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The influence of incubation hub services on the post-graduation business performance of digital technology SMEs in South Africa

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The influence of incubation hub services on the post-graduation business performance of Digital Technology SMEs in South Africa

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

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ABSTRACT

Digital technologies are disruptive technologies implemented across various sectors to improve business models, customer experiences, and value propositions. South African digital technology-focused SMEs arising through incubation programmes therefore have a meaningful role to play during this revolutionary period.

Incubation programmes play a key role in providing services to SMEs with the objective of supporting the SME to become a financially sustainable entity after graduating from the incubation programme. The performance of an incubation programme is usually considered from the perspective of the incubation hub and not the SME, creating a lack of clarity in relation to the services that result in the business performance of the SME post-graduation. Thus, an investigation into the influence of the services provided by incubation programmes, with a specific focus on training and network development, on the post-incubation performance of the graduate digital technology SME is imperative, and was conducted through this study. The study was conducted from the perspective of the post-incubation graduate digital technology SME.

This quantitative study utilised cross-sectional data collected from 130 digital technology SMEs, who participated and graduated from their respective incubation programmes. After performing hierarchical multiple linear regression, together with moderation analysis, the data was analysed. When performing the regression analysis with the predictor variables of network development and training and the dependent variable of financial capital raised, the value of R-square was 0.014, implying that the model was a poor fit. When the model was run with the same predictor variables of network development and training and the dependent variable of turnover growth, a R-square value of 0.43 was achieved implying that the model was good.

Following the examination and interpretation of the data, it was found that the service of training provided by the incubation programme had a significant positive influence on the post-graduate digital technology SME's turnover growth, but did not influence the financial capital raised by the digital technology SME post-incubation graduation. It was also found that the service of network development had a significant positive influence on the post-incubation graduate digital technology SME's turnover growth, but did not influence the financial capital raised by the digital technology SME post-incubation graduation. It is therefore recommended that incubation hubs offer services that better equip digital technology SMEs with raising of financial capital post-graduation. This may be a contributing factor that assists with SME survival post-incubation.

DECLARATION

I, HASHEEL GOVIND, declare that this research report to be my own work, except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Hasheel Govind Signature: 

Signed at Johannesburg

On the 23rd day of March 2021

DEDICATION

This thesis is dedicated to my dad, Raman Govind, who made all the sacrifices for his children and promoted education as an enabler to a better life.

To my family, this thesis is equally dedicated to you. Your love, support, sacrifices, and encouragement has allowed me to achieve my dream of successfully completing my Master's Degree.

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LIST OF ACRONYMS

BBBEE	–	Broad-Based Black Economic Empowerment
GEM	–	Global Entrepreneurship Monitor
NGO	-	Non-Governmental Organisation
SMEs	-	Small and Medium Enterprises

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

The purpose of this study is to evaluate the influence of incubation hub services on the business performance of post-incubation digital technology SMEs, who participated in incubation programmes in South Africa and graduated from the respective programme. In this study, these SMEs are referred to as post-incubation graduate SMEs. The study has a specific focus on the services of network development and training. A quantitative research approach is utilised through this study. The data was collected using an online questionnaire that was sent to digital technology post-incubation graduate SMEs who participated in incubation programmes in South Africa.

1.2 Context of the study

In South Africa, like other parts of the world, Small and Medium Enterprises (SMEs) play an important role in the economy through the promotion of economic growth (Smit & Watkins, 2012). The criteria for classification of an SME is dependent on the sector in which the entity operates, the turnover of the entity, asset value excluding fixed property and number of employees employed by the entity (National Small Business Act 102, 1996). As per the classification criteria, a digital technology SME is not defined. However, the closest category is the ICT SME, which has an upper limit of turnover amounting to R26 million, and employees of 200 people, in order for entities to meet the classification as an ICT SME (National Small Business Act 102, 1996).

Another method that could be utilised to classify a digital technology SME is the utilisation of the Standard Industry Classification (SIC) codes. This approach would, however, not be suitable, as the SIC codes for ICT, and more specifically digital technology SMEs, would require a specific selection from parent and sub-sectors of the SIC codes due to the fact that the ICT category is broad and includes publishing,

television broadcasting, and other sub-categories, which are not relevant for purposes of this study (Statistics South Africa, 2012).

SME development is a priority area for the South African Government. This is demonstrated by the Government setting up a Ministry of Small Business in May 2014, with a Department of Small Business Development subsequently formed in order to promote SMEs and co-operatives demonstrating the commitment to the development of these entities (Department of Small Business Development, 2020). The South African Government has also shown commitment to developing entrepreneurs by setting up various structures and strategies for the promotion and support of entrepreneurs, which include the Small Enterprise Development Agency, Umsombovu Youth Fund, Khula Enterprise Finance, and the Shared Growth Initiative for South Africa (Mahadea & Pillay, 2008).

Despite Government support for SMEs, based on GEM, South Africa still has one of the lowest rates of entrepreneurial activity compared to the rest of the world (Bosma et al., 2020). South Africa's SME failure rate is estimated to be between 70% - 80%, and is not contributing to GDP to the extent initially expected (Galawe, 2017).

Although failure rates across SMEs is generally high, it remains unclear as to whether or not failure rates across digital technology focused SMEs are equal to the average failure rate given the interventions by Government, NGOs, universities and corporates through their own incubation programmes, which focus on digital technology SMEs. Although universities are traditionally known to set up incubation programmes for the development of University owned intellectual property, there is a greater focus on collaboration between Government, universities and the private sector in relation to assisting and nurturing SMEs to become high-performing entities (Dubihlela & Van Schaikwyk, 2014).

