+----------
 Somewhat priority |         7          6 |        13
                   |     53.85      46.15 |    100.00
-------------------+----------------------+----------
           Neutral |         4          9 |        13
                   |     30.77      69.23 |    100.00
-------------------+----------------------+----------
 Moderate priority |         9         23 |        32
                   |     28.13      71.88 |    100.00
-------------------+----------------------+----------
     High priority |        13         21 |        34
                   |     38.24      61.76 |    100.00
-------------------+----------------------+----------
Essential priority |        11         17 |        28
                   |     39.29      60.71 |    100.00
-------------------+----------------------+----------
             Total |        50         87 |       137
                   |     36.50      63.50 |    100.00
```

```
          Pearson chi2(6) =   3.6799   Pr = 0.720

->  tab KO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                   |      Instituion
               KO2 |       TUT       CPUT |     Total
-------------------+----------------------+----------
    Not a priority |         1          8 |         9
                   |     11.11      88.89 |    100.00
-------------------+----------------------+----------
      Low priority |         5         12 |        17
                   |     29.41      70.59 |    100.00
-------------------+----------------------+----------
 Somewhat priority |         2          6 |         8
                   |     25.00      75.00 |    100.00
-------------------+----------------------+----------
           Neutral |         6         18 |        24
                   |     25.00      75.00 |    100.00
-------------------+----------------------+----------
 Moderate priority |        12         17 |        29
                   |     41.38      58.62 |    100.00
-------------------+----------------------+----------
     High priority |        12         21 |        33
                   |     36.36      63.64 |    100.00
-------------------+----------------------+----------
Essential priority |        10          5 |        15
                   |     66.67      33.33 |    100.00
-------------------+----------------------+----------
             Total |        48         87 |       135
                   |     35.56      64.44 |    100.00
```

```
          Pearson chi2(6) =  10.9579   Pr = 0.090

->  tab KO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                   |      Instituion
               KO3 |       TUT       CPUT |     Total
-------------------+----------------------+----------
    Not a priority |         0          1 |         1
                   |      0.00     100.00 |    100.00
-------------------+----------------------+----------
      Low priority |         0          1 |         1
                   |      0.00     100.00 |    100.00
-------------------+----------------------+----------
 Somewhat priority |         0          7 |         7
                   |      0.00     100.00 |    100.00
-------------------+----------------------+----------
           Neutral |         8         12 |        20
                   |     40.00      60.00 |    100.00
-------------------+----------------------+----------
 Moderate priority |         6         13 |        19
                   |     31.58      68.42 |    100.00
-------------------+----------------------+----------
     High priority |         9         17 |        26
                   |     34.62      65.38 |    100.00
-------------------+----------------------+----------
Essential priority |        28         39 |        67
                   |     41.79      58.21 |    100.00
-------------------+----------------------+----------
             Total |        51         90 |       141
                   |     36.17      63.83 |    100.00
```

```
          Pearson chi2(6) =   6.3446   Pr = 0.386

->  tab KOO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                    |      Instituion
               KOO1 |       TUT       CPUT |     Total
--------------------+----------------------+----------
      No attraction |         9          1 |        10
                    |     90.00      10.00 |    100.00
--------------------+----------------------+----------
  Little attraction |         9          8 |        17
                    |     52.94      47.06 |    100.00
--------------------+----------------------+----------
Somewhat attraction |         4          8 |        12
                    |     33.33      66.67 |    100.00
--------------------+----------------------+----------
            Neutral |         3         14 |        17
                    |     17.65      82.35 |    100.00
--------------------+----------------------+----------
     Much attracted |        12         32 |        44
                    |     27.27      72.73 |    100.00
--------------------+----------------------+----------
     Much attracted |        11         22 |        33
                    |     33.33      66.67 |    100.00
--------------------+----------------------+----------
Extremely attracted |         5          7 |        12
                    |     41.67      58.33 |    100.00
--------------------+----------------------+----------
              Total |        53         92 |       145
                    |     36.55      63.45 |    100.00
```

```
          Pearson chi2(6) =  18.8766   Pr = 0.004

->  tab KOO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                    |      Instituion
               KOO2 |       TUT       CPUT |     Total
--------------------+----------------------+----------
      No attraction |         3          4 |         7
                    |     42.86      57.14 |    100.00
--------------------+----------------------+----------
  Little attraction |         4         18 |        22
                    |     18.18      81.82 |    100.00
--------------------+----------------------+----------
Somewhat attraction |         7          6 |        13
                    |     53.85      46.15 |    100.00
--------------------+----------------------+----------
            Neutral |        12         20 |        32
                    |     37.50      62.50 |    100.00
--------------------+----------------------+----------
     Much attracted |        13         19 |        32
                    |     40.63      59.38 |    100.00
--------------------+----------------------+----------
     Much attracted |         9         15 |        24
                    |     37.50      62.50 |    100.00
--------------------+----------------------+----------
Extremely attracted |         5         10 |        15
                    |     33.33      66.67 |    100.00
--------------------+----------------------+----------
              Total |        53         92 |       145
                    |     36.55      63.45 |    100.00
```

```
          Pearson chi2(6) =   5.3154   Pr = 0.504

->  tab KOO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                    |      Instituion
               KOO3 |       TUT       CPUT |     Total
--------------------+----------------------+----------
      No attraction |         0          1 |         1
                    |      0.00     100.00 |    100.00
--------------------+----------------------+----------
  Little attraction |         0          4 |         4
                    |      0.00     100.00 |    100.00
--------------------+----------------------+----------
Somewhat attraction |         0          7 |         7
                    |      0.00     100.00 |    100.00
--------------------+----------------------+----------
            Neutral |         5          8 |        13
                    |     38.46      61.54 |    100.00
--------------------+----------------------+----------
     Much attracted |         6         17 |        23
                    |     26.09      73.91 |    100.00
--------------------+----------------------+----------
     Much attracted |        17         25 |        42
                    |     40.48      59.52 |    100.00
--------------------+----------------------+----------
Extremely attracted |        25         30 |        55
                    |     45.45      54.55 |    100.00
--------------------+----------------------+----------
              Total |        53         92 |       145
                    |     36.55      63.45 |    100.00
```

```
          Pearson chi2(6) =  10.1782   Pr = 0.117

->  tab KKO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             KKO1 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          6 |         7
                  |     14.29      85.71 |    100.00
------------------+----------------------+----------
          neutral |         7         26 |        33
                  |     21.21      78.79 |    100.00
------------------+----------------------+----------
   somewhat agree |        12         20 |        32
                  |     37.50      62.50 |    100.00
------------------+----------------------+----------
            agree |        13         17 |        30
                  |     43.33      56.67 |    100.00
------------------+----------------------+----------
   strongly agree |        20         17 |        37
                  |     54.05      45.95 |    100.00
------------------+----------------------+----------
               54 |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
```

```
            Total |        53         90 |       143
                  |     37.06      62.94 |    100.00

          Pearson chi2(7) =  12.5545   Pr = 0.084

->  tab KKO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             KKO2 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          6 |         7
                  |     14.29      85.71 |    100.00
------------------+----------------------+----------
          neutral |         0         13 |        13
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
   somewhat agree |        13         20 |        33
                  |     39.39      60.61 |    100.00
------------------+----------------------+----------
            agree |        15         23 |        38
                  |     39.47      60.53 |    100.00
------------------+----------------------+----------
   strongly agree |        23         26 |        49
                  |     46.94      53.06 |    100.00
------------------+----------------------+----------
```

```
            Total |        53          91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  12.0703   Pr = 0.060

->  tab KKO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             KKO3 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          neutral |         1          4 |         5
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
   somewhat agree |         2         15 |        17
                  |     11.76      88.24 |    100.00
------------------+----------------------+----------
            agree |        10         28 |        38
                  |     26.32      73.68 |    100.00
------------------+----------------------+----------
   strongly agree |        40         41 |        81
                  |     49.38      50.62 |    100.00
------------------+----------------------+----------
```

```
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  14.2440   Pr = 0.027

->  tab KKO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             KKO4 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         0          4 |         4
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          neutral |         5         15 |        20
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
   somewhat agree |         8         11 |        19
                  |     42.11      57.89 |    100.00
------------------+----------------------+----------
            agree |        13         20 |        33
                  |     39.39      60.61 |    100.00
------------------+----------------------+----------
   strongly agree |        27         39 |        66
                  |     40.91      59.09 |    100.00
------------------+----------------------+----------
```

```
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =   5.4952   Pr = 0.482

->  tab KKO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             KKO5 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          3 |         3
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         3          7 |        10
                  |     30.00      70.00 |    100.00
------------------+----------------------+----------
          neutral |        10          9 |        19
                  |     52.63      47.37 |    100.00
------------------+----------------------+----------
   somewhat agree |         9         19 |        28
                  |     32.14      67.86 |    100.00
------------------+----------------------+----------
            agree |        12         23 |        35
                  |     34.29      65.71 |    100.00
------------------+----------------------+----------
   strongly agree |        18         27 |        45
                  |     40.00      60.00 |    100.00
------------------+----------------------+----------
```

```
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =   4.7868   Pr = 0.571

->  tab LO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              LO1 |       TUT       CPUT |     Total
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          1 |         2
                  |     50.00      50.00 |    100.00
------------------+----------------------+----------
          neutral |         7         14 |        21
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
   somewhat agree |        10         20 |        30
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
            agree |        25         35 |        60
                  |     41.67      58.33 |    100.00
------------------+----------------------+----------
   strongly agree |        10         21 |        31
                  |     32.26      67.74 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00
```