To enable SMEs with a better chance of performing and attaining growth, which also promotes SME survival, SMEs require assistance with enhancing their skills through training and network development, which will aid the SME in raising financial capital (Mahadea & Pillay, 2008). Although the raising of financial capital is a key requirement for SMEs, it is tough for South African SMEs to raise financial capital due to the stringent requirements from funders (Olawale & Garwe, 2010). Due to these

constraints, SMEs are traditionally known to raise funding through friends and family, which are at most times not sufficient (Dubihlela & Van Schaikwyk, 2014). If the SMEs have established professional networks, fund raising may also occur through venture capital companies or other professional organisations, allowing them to focus on their own growth and performance (Scillitoe & Chakrabarti, 2010).

These services of training and network development, in addition to other valuable services geared to developing SMEs, are provided by incubation programmes (Lalkaka, 2001). Despite incubation programmes offering various services, these programmes are not meant to replace initiatives undertaken by entrepreneurs for their own success, but are meant to create a more conducive environment in which entrepreneurs are able to thrive (Dubihlela & Van Schaikwyk, 2014).

Despite the importance of incubation programmes, there is a lack of consensus for a precise definition for an incubation hub, as well as definitive underlying characteristics associated with the various types of hubs, with the boundaries between them often blurred (Littlewood & Kiyumbu, 2018). There is, however, consensus that hubs do participate at an early stage of the participant's growth cycle, which stems from the idea or pre-seed stage, through to pre-growth stage, where a growth stage is characterised by entities generating sustainable profits (Cohen & Hochberg, 2014; Block, Fisch, Vismara & Andres, 2019).

Incubation hubs are referred to by many different names, including tech hubs, accelerators, business incubators, co-creation spaces, science parks, and virtual incubators, but ultimately serve a common goal to bring together skilled individuals for the promotion of innovation, entrepreneurship, and the performance of the SME (De Beer, Millar, Mwangi, Nzomo & Rutenberg, 2016; Theodorakopoulos, Kakabadse & McGowan, 2014). For purposes of this study, we refer to the various hubs as incubation hubs.

Incubation hubs may be categorised by different factors. The goal behind the incubation may be different for the respective organisations, with some organisations aiming to profit from the incubation activities, while others utilise the contribution toward their corporate social investment spend, and yet others utilise sponsors funds with the aim of social upliftment (Tshikulu Social Investments, 2016). Depending on

the objective of the organisation, the services offered by the various categories of incubation hubs could be significantly different, having an impact on the success of the incubation participant.

According to Grimaldi and Grandi (2005), private incubation hubs are incubation hubs driven by a dominant profit goal while non-private incubation hubs, which include government, non-governmental organisations, and other public institutions driven by a dominant goal associated with a social motive.

Another method of classifying incubation hubs is through sponsorship, which may either be private, public, or a hybrid of the two (Cornelius & Bhabra-Remedios, 2003). The sponsorship of the incubation hub may influence the dominant goal of the incubation hub by focusing on specific priorities in line with the sponsor's requirements (Aernoudt, 2004). Incubation hubs may be sector-specific or a generalised incubation hub (Isabelle, 2013).

For purposes of this study, we will be focusing on incubation hubs that have incubated SMEs operating in the digital technology sector.

1.3 Research problem

Incubation hubs are classified according to their dominant goal. The over-arching objective of an incubation hub is to "produce successful firms that will leave the programme financially viable and freestanding" (Ahmad & Thornberry, 2018, p. 1191). The dominant goal of a private incubation hub is associated with a profit motive, while the dominant goal of a non-private incubation hub is to achieve social objectives, which include job creation (Grimaldi & Grandi, 2005). The underlying goal of an incubation hub, being profit-motivated or socially driven, has a bearing on the services offered by the incubator, as well as the management of the incubatee, which contributes to the success of the incubatee post-graduation (Tshikulu Social Investments, 2016).

When considered from the perspective of the incubation hub, regardless of the incubation type, the graduation of an incubatee is often seen as success (Dee, Gill, Lacher, Livesey, & Minshall, 2019). The performance of an incubation programme is

usually considered from the perspective of the incubation hub and not the SME, creating a lack of clarity in relation to the services offered by the incubation programme that ultimately result in the business performance of the SME post-graduation (Aernoudt, 2004; Adlesic & Slavec, 2012). Although the objective of the incubation programme is to create self-sustaining organisations, there remains uncertainty about the services that contribute to the performance of incubatees upon graduating from the incubation programme from an incubatee perspective (Adlesic & Slavec, 2012). There remains further uncertainty as to whether or not the services of network development and training contribute positively to the financial viability of the SME from the viewpoint of the SME (Theodorakopoulos et al., 2014). This uncertainty is also applicable to digital technology SMEs who have graduated from a private incubation programme or non-private incubation programme.

1.4 Research objectives

Main objective: This study seeks to investigate the influence of the services of network development and training provided to digital technology SMEs who participated through incubation programmes and the associated business performance thereof on the post-incubation graduate SMEs. The study seeks to evaluate the business performance of these SMEs resulting from these services, from the perspective of the post-incubation graduate incubatee.

Sub-objective 1: to investigate the influence of training services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by turnover growth;

Sub-objective 2: to investigate the influence of network development services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by turnover growth;

Sub-objective 3: to investigate the influence of training services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by financial capital raised; and

Sub-objective 4: to investigate the influence of network development services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by financial capital raised.

1.5 Significance of the study

The concept of incubation programmes offered by incubation hubs is not new, having been in existence since 1959, with the first incubation hub formed in the United States of America followed by rapid development and global adoption (Theodorakopoulos et al., 2014). Digital technology focused SMEs incubated through incubation programmes have a meaningful role to play during the revolutionary period of the Fourth Industrial Revolution, with the promotion and development of local skills, and development of financially sustainable enterprises.

Within the SME and digital technology context, South Africa has witnessed the growth and expansion of successful entities, which began as SMEs and aggressively expanded their operations into countries outside of South Africa as a result of the business model or product being in high demand and unavailable elsewhere (and in some instances being sold at values unobtainable in the South African market) (Osiakwan, 2017).

Factors that contribute to the success of incubation programmes were tested in literature, with recommendations being provided, however, there remains a dearth of literature from the perspective of the incubatee (Buys & Mbewana, 2007; Alzaghal & Mukhtar, 2017; Bruneel, Ratinho, Clarysse, & Groen, 2012; Adlesic & Slavec, 2012). This sentiment is further echoed by Theodorakopoulos et al. (2014), who is of the view that most of the research conducted about incubation programmes from the perspective of the post-incubation graduate SME remains fragmented and lacks rigour. Von Zedtwitz and Grimaldi (2006) further add that regardless of the size of incubation programmes and how these programmes are managed, many incubation programmes were not aware of the services that were deemed critical for the SMEs, and how these could be implemented.

This study is expected to make two contributions. Firstly, the study seeks to contribute to the literature by determining whether the services of network development and

training offered through incubation programmes delivered in South Africa result in increased business performance of post-incubation graduate digital technology SMEs. The study seeks to contrast these respective services of network development and training and the impact on performance through financial viability.

Secondly, the study seeks to make a practical contribution by identifying the services that promote SME financial growth post-incubation, so as to guide future incubation hub managers.

1.6 Delimitations of the study

This study is limited to the perspective of the digital technology SME who had participated through an incubation programme, and not the perspective of the incubation hub itself. The focus of the study is on digital technology focused SMEs who have graduated prior to the study being conducted and continued to operate as at the date of the questionnaire being distributed to the digital technology SME.

The study will also not focus on the selection of incubatees and macro-economic factors that impact incubatees. The study will remain focused on the services of training and network development and the impact thereof on the post-incubation graduate SME. As a result, this study excludes all other services offered by incubation programmes.

The study will focus on urban areas in South Africa where there are developed incubation programmes who previously incubated digital technology focused SMEs.

The research questionnaire will be conducted in the English medium, and may be open to misinterpretation if the respondent is not conversant with English as a first language. This may present inaccuracies with regard to the data received.

1.7 Definition of terms

Digital technologies - technologies that culminate the digital and physical worlds and reinforce one another (Philbeck & Davis, 2018).

Digital technology SME - entities bringing together the digital and physical worlds through utilising technology as an enabler with a turnover of up to R26m and having employees of up to 200 people (Philbeck & Davis, 2018; Westerman, Bonnet, & McAfee, 2014b; National Small Business Act 102, 1996).

Incubatee – is an entity selected to participate through an incubation programme and is interchangeably referred to as tenant or participant.

Incubation hub - an institution that provides SMEs with a variety of support services through an incubation programme, which may include training, mentorship and counselling, infrastructure services, as well as professional services to create self-sustaining organisations (Lalkaka, 2002; Grimaldi & Grandi, 2005). For purposes of this study, tech hubs, accelerators, incubators, co-creation spaces, and virtual incubators, are collectively referred to as entities as incubation hubs.

Incubation programme – The collective services offered by the incubation hub.

Private incubation hub – organisations with a dominant goal of achieving a profit (Barbero, Casillas, Wright, & Ramos Garcia, 2014)

Post-incubation graduate SME – an SME having both participated in and graduated from an incubation programme.

Non-private incubation hub - organisations with a dominant goal of achieving social objectives as performance measures and would include Government, as well as NGOs (Barbero et al., 2014).

SME – The National Small Business Act 102 of 1996 defines a small business as a business entity, co-operative or NGO classified by size of micro, small or medium,

and who are managed by one owner and carrying on business predominantly in one sector (National Small Business Act 102, 1996).

1.8 Assumptions

The following operational assumptions have been made:

- Entities / Individuals participating through incubation hubs have been adequately screened and the potential of the opportunity assessed before being admitted to participate through the incubation hub.
- Respondents would accurately reflect on their attitudes and perceptions in relation to network development and training services received while in the incubation programme from the respective incubation hubs.
- Where respondents have participated in more than one incubation programme, the response will be based on their latest experience with the respective incubation hub.
- Respondents will respond honestly.
- It is assumed that English is a universal language and the most suitable language in which to communicate to respondents.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

SMEs play an important role in the South African economy. It is estimated that SMEs represent approximately 91 percent of entities that are registered in South Africa and make a contribution of approximately 45 percent to the country's GDP (Galawe, 2017; Masutha & Rogerson, 2014). Despite SMEs comprising a large percentage of registered entities, the failure rate of SMEs is equally concerning (Govuzela & Mafini, 2019). To assist in supporting competitive SMEs and increasing the prospect of SME survival, incubation programmes remain an important conduit (Dubihlela & Van Schaikwyk, 2014).