```
          Pearson chi2(5) =   1.8831   Pr = 0.865

->  tab LO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              LO2 |       TUT       CPUT |     Total
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
          neutral |         4         15 |        19
                  |     21.05      78.95 |    100.00
------------------+----------------------+----------
   somewhat agree |        13         26 |        39
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
            agree |        22         27 |        49
                  |     44.90      55.10 |    100.00
------------------+----------------------+----------
   strongly agree |        13         21 |        34
                  |     38.24      61.76 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(5) =   4.2451   Pr = 0.515

->  tab LO3 Instituion , chi2 r
```

```
+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LO3 |       TUT       CPUT |     Total
-----------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
-----------------+----------------------+----------
somewhat disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
-----------------+----------------------+----------
          neutral |         1         10 |        11
                  |      9.09      90.91 |    100.00
-----------------+----------------------+----------
   somewhat agree |        10         17 |        27
                  |     37.04      62.96 |    100.00
-----------------+----------------------+----------
            agree |        22         40 |        62
                  |     35.48      64.52 |    100.00
-----------------+----------------------+----------
   strongly agree |        19         21 |        40
                  |     47.50      52.50 |    100.00
-----------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(5) =   6.4836   Pr = 0.262

->  tab LO4 Instituion , chi2 r

+----------------+
| Key            |
```

```
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
              LO4 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         1          0 |         1
                  |    100.00       0.00 |    100.00
------------------+----------------------+----------
         disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          5 |         6
                  |     16.67      83.33 |    100.00
------------------+----------------------+----------
          neutral |         6         17 |        23
                  |     26.09      73.91 |    100.00
------------------+----------------------+----------
   somewhat agree |         9         21 |        30
                  |     30.00      70.00 |    100.00
------------------+----------------------+----------
            agree |        25         26 |        51
                  |     49.02      50.98 |    100.00
------------------+----------------------+----------
   strongly agree |        11         21 |        32
                  |     34.38      65.63 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   9.0362   Pr = 0.172

->  tab LO5 Instituion , chi2 r

+----------------+
| Key            |
```

```
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LO5 |       TUT       CPUT |     Total
-----------------+----------------------+----------
strongly disagree |        32         41 |        73
                  |     43.84      56.16 |    100.00
-----------------+----------------------+----------
         disagree |        21         49 |        70
                  |     30.00      70.00 |    100.00
-----------------+----------------------+----------
            Total |        53         90 |       143
                  |     37.06      62.94 |    100.00

          Pearson chi2(1) =   2.9325   Pr = 0.087

->  tab LOO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
            LOO1 |       TUT       CPUT |     Total
-----------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
-----------------+----------------------+----------
         disagree |         1          5 |         6
                  |     16.67      83.33 |    100.00
-----------------+----------------------+----------
somewhat disagree |         1          3 |         4
```

```
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
          neutral |         0         14 |        14
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
   somewhat agree |        11         28 |        39
                  |     28.21      71.79 |    100.00
------------------+----------------------+----------
            agree |        18         26 |        44
                  |     40.91      59.09 |    100.00
------------------+----------------------+----------
   strongly agree |        22         14 |        36
                  |     61.11      38.89 |    100.00
------------------+----------------------+----------
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  20.7247   Pr = 0.002

->  tab LOO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LOO2 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         1          4 |         5
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
         disagree |         2          4 |         6
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
somewhat disagree |         0         12 |        12
```

```
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          neutral |         3         13 |        16
                  |     18.75      81.25 |    100.00
------------------+----------------------+----------
   somewhat agree |        10         23 |        33
                  |     30.30      69.70 |    100.00
------------------+----------------------+----------
            agree |        21         18 |        39
                  |     53.85      46.15 |    100.00
------------------+----------------------+----------
   strongly agree |        16         17 |        33
                  |     48.48      51.52 |    100.00
------------------+----------------------+----------
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  17.2741   Pr = 0.008

->  tab LOO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LOO3 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         1          6 |         7
                  |     14.29      85.71 |    100.00
------------------+----------------------+----------
         disagree |         5          7 |        12
                  |     41.67      58.33 |    100.00
------------------+----------------------+----------
somewhat disagree |         3         13 |        16
```

```
                  |     18.75      81.25 |    100.00
------------------+----------------------+----------
          neutral |         5         13 |        18
                  |     27.78      72.22 |    100.00
------------------+----------------------+----------
   somewhat agree |        12         16 |        28
                  |     42.86      57.14 |    100.00
------------------+----------------------+----------
            agree |        10         20 |        30
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
   strongly agree |        17         16 |        33
                  |     51.52      48.48 |    100.00
------------------+----------------------+----------
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =   8.1878   Pr = 0.225

->  tab LOO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LOO4 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         1         18 |        19
                  |      5.26      94.74 |    100.00
------------------+----------------------+----------
         disagree |         2         14 |        16
                  |     12.50      87.50 |    100.00
------------------+----------------------+----------
somewhat disagree |         3         10 |        13
```

```
                  |     23.08      76.92 |    100.00
------------------+----------------------+----------
          neutral |        10         19 |        29
                  |     34.48      65.52 |    100.00
------------------+----------------------+----------
   somewhat agree |         9         10 |        19
                  |     47.37      52.63 |    100.00
------------------+----------------------+----------
            agree |        12          9 |        21
                  |     57.14      42.86 |    100.00
------------------+----------------------+----------
   strongly agree |        16         11 |        27
                  |     59.26      40.74 |    100.00
------------------+----------------------+----------
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  23.8103   Pr = 0.001

->  tab LOO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LOO5 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         6         22 |        28
                  |     21.43      78.57 |    100.00
------------------+----------------------+----------
         disagree |         4         13 |        17
                  |     23.53      76.47 |    100.00
------------------+----------------------+----------
somewhat disagree |         5         15 |        20
```

```
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
          neutral |         7         20 |        27
                  |     25.93      74.07 |    100.00
------------------+----------------------+----------
   somewhat agree |        11          6 |        17
                  |     64.71      35.29 |    100.00
------------------+----------------------+----------
            agree |        13         10 |        23
                  |     56.52      43.48 |    100.00
------------------+----------------------+----------
   strongly agree |         7          5 |        12
                  |     58.33      41.67 |    100.00
------------------+----------------------+----------
            Total |        53         91 |       144
                  |     36.81      63.19 |    100.00

          Pearson chi2(6) =  18.6317   Pr = 0.005

->  tab LLO1 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LLO1 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         1          4 |         5
```

```
                  |     20.00      80.00 |    100.00
------------------+----------------------+----------
          neutral |         1         13 |        14
                  |      7.14      92.86 |    100.00
------------------+----------------------+----------
   somewhat agree |        10         29 |        39
                  |     25.64      74.36 |    100.00
------------------+----------------------+----------
            agree |        27         23 |        50
                  |     54.00      46.00 |    100.00
------------------+----------------------+----------
   strongly agree |        14         20 |        34
                  |     41.18      58.82 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =  16.4191   Pr = 0.012

->  tab LLO2 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LLO2 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         0          1 |         1
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         0          2 |         2
```

```
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
          neutral |         2         13 |        15
                  |     13.33      86.67 |    100.00
------------------+----------------------+----------
   somewhat agree |        10         25 |        35
                  |     28.57      71.43 |    100.00
------------------+----------------------+----------
            agree |        24         29 |        53
                  |     45.28      54.72 |    100.00
------------------+----------------------+----------
   strongly agree |        17         21 |        38
                  |     44.74      55.26 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   9.5923   Pr = 0.143

->  tab LLO3 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LLO3 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         1          2 |         3
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
         disagree |         1          3 |         4
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         3          6 |         9
```

```
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
          neutral |         8         16 |        24
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
   somewhat agree |        15         25 |        40
                  |     37.50      62.50 |    100.00
------------------+----------------------+----------
            agree |        15         25 |        40
                  |     37.50      62.50 |    100.00
------------------+----------------------+----------
   strongly agree |        10         15 |        25
                  |     40.00      60.00 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   0.5501   Pr = 0.997

->  tab LLO4 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LLO4 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         0          2 |         2
                  |      0.00     100.00 |    100.00
------------------+----------------------+----------
         disagree |         4          7 |        11
                  |     36.36      63.64 |    100.00
------------------+----------------------+----------
somewhat disagree |         4         15 |        19
```

```
                  |     21.05      78.95 |    100.00
------------------+----------------------+----------
          neutral |         8         19 |        27
                  |     29.63      70.37 |    100.00
------------------+----------------------+----------
   somewhat agree |        12         14 |        26
                  |     46.15      53.85 |    100.00
------------------+----------------------+----------
            agree |        13         22 |        35
                  |     37.14      62.86 |    100.00
------------------+----------------------+----------
   strongly agree |        12         13 |        25
                  |     48.00      52.00 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   6.1300   Pr = 0.409

->  tab LLO5 Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

                  |      Instituion
             LLO5 |       TUT       CPUT |     Total
------------------+----------------------+----------
strongly disagree |         3         10 |        13
                  |     23.08      76.92 |    100.00
------------------+----------------------+----------
         disagree |         5         15 |        20
                  |     25.00      75.00 |    100.00
------------------+----------------------+----------
somewhat disagree |         5         10 |        15
```