Incubation hubs have grown rapidly on a global basis, with developing countries typically focusing on technology-related incubations (Lalkaka, 2001). The objective of the incubation programme is to provide high potential participants with an opportunity to reach their full potential by providing mentorship and facilitation of other services relevant to local conditions (Lalkaka, 2002).

As elucidated in Chapter One, incubation hubs are referred to by many names and are differentiated by factors which include services offered, sector focus, and goals associated with the mandate of the incubation hub. This chapter reviews the literature relating to the history and developments of incubation hubs, with a specific focus on identification of incubation hubs in its various forms and understanding of the services offered through incubation programmes, which results in the performance of the SMEs. An extensive review of the literature is explored targeted at addressing the following research objectives:

1) To investigate the influence of training services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by turnover growth;
2) To investigate the influence of network development services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by turnover growth;

3) To investigate the influence of training services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by financial capital raised; and
4) To investigate the influence of network development services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by financial capital raised.

As this study is focused on digital technology SMEs that have been through an incubation programme and subsequently graduated, a review of digital technology will first be conducted. This will be followed by a discussion relating to digital technology SMEs for purposes of this study, followed by a review of the history of incubation hubs, with a focus on the South African landscape. The review further defines the key constructs with a specific focus on services associated with the incubation programmes offered by the incubation hubs.

2.2 Digital technology

As this study is focused on digital technology SMEs, a literary discussion regarding digital technology and the various sub-sectors of specialism within digital technology used in this study is discussed.

Digital technology refers to the advancement in technology within the digital environment that can be applied across various sectors and is used to improve the business context of customer experience and relationships, internal processes, value propositions, and entire business models, while simultaneously remaining valuable to consumers (Westerman et al., 2014b). Synonymous with certain aspects of ICT, digital technology also includes electronic communication and conferencing tools, work management tools, and social tools (Oldham & Da Silva, 2015). Based on this broad relationship, ICT is used as the foundation or enabler on which digital technology thrives (Arendt, 2008). Apart from tools identified and built on other traditional ICT related technologies, the digital technologies and advances include cloud computing, analytics, social media, big data, blockchain, artificial intelligence, embedded devices, network security, virtual reality, and the internet of things (Yusuf,

Walters, & Sailin, 2020; Westerman et al., 2014b). These technologies culminate in the digital and physical worlds and reinforce one another (Philbeck & Davis, 2018).

The tools as identified above give rise to additional opportunities to promote new businesses and transform traditional businesses, giving rise to new age business models, which include sharing economies and platform economies (Sutherland & Jarrahi, 2018). Based on the preceding inclusion of digital technology, the term digital technology is an encompassing term utilised to define technologies within the digital realm. Digital technology can be used across sectors to provide rich and usable data, assist with decision-making, and the automation of various tasks (Ivanov, Dolgui, & Sokolov, 2019).

2.2.1 *Analytics*

Analytics is associated with big data, where data from various sources are extracted and analysed (Ivanov et al., 2019). The techniques and applications are used to assist organisations with critical data to better understand their environment, and make faster data driven decisions, which significantly contribute to these organisations remaining competitive and becoming innovative (Vassakis, Petrakis, & Kopanakis, 2018).

2.2.2 *Artificial Intelligence*

Artificial intelligence refers to the ability of machines to exhibit intelligence similar to that of humans without using detailed software code explicitly advising the machine on how to solve the task (Bavaresco et al., 2020). Artificial intelligence may utilise voice, text, or image recognition, or alternatively generation, to solve tasks and are used within a wide array of organisations as part of advanced uses, such as digital assistants and chat bots (Maedche et al., 2019; Adam, Wessel, & Benlian, 2020).

2.2.3 *Big data*

Big data refers to large data sets of structured, semi-structured and unstructured data collected through various formats, which include sound, text, video and image from various sources (Vassakis et al., 2018). As discussed by Wamba, Akter, Edwards,

Chopin, and Gnanzou (2015), big data is characterised in literature by the ‘5 Vs’, which denote the following:

- volume of data collected;
- variety of data collected from various sources;
- velocity or the speed or frequency of data;
- veracity or the quality of data collected; and
- value or economic benefits associated with the extraction of data.

Each of the above contribute to the rich data that can be analysed for enhanced decision-making (Vassakis et al., 2018).

2.2.4 *Blockchain*

Blockchain technology comprises a distributed ledger with cryptographic protocols and a network of distributed computers in different organisations that integrate networks between the organisations to ensure that data is copied simultaneously in multiple physical locations with algorithms in place to ensure data is both secure and traceable (Ting, Carin, Dzau, & Wong, 2020). Data contained within the blockchain cannot be deleted unless agreed to by a majority of the network using that specific blockchain, with any data modification easily detected (Sankaa, Irfana, Huangb, & Cheunga, 2021). While blockchain is commonly known to be used in cryptocurrencies, it is used by many industries to increase transparency and the speed of settling transactions, to reduce costs, and to provide additional transactional security (Sankaa et al., 2021).

2.2.5 *Cloud Computing*

Cloud computing is a pay-per-use model that enables on demand shared computing resources such as storage, servers, applications and networks, which can be provisioned and deployed with minimal effort enabling organisations to quickly scale up or down on resources as and when required (Sharma, Jindal, & Borah, 2020). Cloud computing is often used for data storage, and the associated analysis of data

collected through big data applications, due to the large storage requirements and the associated added security provided by cloud platforms (Wang et al., 2010)

2.2.6 *Embedded devices*

Embedded devices are very tiny computers allowing any sensor attached to this tiny computer to transmit information about that object, or objects such as a medical devices and footwear, to a central application for purposes of monitoring the performance of that object (Guinard & Trifa, 2009). Embedded devices are integral to the internet of things, and remain heavily reliant on cloud computing as well as network security to prevent authorised access to the device data (Koeberl, Schulz, Sadeghi, & Varadharajan, 2014).

2.2.7 *Internet of things*

The internet of things (IoT), also commonly known as IoT, uses the internet and an embedded device to collect data from any object, which includes living things like animals and humans, and non-living things like food and furniture (Madakam, Lake, Lake, & Lake, 2015). IoT enables a network for intelligent communication between things-to-things, things-to-humans, and humans-to-humans, for the understanding of the complex thing, enabling the user to respond to the extracted information (Madakam et al., 2015).

2.2.8 *Network security*

Network security refers to the security protocols deployed on the network of connected devices for the protection of the network against real-time network attacks (Yang, Zeng, Xu, & Zhang, 2021). Network security is particularly important due to the vast and complex data being transmitted, and requires threat detection and

response capabilities, as well as information security teams with the requisite knowledge to neutralise any potential threats (Miloslavskaya, 2020).

2.2.9 *Robotics*

While industrial robots are not a recent phenomenon, the utilisation of robotics coupled with IoT, big data, and machine learning has renewed the interest in this area as a way of increasing productivity and simultaneously decreasing costs within organisations (Ballestar, Díaz-Chao, Sainz, & Torrent-Sellens, 2020). There are numerous examples of robotics in commercial use, however, within the supply chain industry, a commonly cited example is that of robotics used by Amazon, where self-learning robots are picking required products within large warehouses, and transferring appropriate data in relation to the ideal packing strategy for the picked products (Ivanov et al., 2019).

2.2.10 *Social Media*

Social media, through the likes of Facebook, Snapchat, Twitter, Instagram, and others, have become part of everyday life for consumers, with organisations taking advantage of this medium to reach their targeted audience; which may comprise of billions of people, while doing so at a relatively low cost (Dwivedi et al., 2020). While the benefits associated with social media use by companies include awareness of their brand, receiving feedback to improve products and services, and influencing consumers, social media can also be used for public service awareness or political promotions (Dwivedi et al., 2020).

2.2.11 *Virtual reality*

Virtual reality refers to technology developed using various sensors and natural-computer interaction technology, which allows a user to be immersed in a computer-generated virtual space, where a presence similar to that in the real world is felt by the user, and where the user's interactions approximate real-world interactions (Wu, Cai, Luo, Liu, & Zhang, 2021). Apart from use in the gaming and entertainment

industries, virtual reality has a real world significance, and is used in the sectors of education, engineering, healthcare, and emergency services (Wu et al., 2021).

2.2.12 *Digital technology SMEs*

The National Small Business Act 102 of 1996 defines a small business as a business entity, co-operative, or NGO classified by the size of micro, small or medium, managed by one owner and carrying on business predominantly in one sector (National Small Business Act 102, 1996).

An SME within the ICT sector is classified as an entity having a maximum turnover amounting to R26m and employees of 200 people (National Small Business Act 102, 1996).

Based on the above, this study defines digital technology SMEs as entities that bring together the digital and physical worlds through utilising technology as an enabler with a turnover of up to R26m, and up to 200 employees (Philbeck & Davis, 2018; Westerman et al., 2014b; National Small Business Act 102, 1996).

2.3 Incubation hubs

The informal concept of an incubation hub was established in Batavia, New York in 1959, when a local real estate developer acquired a large building which was left vacant following the exit of a large corporate unable to subsequently let it out to a single tenant, who then decided to subdivide the building and rent it to a variety of tenants, some of whom requested business advisory services (Hackett & Dilts, 2004). Bruneel et al. (2012) assert that the concept of incubation programmes became widespread in the 1980s, and have been particularly accelerated in the last ten years, as the value in providing business expertise to new ventures was realised. Cornelius and Bhabra-Remedios (2003) note that during this period, a few profit-motivated individuals and corporations began renting dilapidated buildings to businesses at reduced rentals, together with resources that were commonly required, which included infrastructures such as photocopiers and services such as secretarial services and business advisory services.

It should however be noted that incubation programmes were not embraced globally at the same time. In Europe, one of the first incubation programmes was set up during 1975 in the United Kingdom after British steel plant closures (Aernoudt, 2004). According to Lalkaka (2001), incubation programmes were started in China in 1987, Turkey in 1990, Japan in 1991, and in Korea in 1993.

South Africa's support for SMEs was not far behind. In South Africa, since the dawn of democracy in 1994, the South African Government has taken measures for the development of SMEs (Tshikulu Social Investments, 2016). A framework for SME development was put forward through a White Paper on National Strategy for the promotion of Small Business issued in 1995 and the establishment of institutional structures for SME business development and financial support (Rogerson, 2004). Although this was not business incubation as we know it today, the purpose was to support and promote small business growth through subsidised rental as well as provision of ancillary support services to these businesses, while simultaneously receiving support from private sector companies through sub-contracts as well as inclusion into the private sector company supply chains (Lose, Nxopo, Maziriri, & Madinga, 2016; Masutha & Rogerson, 2014).