```
                  |     33.33      66.67 |    100.00
------------------+----------------------+----------
          neutral |        16         22 |        38
                  |     42.11      57.89 |    100.00
------------------+----------------------+----------
   somewhat agree |        14         18 |        32
                  |     43.75      56.25 |    100.00
------------------+----------------------+----------
            agree |         5          9 |        14
                  |     35.71      64.29 |    100.00
------------------+----------------------+----------
   strongly agree |         5          8 |        13
                  |     38.46      61.54 |    100.00
------------------+----------------------+----------
            Total |        53         92 |       145
                  |     36.55      63.45 |    100.00

          Pearson chi2(6) =   3.4806   Pr = 0.747

->  tab age Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

            |      Instituion
        age |       TUT       CPUT |     Total
------------+----------------------+----------
17 - 29 yrs |        53         88 |       141
            |     37.59      62.41 |    100.00
------------+----------------------+----------
30 - 39 yrs |         0          3 |         3
            |      0.00     100.00 |    100.00
------------+----------------------+----------
40 - 49 yrs |         0          1 |         1
```

```
           |      0.00     100.00 |    100.00
-----------+----------------------+----------
     Total |        53         92 |       145
           |     36.55      63.45 |    100.00

          Pearson chi2(2) =   2.3697   Pr = 0.306

->  tab gender Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

           |      Instituion
    gender |       TUT       CPUT |     Total
-----------+----------------------+----------
      Male |        45         67 |       112
           |     40.18      59.82 |    100.00
-----------+----------------------+----------
    Female |         8         25 |        33
           |     24.24      75.76 |    100.00
-----------+----------------------+----------
     Total |        53         92 |       145
           |     36.55      63.45 |    100.00

          Pearson chi2(1) =   2.7913   Pr = 0.095

->  tab study Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+
```

Level of study	Instituion TUT	CPUT	Total
1st year	18	37	55
	32.73	67.27	100.00
2nd year	21	30	51
	41.18	58.82	100.00
3rd year	14	25	39
	35.90	64.10	100.00
Total	53	92	145
	36.55	63.45	100.00

Pearson chi2(2) = 0.8244 Pr = 0.662

-> tab ethnic Instituion , chi2 r

Key
frequency
row percentage

Ethnic group	Instituion TUT	CPUT	Total
African	29	11	40
	72.50	27.50	100.00
Indian	1	0	1
	100.00	0.00	100.00
Coloured	2	11	13
	15.38	84.62	100.00

```
-----------+----------------------+----------
     White |        20         63 |        83
           |     24.10      75.90 |    100.00
-----------+----------------------+----------
     Other |         0          3 |         3
           |      0.00     100.00 |    100.00
-----------+----------------------+----------
     Total |        52         88 |       140
           |     37.14      62.86 |    100.00

          Pearson chi2(4) =  33.5705   Pr = 0.000


->  tab FATHER_EDUCATION Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

FATHER_EDUCA |      Instituion
        TION |       TUT       CPUT |     Total
-------------+----------------------+----------
    primaryr |         3          1 |         4
             |     75.00      25.00 |    100.00
-------------+----------------------+----------
   secondary |        12         18 |        30
             |     40.00      60.00 |    100.00
-------------+----------------------+----------
    Tertiary |        17         32 |        49
             |     34.69      65.31 |    100.00
-------------+----------------------+----------
Postgraduate |        1631 |        41
             |     34.04      65.96 |    100.00
-------------+----------------------+----------
       Other |         00 |         0
```

```
             |     00.0000.00 |    00.00
-------------+----------------------+----------
       Total |        48         82 |       130
             |     36.92      63.08 |    100.00

          Pearson chi2(4) =   2.8855   Pr = 0.577

->  tab MOTHER_EDUCATION Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

MOTHER_EDUCA |      Instituion
        TION |       TUT       CPUT |     Total
-------------+----------------------+----------
    primaryr |         5          6 |        11
             |     45.45      54.55 |    100.00
-------------+----------------------+----------
   secondary |        11         18 |        29
             |     37.93      62.07 |    100.00
-------------+----------------------+----------
    Tertiary |        13         39 |        52
             |     25.00      75.00 |    100.00
-------------+----------------------+----------
Postgraduate |        20         21 |        41
             |     48.78      51.22 |    100.00
-------------+----------------------+----------
       Other |         00 |         0
             |     00.0000.00 |    00.00
-------------+----------------------+----------
       Total |        49         84 |       133
             |     36.84      63.16 |    100.00

          Pearson chi2(4) =   6.4557   Pr = 0.168
```

```
->  tab FATHER_SECTOR Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
 FATHER_SECTOR |       TUT       CPUT |     Total
---------------+----------------------+----------
Private sector |        11         32 |        43
               |     25.58      74.42 |    100.00
---------------+----------------------+----------
 Public sector |        17         17 |        34
               |     50.00      50.00 |    100.00
---------------+----------------------+----------
 self-employed |        12         32 |        44
               |     27.27      72.73 |    100.00
---------------+----------------------+----------
       Retired |         4          3 |         7
               |     57.14      42.86 |    100.00
---------------+----------------------+----------
    unemployed |         3          2 |         5
               |     60.00      40.00 |    100.00
---------------+----------------------+----------
         Total |        47         86 |       133
               |     35.34      64.66 |    100.00

          Pearson chi2(4) =   9.0299   Pr = 0.060

->  tab MOTHER_SECTOR Instituion , chi2 r

+----------------+
| Key            |
|----------------|
```

```
|   frequency    |
| row percentage |
+----------------+

               |      Instituion
 MOTHER_SECTOR |       TUT       CPUT |     Total
---------------+----------------------+----------
Private sector |         9         29 |        38
               |     23.68      76.32 |    100.00
---------------+----------------------+----------
 Public sector |        22         26 |        48
               |     45.83      54.17 |    100.00
---------------+----------------------+----------
 self-employed |         8         20 |        28
               |     28.57      71.43 |    100.00
---------------+----------------------+----------
       Retired |         3          3 |         6
               |     50.00      50.00 |    100.00
---------------+----------------------+----------
    unemployed |         7          9 |        16
               |     43.75      56.25 |    100.00
---------------+----------------------+----------
         Other |         0          1 |         1
               |      0.00     100.00 |    100.00
---------------+----------------------+----------
         Total |        49         88 |       137
               |     35.77      64.23 |    100.00

          Pearson chi2(5) =   6.6927   Pr = 0.245


->  tab income Instituion , chi2 r

+----------------+
| Key            |
|----------------|
|   frequency    |
| row percentage |
```

+----------------+

| Instituion
Estimated income	TUT CPUT	Total
up to R 5000	3 10	13
| 23.08 76.92 | 100.00
---|---|---
R5 001 - R10 000 | 7 6 | 13
| 53.85 46.15 | 100.00
---|---|---
R10 001 - R20 000 | 10 10 | 20
| 50.00 50.00 | 100.00
---|---|---
R20 001 - R40 000 | 14 27 | 41
| 34.15 65.85 | 100.00
---|---|---
R40 001 - R70 000 | 8 18 | 26
| 30.77 69.23 | 100.00
---|---|---
R70 001 - R100 000 | 2 3 | 5
| 40.00 60.00 | 100.00
---|---|---
More than R100 001 | 9 5 | 14
| 64.29 35.71 | 100.00
---|---|---
Total | 53 79 | 132
| 40.15 59.85 | 100.00

Pearson chi2(6) = 8.3603 Pr = 0.213

Two-sample t test with equal variances

--

Group | Obs Mean Std. Err. Std. Dev. [95% Conf.
Interval]

```
---------+--------------------------------------------------------------------
--
     TUT |         49      4.244898      .2378522      1.664965      3.766664
4.723132
    CPUT |         87      3.942529       .183054      1.707414      3.578629
4.306428
---------+--------------------------------------------------------------------
--
combined |        136      4.051471      .1451165      1.692335      3.764475
4.338466
---------+--------------------------------------------------------------------
--
    diff |               .3023692     .3022714                     -.295471
.9002094
------------------------------------------------------------------------------
--
    diff = mean(TUT) - mean(CPUT)                                     t =
1.0003
Ho: diff = 0                                     degrees of freedom =
134

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.8405         Pr(|T| > |t|) = 0.3190          Pr(T > t) = ff
```

APPENDIX E: PLACE OF BIRTH AND RESIDENCE

Section B: Demographics and other questions

Which place were you born?

Town

PLACE_TOWN	Freq.	Percent	Cum.
ADELAIDE	1	0.72	0.72
AMANZIMTOTI	1	0.72	1.45
AMSTERDAM	1	0.72	2.17
BELVILLE	1	0.72	2.90
BOKSBURG	1	0.72	3.62
BRITS	1	0.72	4.35
BURGERSFORT	1	0.72	5.07
CAPE TOWN	41	29.71	34.78
CENTURION	1	0.72	35.51
CERES	1	0.72	36.23
CITRASDAL	1	0.72	36.96
DAVEYTON	1	0.72	37.68
DURBAN	3	2.17	39.86
EAST LONDON	1	0.72	40.58
EMPANGENI	2	1.45	42.03
ERMELO	1	0.72	42.75
ESHOWI	1	0.72	43.48
GERMANY	1	0.72	44.20
GLEN COWIE	1	0.72	44.93
GROBLERSDAL	1	0.72	45.65
HERMANS	1	0.72	46.38
JHB	3	2.17	48.55
JOBURG	2	1.45	50.00
JOHANNESBURG	10	7.25	57.25
JOZINI	1	0.72	57.97
KLERKSDORP	1	0.72	58.70
LENASIA	1	0.72	59.42
LUSIKISIKI	1	0.72	60.14
MAMELODI	1	0.72	60.87

MANENBURG	1	0.72	61.59
MELROSE	1	0.72	62.32
MILNERTON	1	0.72	63.04
NELSPRUIT	2	1.45	64.49
NEWCASTLE	1	0.72	65.22
PAARL	1	0.72	65.94
PHALABORWA	1	0.72	66.67
POLOKWANE	5	3.62	70.29
PORT ELIZABERTH	1	0.72	71.01
PRETORIA	22	15.94	86.96
ROBESTON	1	0.72	87.68
ROODEPOORT	1	0.72	88.41
RUSTERNBURG	1	0.72	89.13
SAN DIEGO	1	0.72	89.86
SASOLBURG	1	0.72	90.58
SIMONS TOWN	1	0.72	91.30
SPRINGS	1	0.72	92.03
SWARTDAM	1	0.72	92.75
THOHOYANDOU	1	0.72	93.48
TURFLOOP	1	0.72	94.20
VANDEBYLPARK	1	0.72	94.93
VANDERBIJILPARK	1	0.72	95.65
VERENIGING	1	0.72	96.38
VILLIERNDORP	1	0.72	97.10
VREDENDAL	1	0.72	97.83
WIGAN	1	0.72	98.55
WINDHOEK	1	0.72	99.28
WORCESNER	1	0.72	100.00
Total	138	100.00	

Current place of residence

Town

RESIDENCE_TOWN	Freq.	Percent	Cum.
BENONI	1	0.72	0.72
BRACKENFELL	2	1.44	2.16
CAPE TOWN	73	52.52	54.68