The incubation hub concept, backed by the South African Government, was made popular through the Godisa initiative in the year 2000, with the twin goals of creating new businesses and employment (Buys & Mbewana, 2007). Since then, the popularity of incubation programmes has grown both in the private and non-private sectors, with the launch of the Seda Technology Programme and the subsequent launch of the Incubation Support Programme by the Department of Trade and Industry (Lose et al., 2016; Masutha & Rogerson, 2014).

South Africa has also had a key focus on developing technology SMEs. This was demonstrated as early on as the year 2000, around the time of the Godisa Initiative, with the Gauteng Provincial Department's launch of the Innovation Hub, an incubation programme focused on developing SMEs in the leading edge of technology (Dubihlela & Van Schaikwyk, 2014). Since then, there has been a launch of many other technology focused incubation hubs as well as mixed-sector incubation hubs launched by Government, universities and the private sector, as well as various

collaborations between these organisations who have embraced digital technology SMEs (Dubihlela & Van Schaikwyk, 2014).

Based on literature as reviewed above, incubation hubs through their incubation programmes play a key role in the promotion of SMEs. However, there remains lack of consensus as to what constitutes an incubation hub (Hackett & Dilts, 2004). In the next section, the study presents the definitional elements of an incubation hub.

2.3.1 *Variation of incubation hubs*

Based on literature, there appears to be a lack of consensus as to a definition of an incubation hub and the services offered through their incubation programmes (Hackett & Dilts, 2004).

In their seminal paper, Allen and McClusky (1990, p. 61) define incubation hubs as "providers of affordable space, shared support services, and business development assistance in an environment conducive to enterprise creation, survival, and early-stage growth". Bergek and Norrman (2008) define an incubation hub as a collective term for organisations that create an environment that is conducive for the growth of young firms. Hackett and Dilts (2004, p.57) define an incubation hub as

> a shared office space facility that seeks to provide its incubatees (i.e. ''portfolio-'' or ''client-'' or ''tenant-companies'') with a strategic, value-adding intervention system (i.e. business incubation) of monitoring and business assistance. This system controls and links resources with the objective of facilitating the successful new venture development of the incubatees while simultaneously containing the cost of their potential failure.

Hackett and Dilts (2004) further acknowledged that the definition would not suffice as a universal definition, due to the emergence of virtual incubation hubs that do not require office space.

There is also a challenge in the way that various names are used interchangeably to describe incubation hubs and their incubation programmes, creating further division amongst researchers (Hackett & Dilts, 2004; Bergek & Norrman, 2008). According to

Theodorakopoulos et al. (2014, p. 604), there are many terms used by researchers to refer to incubation hubs, which include “research parks, enterprise centres, seedbeds, science parks, innovation centres, knowledge parks, business accelerators, hatcheries, hives, ideas labs, managed workspace, venture labs and network incubators”, further emphasising the lack of congruence.

Grimaldi and Grandi (2005) advise that while most incubation programmes offer similar services, it is important for incubation programmes to offer services and resources, that may be distinct and aimed at adding value to the respective SMEs. It may be for this reason that incubation programmes are known by a variety of names, with subtle distinctions between them in certain cases so as to cater for the requirements of targeted SMEs. Examples of such may include virtual incubators, where SMEs value other services being provided, but are not in need of space to work from, and networked incubators, where the focus is on partnerships and networking, which may be most valued by some SMEs (Hackett & Dilts, 2004; Bøllingtoft & Ulhøi, 2005).

Cohen, Fehder, Hochberg, and Murray (2019) attempt to differentiate accelerator programmes from other incubation programmes by focusing on specific services offered to the SMEs, which include assistance with seed capital, networking opportunities, training and mentorship, and graduation within a fixed term. However, as discussed by Van Weele, Van Rijnsoever, and Nauta (2017), incubation hubs do indeed provide the services as outlined above, and further support the view that differentiating between different incubation hubs is often difficult. This view is further supported by Littlewood and Kiyumbu (2018), who discussed that the services and activities between the types of incubation hubs could often overlap, resulting in the boundaries being unclear. Cohen et al. (2019) go on to advise that existing research is fragmented, and that there is no consensus on these differentiating factors.

In line with the preceding definitions, for purposes of this study, we define an incubation hub as an institution that provides SMEs with a variety of support services through an incubation programme which may include training, network development, mentorship, and counselling, infrastructure services, as well as professional services

to create self-sustaining organisations (Lalkaka, 2002; Theodorakopoulos et al., 2014; Grimaldi & Grandi, 2005).

2.3.2 *Private and non-private incubation hubs*

Based on the literature, there appears to be a consensus of incubation programmes having an over-arching objective, namely to nurture incubatees who will graduate from the incubation programme as a successful and financially viable firm (Aernoudt, 2004).

Although incubation programmes subscribe to this objective, in the seminal paper, Allen and McCluskey (1990) proposed four categories of incubation classifications, two of which were associated with profit generation, while the other two classifications focused on a social imperatives. Barbero et al. (2014) support this view, and confirm that the services offered through the incubation programme are driven by the underlying goal of the incubation hub, which is profit-motivated or motivated by the achievement of social objectives. Bergek and Norrman (2008) also highlight that failure to take incubation hub goals into account is problematic as the different goals of the incubation hubs drive different behaviours and outcomes when delivering the incubation programme.

Alsos, Hytti, and Ljunggren (2011) cautions that incubation hubs ought to also consider the sponsors of the incubation hub and their objectives in determination of the profit or social imperative focus. Based on the literature, sponsors would have an impact on influencing different priorities, which have an impact on incubation hub goals (Bergek & Norrman, 2008). These priorities, driven by the sponsor's requirements, may impact the services offered to incubatees, which in turn may drive a different behaviour (Alsos et al., 2011).

Barbero et al. (2014) advocate that the basic classification of incubation hubs is either for-profit in nature and considered a private incubation hub, or non-profit in nature and considered a non-private incubation hub. These classifications aid to focus performance in employment creation for non-private incubation hubs with a socialistic goal, or achievement of profits for private incubation hubs through the involvement of

the SMEs (Barbero et al., 2014). This broad classification is also supported by Grimaldi and Grandi (2005).

As pointed out by Cornelius and Bhabra-Remedios (2003), the classification of incubation hubs as presented above is part of a value continuum, with the least value afforded to tenants by incubation hubs focused on social imperatives and the most value received by tenants of incubation hubs seeking to profit from the incubatee, which is ultimately tied back to the goal of the incubation hub. An example of such is the ability of private incubation hubs to focus on incubatees who offer value and profit potential as opposed to focusing on the number of incubatees graduating from the incubation programme, which may be a priority of non-private incubation hubs who are sponsored by Government-related or NGO entities (Cornelius & Bhabra-Remedios, 2003). Vanderstraeten, Van Witteloostuijn, Matthyssens, and Andreassi (2016) add to this point in noting that due to increased number of incubation hubs and the increase in competition between them, incubation hubs have highlighted their strategic positioning by focusing on either private incubation where investors have a vested financial interest, or non-private incubation hubs, where the role of the incubation hub is more of an intermediary.

When focusing our attention on private incubation hubs, the profits sought by private incubation hubs can be achieved through charging fees, sharing in revenues of the incubatee, or by acquiring a percentage of equity in the incubatee to subsequently sell the equity at the appropriate time (Grimaldi & Grandi, 2005). To assist with the achievement of this dominant profit-motivated goal, business advisory services offered to incubatees are focused, and may include validation and vetting of business models, provision of experienced staff, and access to strategic networks to decrease the time of taking the incubatee to market, and of integrating it with commercial large actors within the same network (Lose, Nxopo, Maziriri, & Madinga, 2016).

Concerning non-private incubation hubs, these hubs are more orientated around tangible assets at low prices so as to assist with entrepreneurial initiatives and have been better placed at assisting incubatees involved in traditional sectors (Grimaldi & Grandi, 2005).

For purposes of this study, although it is broadly focused on incubation hubs, this study defines private and non-private incubation hubs based on their dominant goal. Non-private incubation hubs are defined as organisations with a dominant goal of achieving social objectives, while private incubation hubs are defined as organisations with a dominant goal of achieving a profit (Barbero et al., 2014).

2.4 Services provided by incubation hubs

Since the formalisation of incubation programmes in the 1980s, incubation programmes are synonymous with providing services for growth of SMEs participating through the incubation programme (Bruneel et al., 2012).

Based on the literature, there are numerous services offered to SMEs, with some services having a greater importance when compared to others (Ndabeni, 2008). The services offered to SMEs as discussed in literature, include free or cheap office space, support services, access to financial capital, coaching, training, mentorship, access to networks and professional services, and adding to the legitimacy of the SME (Grimaldi & Grandi, 2005; Theodorakopoulos et al., 2014).

This study has adapted the broad categories of services offered as utilised by Van Weele et al. (2017) when creating a comprehensive tabulation of input from literature relating to the services offered by incubation hubs through their incubation programmes. The services offered by incubation programmes as discussed in literature is set out in Table 1 below.

Table 1: Services offered by incubation programmes

(Service categories adapted from Van Weele et al., 2017)

Services offered	**Description**	**Literature**
Physical capital and administrative support services	Free or cheap office space, pooled staff and equipment	Allen and McCluskey (1990); Aernoudt (2004); Barbero et al. (2014); Bergek and Norrman (2008); Grimaldi and Grandi (2005); Lalkaka (2001); Ndabeni (2008); Smilor (1987); Theodorakopoulos et al. (2014); Van Weele et al. (2017)
Financial capital	Seed capital, and access to funders	Aernoudt (2004); Barbero et al. (2014); Bergek and Norrman (2008); Bruneel et al. (2012); Cohen and Hochberg (2014); Grimaldi and Grandi (2005); Ndabeni (2008); Van Weele et al. (2017)
Knowledge	Coaching, training, mentorship, and counselling	Aernoudt (2004); Bergek and Norrman (2008); Bruneel et al. (2012); Bøllingtoft and Ulhøi (2005); Clarysse and Bruneel (2007); Cohen and Hochberg (2014); Grimaldi and Grandi (2005); Lalkaka (2001); Messeghem, Bakkali, Sammut, and Swalhi (2018); Mian (1996); Ndabeni (2008); Rogerson (2004); Rice (2002); Smilor (1987); Storey (2016); Theodorakopoulos et al. (2014); Van Weele et al. (2017)

Social capital	External and internal networks, and access to professional services providers	Allen and McCluskey (1990); Aernoudt (2004); Bergek and Norrman (2008); Bøllingtoft and Ulhøi (2005); Bruneel et al. (2012); Chrisman and McMullan (2004); Cohen and Hochberg (2014); Grimaldi and Grandi (2005); Hansen, Chesbrough, Nohria, and Sull (2000); Lalkaka (2001); Lose et al. (2016); Mian (1996); Ndabeni (2008); Scillitoe and Chakrabarti (2010); Smilor (1987); Rice (2002); Soetanto and Jack (2013); Theodorakopoulos et al. (2014); Van Weele et al. (2017)
Legitimacy	Association with the incubation brand	Bruneel et al. (2012); Cohen and Hochberg (2014); Van Weele et al. (2017)