```
    CAPRE TOWN |          1        0.72       55.40
     CENTURION |          2        1.44       56.83
      DAVEYTON |          1        0.72       57.55
   DURBANVILLE |          3        2.16       59.71
   FAERIE GLEN |          1        0.72       60.43
   GORDONS BAY |          1        0.72       61.15
      HERCULES |          1        0.72       61.87
  JOHANNESBURG |          1        0.72       62.59
   KHAYELITSHA |          1        0.72       63.31
     KOMMETJIE |          1        0.72       64.03
      MAMELODI |          1        0.72       64.75
     MANENBURG |          1        0.72       65.47
 MELKBOSSTRAND |          1        0.72       66.19
         PAARL |          2        1.44       67.63
      PRETORIA |         37       26.62       94.24
PRETORIA NORTH |          1        0.72       94.96
 PRETORIA WEST |          1        0.72       95.68
           PTA |          1        0.72       96.40
      ROSEBANK |          1        0.72       97.12
     SEA POINT |          1        0.72       97.84
       SPRINGS |          1        0.72       98.56
    TABLE VIEW |          1        0.72       99.28
    WONDERBOOM |          1        0.72      100.00
---------------+-----------------------------------
         Total |        139      100.00
```

Current place of residence
Province

```
RESIDENCE_PROVINC |
                E |      Freq.     Percent        Cum.
------------------+-----------------------------------
          GAUTENG |         51       37.78       37.78
     WESTERN CAPE |         8462.22      100.00
------------------+-----------------------------------
            Total |        135      100.00
```

Which industry or service would you like to start your business in? (You may choose more than one option) (J01-J23)

	Industry or service to start business in	Frequency	Percent of responses	Percent of cases
13	Chemicals	7	0.99	4.86
1	Mining	14	1.97	9.72
19	Technology: Software and compu	19	2.68	13.19
8	Property	20	2.82	13.89
3	Health care equipment	22	3.10	15.28
10	Telecoms and technology	22	3.10	15.28
5	Land and Agric	23	3.24	15.97
9	Retail and consumer	24	3.38	16.67
17	Construction and materials	24	3.38	16.67
11	Transport, tourism and leisure	25	3.52	17.36
22	Other	29	4.08	20.14
2	Energy	30	4.23	20.83
6	Media and advert.	33	4.65	22.92
15	Home construction	33	4.65	22.92
7	Green business	35	4.93	24.31
20	Technology: Hardware and equip	36	5.07	25.00
18	Electronic and electrical equi	40	5.63	27.78
21	Industrial engineering	40	5.63	27.78
16	Leisure goods	48	6.76	33.33
12	Automotive industry	54	7.61	37.50
4	Industrial manufacturing	66	9.30	45.83
14	Household goods	66	9.30	45.83
	Total	710	100.00	493.06

APPENDIX F: FACTOR ANALYSIS AND RELIABILITY TESTS

FACTOR ANALYSIS

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.853
Bartlett's Test of Sphericity	Approx. Chi-Square	1329.204
	df	190
	Sig.	.000

Communalities

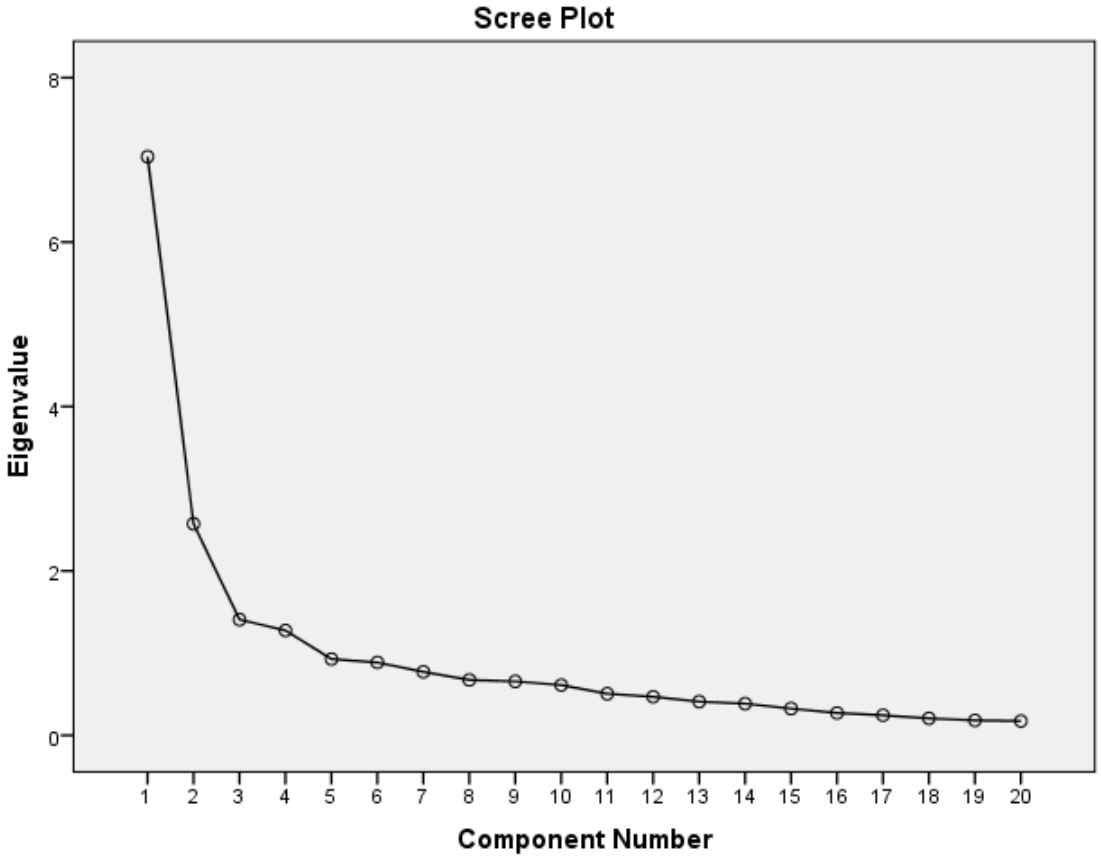
	Initial	Extraction
AO1	1.000	.419
AO2	1.000	.713
AO3	1.000	.712
AO4	1.000	.561
AO5	1.000	.585
AO6	1.000	.570
AO7	1.000	.691
AO8	1.000	.417
AO9	1.000	.697
AO10	1.000	.535
AO11	1.000	.658
AO12	1.000	.591
AO13	1.000	.756
AO14	1.000	.587
HO1	1.000	.471
HO2	1.000	.620
HO3	1.000	.627
HO4	1.000	.717
HO5	1.000	.617
HO6	1.000	.751

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.039	35.195	35.195	7.039	35.195	35.195	4.604	23.020	23.020
2	2.573	12.866	48.061	2.573	12.866	48.061	3.713	18.563	41.582
3	1.409	7.044	55.105	1.409	7.044	55.105	2.101	10.503	52.086
4	1.275	6.376	61.481	1.275	6.376	61.481	1.879	9.395	61.481
5	.928	4.640	66.122						
6	.887	4.433	70.554						
7	.772	3.859	74.414						
8	.675	3.373	77.787						
9	.656	3.281	81.068						
10	.611	3.057	84.126						
11	.506	2.528	86.654						
12	.470	2.348	89.002						
13	.410	2.051	91.053						
14	.385	1.927	92.980						
15	.326	1.628	94.608						
16	.272	1.359	95.967						
17	.244	1.221	97.187						
18	.206	1.032	98.220						
19	.182	.909	99.129						
20	.174	.871	100.000						

Extraction Method: Principal Component Analysis.



Component Matrix[a]

	Component			
	1	2	3	4
HO2	.716			
HO6	.702	-.473		
HO4	.683	-.458		
AO11	.674			
AO3	.669			
HO3	.665	-.413		
AO13	.663			-.440
AO4	.655			
AO9	.654	.511		
HO5	.645	-.431		
AO12	.630			
AO14	.613			
HO1	.566			
AO8	.552			
AO1	.503			
AO6	.486			

AO10	.418		.483	
AO7	.415		.482	
AO2		.422	.442	.460
AO5				.440

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
HO6	.828			
HO4	.784			
HO3	.764			
HO5	.763			
HO2	.724			
HO1	.669			
AO14	.643			
AO10	.598			
AO3		.750		
AO11		.730		
AO12		.706		
AO9		.686		
AO1		.628		
AO4		.608		
AO7			.798	
AO6			.702	
AO13		.518	.673	
AO2				.813
AO5				.723
AO8				.450

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Component Transformation Matrix

Component	1	2	3	4
1	.677	.604	.330	.259
2	-.725	.461	.351	.373
3	.117	-.650	.540	.522

4	.047	.015	-.690	.722

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Component Score Coefficient Matrix

	Component			
	1	2	3	4
AO1	-.049	.236	-.066	-.060
AO2	-.031	-.092	-.005	.498
AO3	-.020	.269	-.230	.085
AO4	.018	.189	-.177	.096
AO5	-.028	-.039	-.047	.435
AO6	-.006	-.088	.398	-.019
AO7	-.036	-.127	.469	.020
AO8	.019	.043	-.061	.230
AO9	-.090	.187	.088	.043
AO10	.181	-.250	.141	.159
AO11	-.055	.239	.058	-.118
AO12	-.059	.236	.033	-.093
AO13	-.045	.088	.337	-.154
AO14	.136	.081	.008	-.218
HO1	.168	-.048	-.015	.002
HO2	.162	.000	-.014	-.014
HO3	.191	-.062	-.020	.035
HO4	.186	-.017	.071	-.162
HO5	.193	-.057	-.049	.045
HO6	.208	-.024	-.129	.062

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Component Score Covariance Matrix

Component	1	2	3	4
1	1.000	.000	.000	.000
2	.000	1.000	.000	.000
3	.000	.000	1.000	.000
4	.000	.000	.000	1.000

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

RELIABILITY

Scale: SE

Case Processing Summary

		N	%
Cases	Valid	142	97.9
	Excluded[a]	3	2.1
	Total	145	100

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.881	0.887	8

Inter-Item Correlation Matrix

	AO10	AO14	HO1	HO2	HO3	HO4	HO5
AO10	1	0.26	0.373	0.348	0.435	0.358	0.34
AO14	0.26	1	0.41	0.355	0.458	0.704	0.528
HO1	0.373	0.41	1	0.55	0.49	0.435	0.428
HO2	0.348	0.355	0.55	1	0.659	0.493	0.533
HO3	0.435	0.458	0.49	0.659	1	0.544	0.517
HO4	0.358	0.704	0.435	0.493	0.544	1	0.693
HO5	0.34	0.528	0.428	0.533	0.517	0.693	1
HO6	0.447	0.49	0.537	0.613	0.6	0.61	0.647

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AO10	34.162	57.442	0.463	0.261	0.887
AO14	34.6901	53.818	0.604	0.522	0.872
HO1	34.8662	57.932	0.603	0.402	0.871
HO2	34.2535	54.744	0.661	0.556	0.865

HO3	33.9718	56.879	0.706	0.546	0.862	
HO4	34.7113	52.533	0.746	0.663	0.855	
HO5	34.7113	53.455	0.706	0.573	0.86	

Scale: PA

Case Processing Summary

		N	%
Cases	Valid	141	97.2
	Excluded[a]	4	2.8
	Total	145	100

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.858	0.861	7

Inter-Item Correlation Matrix

	AO1	AO3	AO4	AO9	AO11	AO12	AO13
AO1	1	0.356	0.296	0.417	0.44	0.381	0.412
AO3	0.356	1	0.696	0.496	0.512	0.471	0.349
AO4	0.296	0.696	1	0.413	0.418	0.401	0.328
AO9	0.417	0.496	0.413	1	0.643	0.6	0.56
AO11	0.44	0.512	0.418	0.643	1	0.566	0.556
AO12	0.381	0.471	0.401	0.6	0.566	1	0.537
AO13	0.412	0.349	0.328	0.56	0.556	0.537	1

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AO1	32.5674	44.276	0.502	0.263	0.858
AO3	33.1773	42.061	0.641	0.566	0.836
AO4	32.539	45.522	0.567	0.496	0.846
AO9	32.5035	43.552	0.71	0.54	0.828
AO11	33.4965	40.395	0.709	0.533	0.826
AO12	33.0567	43.082	0.662	0.469	0.833

AO13	32.6596	44.683	0.609	0.429	0.841	

Scale: SN

Case Processing Summary

		N	%
Cases	Valid	143	98.6
	Excluded[a]	2	1.4
	Total	145	100

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.639	0.631	3

Inter-Item Correlation Matrix

	AO2	AO5	AO8
AO2	1	0.543	0.357
AO5	0.543	1	0.189
AO8	0.357	0.189	1

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AO2	11.7552	3.327	0.587	0.361	0.318
AO5	11.6643	4.563	0.468	0.294	0.516
AO8	11.8811	5.486	0.319	0.127	0.697

Scale: EI

Case Processing Summary

		N	%
Cases	Valid	142	97.9
	Excluded[a]	3	2.1

Total	145	100

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.731	0.736	3

Inter-Item Correlation Matrix

	AO6	AO7	AO13
AO6	1	0.441	0.515
AO7	0.441	1	0.491
AO13	0.515	0.491	1

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AO6	10.9718	6.595	0.549	0.312	0.651
AO7	10.8662	6.514	0.532	0.289	0.674
AO13	10.4296	7.41	0.592	0.352	0.612

Scale: BE

Case Processing Summary

		N	%
Cases	Valid	145	100
	Excluded[a]	0	0
	Total	145	100

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.851	0.858	5

Inter-Item Correlation Matrix

	LLO1	LLO2	LLO3	LLO4	LLO5
LLO1	1	0.782	0.405	0.482	0.393
LLO2	0.782	1	0.517	0.534	0.371
LLO3	0.405	0.517	1	0.767	0.589
LLO4	0.482	0.534	0.767	1	0.629
LLO5	0.393	0.371	0.589	0.629	1

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
LLO1	19.7655	23.167	0.598	0.633	0.837
LLO2	19.6345	23.206	0.651	0.665	0.827
LLO3	20.1793	20.357	0.728	0.629	0.802
LLO4	20.4897	18.363	0.773	0.66	0.788
LLO5	21.3103	19.354	0.616	0.439	0.84

Scale: EK

Case Processing Summary

		N	%
Cases	Valid	143	98.6
	Excluded[a]	2	1.4
	Total	145	100

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.923	0.923	7

Inter-Item Correlation Matrix

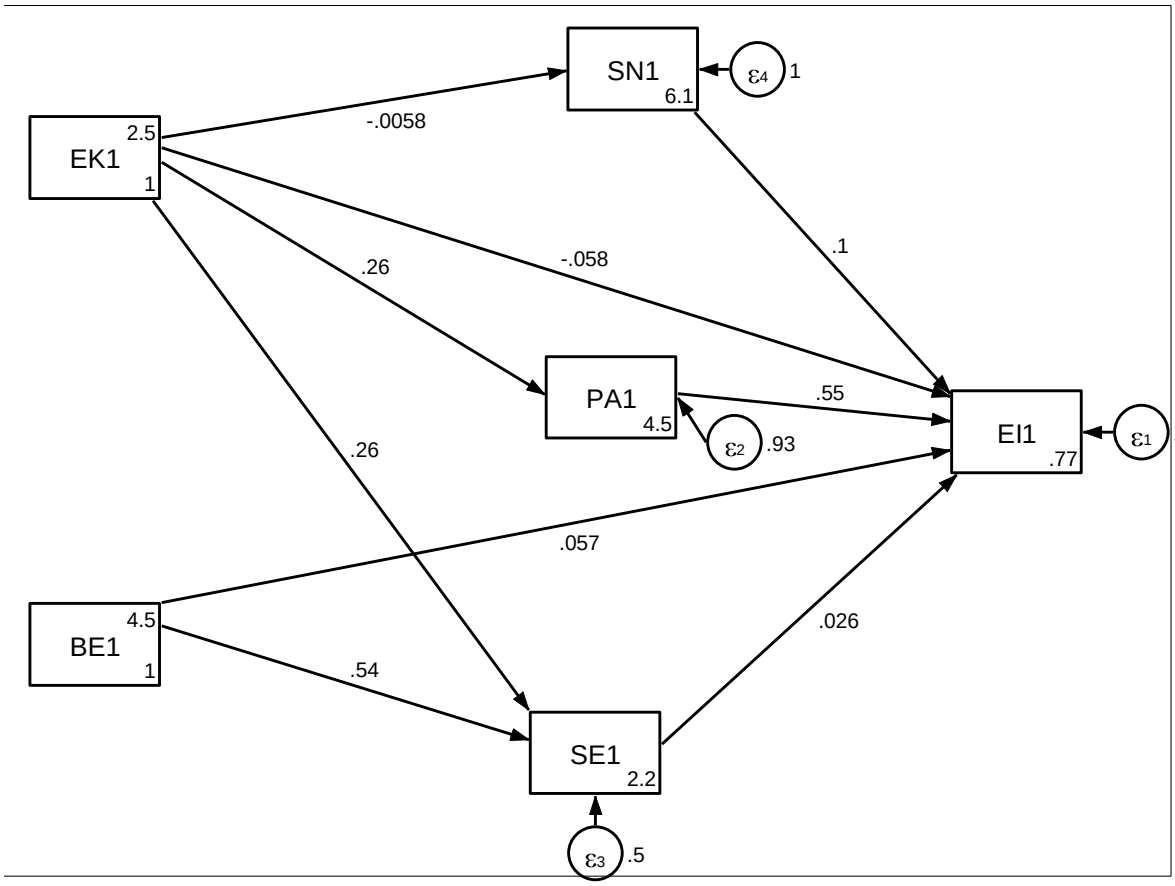
	GGO1	GGO2	GGO3	GGO4	GGO5	GGO6	GGO7

GGO1	1	0.656	0.62	0.558	0.653	0.613	0.539
GGO2	0.656	1	0.713	0.516	0.672	0.571	0.476
GGO3	0.62	0.713	1	0.605	0.711	0.685	0.577
GGO4	0.558	0.516	0.605	1	0.7	0.648	0.611
GGO5	0.653	0.672	0.711	0.7	1	0.769	0.616
GGO6	0.613	0.571	0.685	0.648	0.769	1	0.74
GGO7	0.539	0.476	0.577	0.611	0.616	0.74	1

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
GGO1	19.4196	68.682	0.723	0.546	0.915
GGO2	20.1608	68.249	0.714	0.606	0.915
GGO3	19.7343	65.619	0.786	0.649	0.908
GGO4	19.8462	66.427	0.726	0.557	0.915
GGO5	20	64.225	0.837	0.724	0.903
GGO6	20.049	64.047	0.816	0.722	0.905
GGO7	20.3427	66.987	0.709	0.582	0.916

APPENDIX G: THE PROPOSED (RESEARCH) MODEL



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Statistics/Data Analysis

```
. sem (PA1 -> EI1, ) (SE1 -> EI1, ) (EK1 -> EI1, ) (EK1 -> PA1, ) (EK1 -> SE1, ) (EK1 -> SN1
>  method(mlmv) nocapslatent
note: Missing values found in observed exogenous variables. Using the noxconditional behavior
      override this behavior.
Endogenous variables

Observed:  PA1 EI1 SE1 SN1

Exogenous variables

Observed:  EK1 BE1

Fitting saturated model:

Iteration 0:   log likelihood = -1157.8522
Iteration 1:   log likelihood =  -1157.751
Iteration 2:   log likelihood = -1157.7509
Iteration 3:   log likelihood = -1157.7509

Fitting baseline model:

Iteration 0:   log likelihood = -1286.6695
Iteration 1:   log likelihood = -1286.6694
Iteration 2:   log likelihood = -1286.6694

Fitting target model:

Iteration 0:   log likelihood = -1198.1095
Iteration 1:   log likelihood = -1198.1078
Iteration 2:   log likelihood = -1198.1078

Structural equation model                       Number of obs      =        145
Estimation method  = mlmv
Log likelihood     = -1198.1078
```

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
PA1 <-						
EK1	.2051458	.0640293	3.20	0.001	.0796506	.330641
_cons	4.809922	.2285293	21.05	0.000	4.362013	5.257831
EI1 <-						
PA1	.6150949	.1010965	6.08	0.000	.4169493	.8132404
SE1	.0353679	.1480429	0.24	0.811	-.2547907	.3255266
SN1	.1293848	.0994705	1.30	0.193	-.0655738	.3243434
EK1	-.05136	.0761756	-0.67	0.500	-.2006615	.0979415
BE1	.0615424	.1046192	0.59	0.556	-.1435075	.2665924
_cons	.9202081	.6207849	1.48	0.138	-.296508	2.136924
SE1 <-						
EK1	.1715184	.0445044	3.85	0.000	.0842913	.2587454
BE1	.4240031	.053547	7.92	0.000	.3190529	.5289533
_cons	1.894421	.2392671	7.92	0.000	1.425466	2.363376
SN1 <-						
EK1	-.0041477	.0594816	-0.07	0.944	-.1207295	.1124342
_cons	5.902227	.2124031	27.79	0.000	5.485924	6.318529
mean(EK1)	3.308132	.1123315	29.45	0.000	3.087967	3.528298
mean(BE1)	5.068966	.0928426	54.60	0.000	4.886997	5.250934
var(e.PA1)	1.073367	.1261159			.8525814	1.351328
var(e.EI1)	.9843889	.1156142			.781979	1.239191
var(e.SE1)	.3836962	.045085			.3047683	.4830647
var(e.SN1)	.927193	.1088933			.7365489	1.167182
var(EK1)	1.813016	.2147544			1.437393	2.286798
var(BE1)	1.249864	.1467891			.9928745	1.573372

cov(EK1,BE1)	.766429	.1409388	5.44	0.000	.490194 1.042664

LR test of model vs. saturated: chi2(5) = 80.71, Prob > chi2 = 0.0000

. estat mindices, showpclass(all)

Modification indices

	MI	df	P>MI	EPC	Standard EPC
Structural					
PA1 <-					
EI1	49.771	1	0.00	4.150207	4.636618
SE1	32.539	1	0.00	.6630031	.5437227
SN1	33.617	1	0.00	.5182335	.4654058
BE1	7.356	1	0.01	.2429381	.2533034
SE1 <-					
PA1	25.383	1	0.00	.2503754	.305302
EI1	27.005	1	0.00	.4120511	.5613332
SN1 <-					
PA1	33.617	1	0.00	.4476591	.4984724
EI1	37.763	1	0.00	.7659783	.9528877
SE1	7.528	1	0.01	.2963338	.2706056
BE1	8.941	1	0.00	.2488903	.2889662
cov(e.PA1,e.SE1)	25.383	1	0.00	.2687447	.4187665
cov(e.PA1,e.SN1)	33.617	1	0.00	.4805025	.4816554

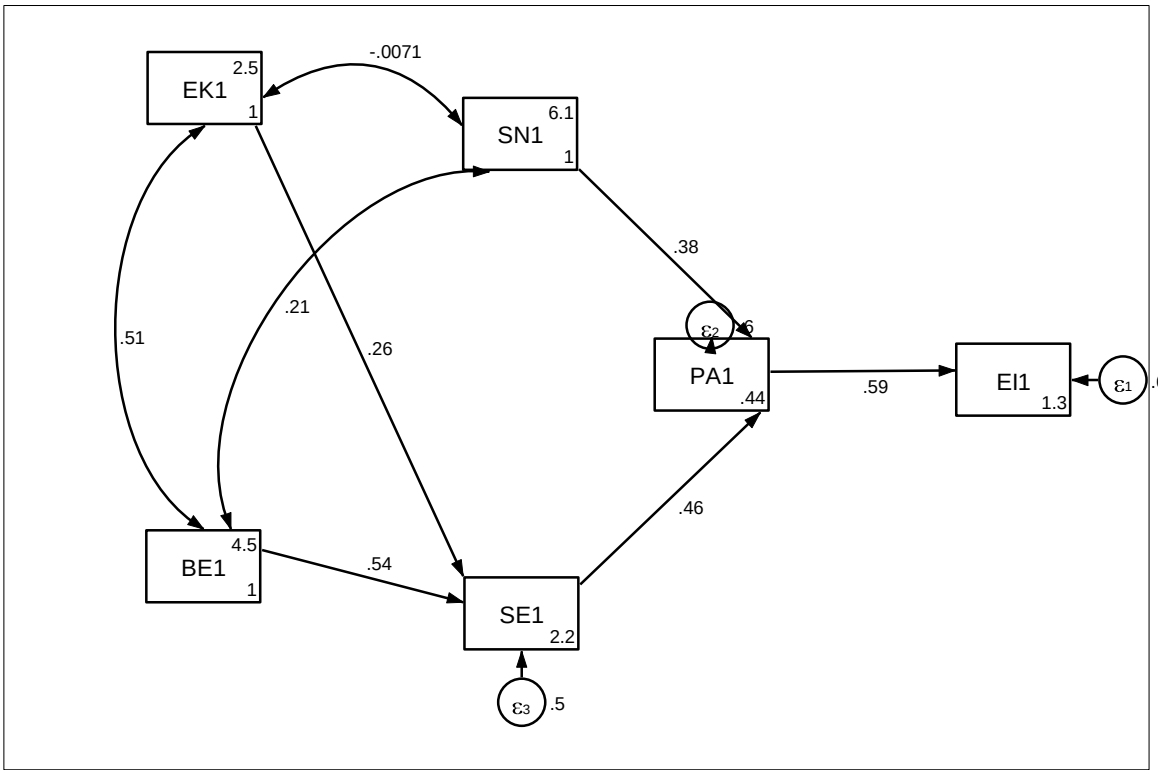
EPC = expected parameter change

. estat gof, stats(all)

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(5)	80.714	model vs. saturated
p > chi2	0.000	
chi2_bs(14)	257.837	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.323	Root mean squared error of approximation
90% CI, lower bound	0.263	
upper bound	0.387	
pclose	0.000	Probability RMSEA <= 0.05
Information criteria		
AIC	2440.216	Akaike's information criterion
BIC	2505.704	Bayesian information criterion
Baseline comparison		
CFI	0.689	Comparative fit index
TLI	0.131	Tucker-Lewis index
Size of residuals		
CD	0.530	Coefficient of determination

Note: SRMR is not reported because of missing values.

APPENDIX H: THE REVISED MODEL



Statistics/Data Analysis

```
. sem (PA1 -> EI1, ) (SE1 -> PA1, ) (EK1 -> SE1, ) (SN1 -> PA1, ) (BE1 -> SE1, ), method(mlmv)
note: Missing values found in observed exogenous variables. Using the noxconditional behavior.
      override this behavior.
Endogenous variables

Observed:  PA1 EI1 SE1

Exogenous variables

Observed:  EK1 SN1 BE1

Fitting saturated model:

Iteration 0:   log likelihood = -1157.8522
Iteration 1:   log likelihood =  -1157.751
Iteration 2:   log likelihood = -1157.7509
Iteration 3:   log likelihood = -1157.7509

Fitting baseline model:

Iteration 0:   log likelihood =  -1282.044
Iteration 1:   log likelihood = -1282.0437
Iteration 2:   log likelihood = -1282.0437

Fitting target model:

Iteration 0:   log likelihood = -1161.4359
Iteration 1:   log likelihood = -1161.4359

Structural equation model                       Number of obs      =        145
Estimation method  = mlmv
Log likelihood     = -1161.4359
```

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
PA1 <-						
SE1	.551546	.0790557	6.98	0.000	.3965996	.7064924
SN1	.421169	.072192	5.83	0.000	.2796753	.5626628
_cons	.4652904	.5096716	0.91	0.361	-.5336476	1.464228
EI1 <-						
PA1	.6879522	.0776521	8.86	0.000	.5357569	.8401474
_cons	1.587344	.4342555	3.66	0.000	.7362185	2.438469
SE1 <-						
EK1	.1710642	.0445498	3.84	0.000	.0837482	.2583801
BE1	.4248006	.0535174	7.94	0.000	.3199084	.5296929
_cons	1.89137	.2393682	7.90	0.000	1.422217	2.360523
mean(EK1)	3.311121	.1121861	29.51	0.000	3.09124	3.531001
mean(SN1)	5.888506	.0799666	73.64	0.000	5.731774	6.045237
mean(BE1)	5.068966	.0928426	54.60	0.000	4.886997	5.250934
var(e.PA1)	.6757406	.0793617			.5367987	.8506454
var(e.EI1)	1.005186	.1180531			.7985054	1.265362
var(e.SE1)	.3839215	.0451142			.304943	.483355
var(EK1)	1.807821	.2137673			1.433852	2.279326
var(SN1)	.9272242	.108897			.7365737	1.167222
var(BE1)	1.249864	.1467891			.9928745	1.573372
cov(EK1,SN1)	-.0091788	.1076909	-0.09	0.932	-.220249	.2018914
cov(EK1,BE1)	.7626371	.140656	5.42	0.000	.4869564	1.038318
cov(SN1,BE1)	.2265398	.0913585	2.48	0.013	.0474804	.4055992

```
LR test of model vs. saturated: chi2(7)    =      7.37, Prob > chi2 = 0.3914
```

```
. estat mindices, showpclass(all)
(no modification indices to report, all MI values less than 3.841458820694123)

. estat gof, stats(all)
```

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(7)	7.370	model vs. saturated
p > chi2	0.391	
chi2_bs(12)	248.586	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.019	Root mean squared error of approximation
90% CI, lower bound	0.000	
upper bound	0.105	
pclose	0.620	Probability RMSEA <= 0.05
Information criteria		
AIC	2362.872	Akaike's information criterion
BIC	2422.406	Bayesian information criterion
Baseline comparison		
CFI	0.998	Comparative fit index
TLI	0.997	Tucker-Lewis index
Size of residuals		
CD	0.600	Coefficient of determination

Note: SRMR is not reported because of missing values.

APPENDIX I: DEMOGRAPHICS AND DESCRIPTIVE ANALYSIS OF GROUP 2 PARTICIPANTS

Frequency tables were used to summarise all categorical variables. Stata's mrtab command was used to generate tables for multiple response items.

```
. tab m001

       M001 |      Freq.     Percent        Cum.
------------+-----------------------------------
       2011 |          3       13.64       13.64
       2012 |          4       18.18       31.82
       2013 |          7       31.82       63.64
       2014 |          8       36.36      100.00
------------+-----------------------------------
      Total |         22      100.00

. tab m002

       M002 |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |         21       95.45       95.45
          2 |          1        4.55      100.00
------------+-----------------------------------
      Total |         22      100.00

. tab n001

       n001 |      Freq.     Percent        Cum.
------------+-----------------------------------
          1 |         22      100.00      100.00
------------+-----------------------------------
      Total |         22      100.00

. mrtab n01- n04, poly response (1/10) include sort ti(Current employment)

                                    |            Percent of     Percent
```

```
              Current employment |  Frequency   responses    of cases
---------------------------------+-----------------------------------
 3                 Work for govn. |          1        4.54        4.54
 1                   Own business |          5       22.73       27.27
 4   Work for business and has an |          5       22.73       50.00
                     own business |
 2            Work for a business |         11       50.00       100.00
---------------------------------+-----------------------------------
              Total |         22  100.00      100.00

Valid cases:         22
Missing cases:        0
```

Most of the participants (11; 50.00%) worked for a business. Only one participant worked for the government.

```
. sum n005

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        n005 |         9        2.25          .5          2          3
```

```
. mrtab p01 - p04 , poly response (1/10) include sort ti(where do you operate your business from?)

  where do you |
  operate your |             Percent of     Percent
business from? |  Frequency   responses    of cases
---------------+-----------------------------------
 3     Factory |          2       22.22       22.22
 1 Garage/Home |          7       77.78      100.00
---------------+-----------------------------------
         Total |          9      100.00      100.00

Valid cases:          9
Missing cases:       13
```

```
. mrtab r1 - r23 , poly response (1/50) include sort ti(which service did
you start your business from?)

      which |
service did |
  you start |
       your |
   business |              Percent of     Percent
      from? |  Frequency   responses    of cases
------------+-----------------------------------
          2 |          1        1.75        5.00
          3 |          1        1.75        5.00
          5 |          1        1.75        5.00
          7 |          1        1.75        5.00
          8 |          1        1.75        5.00
         13 |          1        1.75        5.00
         17 |          1        1.75        5.00
         21 |          1        1.75        5.00
         22 |          1        1.75        5.00
          1 |          2        3.51       10.00
         10 |          2        3.51       10.00
          6 |          3        5.26       15.00
          9 |          3        5.26       15.00
         15 |          3        5.26       15.00
         18 |          4        7.02       20.00
         20 |          4        7.02       20.00
         19 |          6       10.53       30.00
          4 |          7       12.28       35.00
         14 |          7       12.28       35.00
         16 |          7       12.28       35.00
------------+-----------------------------------
      Total |         57      100.00      285.00

Valid cases:         20
Missing cases:        2

. tab s001
```

```
       s001 |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |         12       60.00       60.00
         No |          8       40.00      100.00
------------+-----------------------------------
      Total |         20      100.00
```

```
. tab s002
```

```
       s002 |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |         18       90.00       90.00
         No |          2       10.00      100.00
------------+-----------------------------------
      Total |         20      100.00
```

```
. tab s00
s00 ambiguous abbreviation
r(111);
. tab s003
```

```
       s003 |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |         12       63.16       63.16
         No |          7       36.84      100.00
------------+-----------------------------------
      Total |         19      100.00
```

```
. tab s004
```

```
       s004 |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |          4       28.57       28.57
         No |         10       71.43      100.00
------------+-----------------------------------
      Total |         14      100.00
```

```
. tab1 b1 b2 b4 b6
```

-> tabulation of b1

b1	Freq.	Percent	Cum.
17 - 29 yrs	21	95.45	95.45
30 - 39 yrs	1	4.55	100.00
Total	22	100.00	

-> tabulation of b2

b2	Freq.	Percent	Cum.
Male	18	81.82	81.82
Female	4	18.18	100.00
Total	22	100.00	

-> tabulation of b4

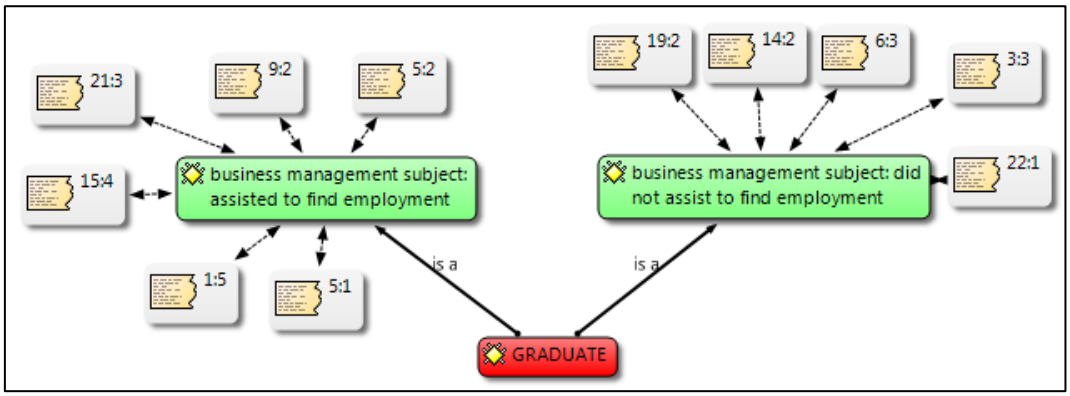
b4	Freq.	Percent	Cum.
African	4	18.18	18.18
Other	0	0.00	18.18
6	0	0.00	18.18
White	18	81.82	100.00
Total	22	100.00	

Parent's educ	Frequency	Percent of responses
4 Postgraduate	9	22.50
2 Secondary	14	35.00
3 Tertiary	17	42.50
Total	40	100.00

```
Valid cases:         20
Missing cases:        2

. mrtab b81 - b82 , poly response (1/10) include sort ti(Parent's
employment)

     Parent's |             Percent of
   employment |  Frequency   responses
--------------+-------------------------
 5 Unemployed |          1        2.56
 6      Other |          1        2.56
 4    retired |          3        7.69
 3       Self |          9       23.08
 2     Public |          9       23.08
 1    Private |         16       41.03
--------------+-------------------------
        Total |         39      100.00

Valid cases:         20
Missing cases:        2

. tab b10
               b10 |      Freq.     Percent        Cum.
-------------------+-----------------------------------
   R5001 - R10 000 |          1        5.26        5.26
   R10001 - R20000 |          7       36.84       42.11
  R20001 - R40 000 |          4       21.05       63.16
 R40 001 - R70 000 |          3       15.79       78.95
R70 001 - R100 000 |          4       21.05      100.00
-------------------+-----------------------------------
             Total |         19      100.00
. sum b9

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
          b9 |        19    2.684211    1.565341          1          6
```

APPENDIX J: QUALITATIVE ANALYSIS OF THEMES

THEME 1: BUSINESS SUBJECTS' INFLUENCE ON FINDING EMPLOYMENT



Business management subject - Assisted to find employment:

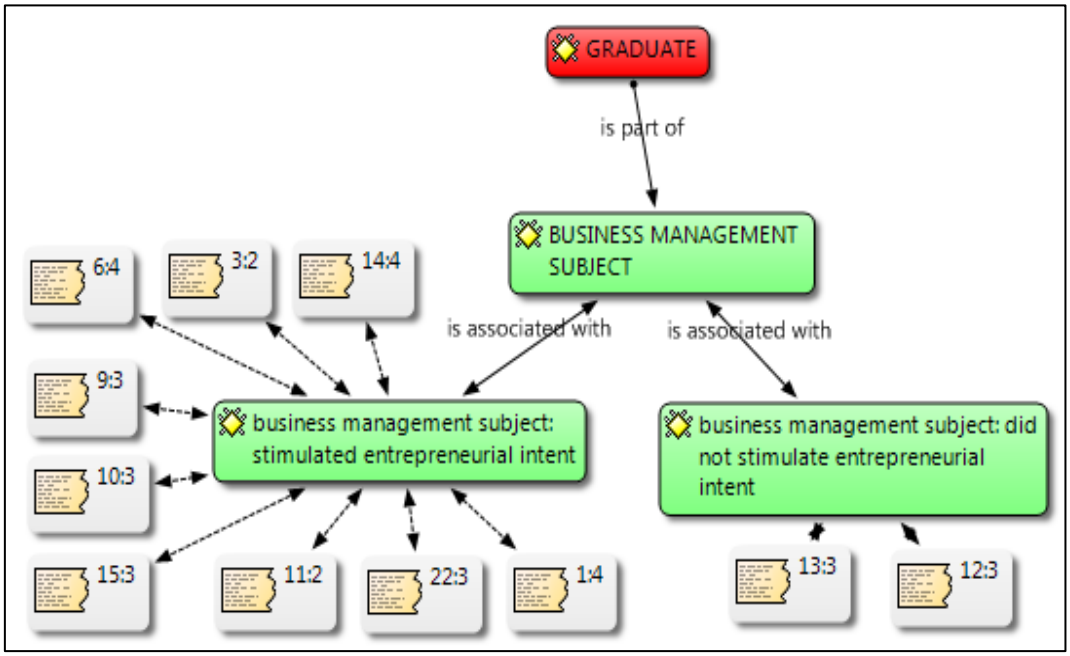
a. "Yes, it (sic) did especially when it comes to the cost of manufacturing and marketing yourself as a designer" (Participant 5. Quote 5:2);
b. "I (sic) got a job in 2 weeks as soon as I started to look for one" (Participant 9. Quote 9:2);
c. "Immediately I finished my studies in November and started my business (sic) in December" (Participant 21. Quote 21:3);
d. "It was posted on our Facebook group from when I was in third year so I just applied from the companies that posted" (Participant 15. Quote 15:4);
e. "Yes, very easy (sic) I receive job offers a few times a year, all in my field. It would appear that once you choose your direction and spend time in it and deal with people in similar fields, doors start opening" (Participant 1. Quote 1:5); and
f. "one week'" (Participant 5. Quote 5:1).

Business management subject – Did not assist to find employment:

a. "Unemployment is a problem in South Africa, and employers are looking for under qualified applicants" (Participant 19. Quote 19:2);

b. “Four months without employment: NOTE: I am not employed in my field of study” (Participant 14. Quote 14:2);
c. “There is a lack of knowledge on the industrial design movement in most of Africa. People do not know what industrial designers are used for. In South Africa, there are a few companies that specialise in industrial design, making jobs harder to come by” (Participant 6. Quote 6:3);
d. “Industrial design is very new so the jobs are not advertised correctly. Some people are looking for designers but do not know the functions or job descriptions” (Participant 3. Quote 3:3); and
e. “I was not able to find work in my field, thus resorted to self-employment as of September 2014” (Participant 22. Quote 22:1).

THEME 2: BUSINESS SUBJECTS’ STIMULATION OF ENTREPRENEURIAL INTENTIONS



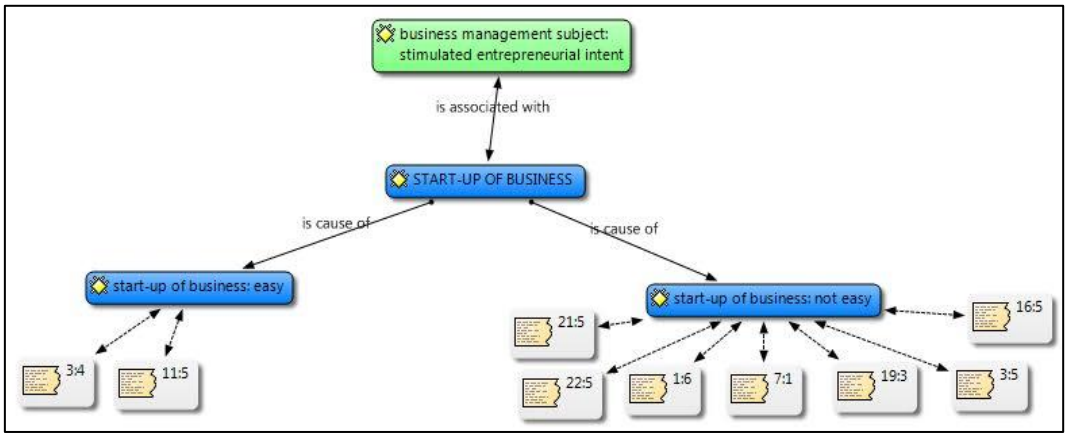
Business management subject – did not stimulate entrepreneurial intention:

a. “It assisted me in gaining the Diploma but I have not used the knowledge of those subjects thus far” (Participant 12. Quote 12:3); and
b. *“*It could definitely go more in depth. Particularly quoting potential clients and the whole process of running your own business*”* (Participant 13. Quote 13:3).

Business management subject – stimulated entrepreneurial intention:

a. “I understand how a business functions and what is needed to make the business thrive. The marketing aspects, the feasibility and viability of an action/plan/opportunity*”* (Participant 14. Quote 14:4);
b. It gives a broad view of what happens in business, showing you the individual organs required to make a business run. I had a good sense of business (sic) before starting to work, so I had a starting point where some design practitioners have no clue” (Participant 3. Quote 3:2);
c. “I think the business management subject (sic) helped shine the light on design with the competitions” (Participant 6. Quote 6:4);
d. “One year, I was working full-time for myself” (Participant 9. Quote 9:3);
e. “It helped me understand my projects from a business standing” (Participant 10. Quote 10:3);
f. “It gave me a better understanding of how to work in a business environment as a designer, an understanding of working with other people’s intellectual property, and how to manage my own as well” (Participant 15. Quote 15:3);
g. “Started in second year of studies with my own business (sic)” (Participant 11. Quote 11:2);
h. “One year from studies till I started my own business” (Participant 22. Quote 22:3); and
i. “Yes, loads, it is what led me to believe a business as opposed to employment is a feasible idea” (Participant 1. Quote 1:4).

THEME 3: TRANSLATION OF ENTREPRENEURIAL INTENTIONS INTO ACTUAL BUSINESS START-UPS



Start-up of business – easy:

a. "Starting a business is easy, finding a supplier is a headache but still easy, marketing yourself to get buyers for your product is a huge challenge. The (sic) biggest challenge of all is having enough support and capital behind you to carry you until the business becomes profitable, which means at least one year" (Participant 3. Quote 3.4); and
b. "The business started itself" (Participant 11. Quote 11:5).

Start-up of business was not easy:

Participants found it challenging to start-up an actual business. The following were some of the reasons the cases identified:

a. "Even with the creativity and skills I acquired as an industrial design student I realised that it is never easy starting a business" (Participant 16. Quote 16:5);
b. "….finding a supplier is a headache" (Participant 3. Quote 3.5);
c. "Lack of financing" (Participant 19. Quote 19:3);
d. "Need funding; I do not want any business relationship with the government. The (sic) government has (sic) too much forms et cetera and wants to control (sic) your business" (Participant 7. Quote 7:1);

e. “The challenge lies in accumulating the required capital to start up, for me, machines were the challenge. Also, generating a cash-flow large enough to live off and grow the business” (Participant 1. Quote 1.6);
f. “Funding is always an issue” (Participant 22. Quote 22.5); and
g. “It is a big risk, but with the right help it is possible” (Participant 21. Quote 21.5).