While Table 1 above categorises the services offered, incubation programmes offer a mix of services to the SMEs participating through the programme. According to Allen and McCluskey (1990), incubation programmes provide shared space, support services, and business development services, however, the authors also indicated that the real value offered by incubation programmes was in networking. This view was further supported by Bergek and Norrman (2008), who compare an incubation programme without networking facilities to a hotel. Bruneel et al. (2012) also agree with this view, but highlighted that it was not access to networks, but preferred access to networks that made the difference to the SME. In addition to the facilitation of networks, Barbero et al. (2014) considered support to the SME in the form of assistance with raising financial capital, knowledge acquisition, and mentorship to be key services. In addition to networking and focused business development, incubation programmes also played a key role and added significant value when they impart industry knowledge to the SMEs participating in their programmes (Alsos et

al., 2011). Bruneel et al. (2012, p. 112) also add that active coaching in addition to training assists the incubatees to avoid a “process of trial and error and ascend more quickly up the learning curve” thereby reaffirming the importance of the services of proactive support and mentoring and coaching.

It should be noted that not all of the services as discussed in Table 1 were available when incubation programmes were popularised. According to Theodorakopoulos et al. (2014), incubation programmes have entered the third-generation of evolution, with additional services apart from shared facilities and affordable space offered to tenants (See Figure 1).

Based on Figure 1 below, the services offered by incubation programmes have progressed from being predominantly focused around property and shared facilities prior to 1990, to other value-added business development activities, which included business advisory services and networking which aimed to provide holistic services for the development of the enterprise during the 1990s (Theodorakopoulos et al., 2014).

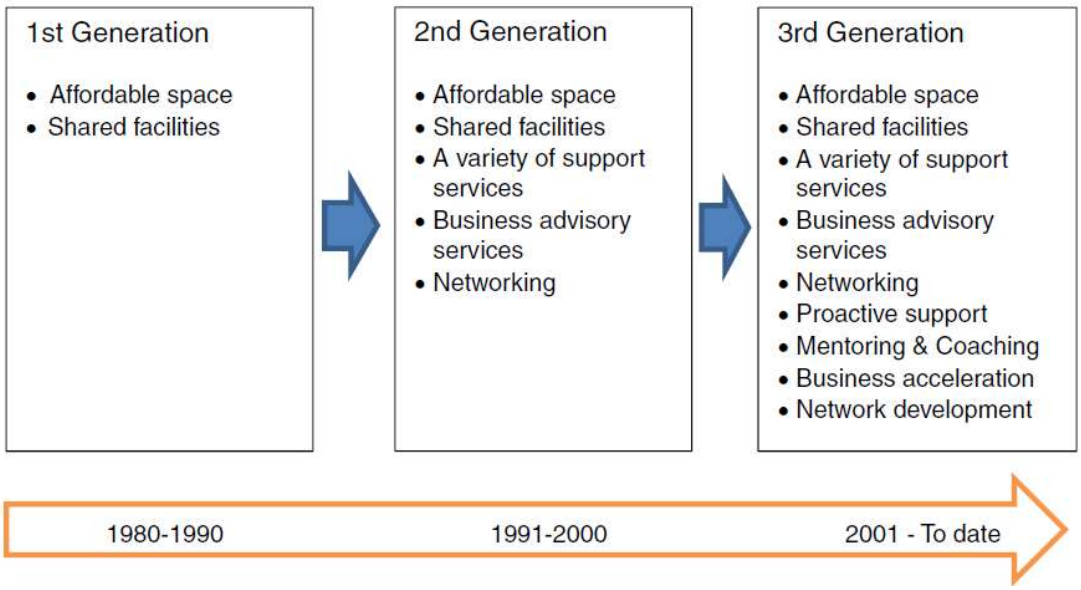


Figure 1: Evolution of Incubation Hubs

Source: (Theodorakopoulos et al., 2014, p. 606)

The services offered through the third-generation incubation programmes include a comprehensive set of services to provide the SME with a significant prospect of

achieving growth. Despite the availability of the service offering by the incubation programme, there is more that is required for the successful incubation of the SME, which includes how these services are offered (Lose et al., 2016). The SMEs would also need to embrace the service offering and the interventions to realise the full benefit. Although services are offered by the incubation programmes, it is also worth noting that SMEs may also not take up the services due to their lack of knowledge and biases concerning their own resource gaps (Van Weele et al., 2017).

It is found that SMEs participating in older generation incubation programmes may not see the value in the services offered and may not take full advantage of the services impacting their potential future sustainability (Bruneel et al., 2012). Van Weele et al. (2017) support this assertion, but apply it across incubation programmes, regardless of the respective incubation generation and associated service offering.

According to Von Zedtwitz and Grimaldi (2006), the identification of critical services required for the SMEs success, coupled with the successful implementation of these by the incubation programme, is a key challenge. Based on recent research, another point to consider is that it may not be the type of services that are offered to the SME that adds value to the SME, but also the level of customisation and flexibility of the relationship between the incubation programme and the SME in matching the service offering with the SMEs needs (Vanderstraeten et al., 2016).

As this study is focused on the services of training and network development, a discussion relating these services are conducted next.

2.4.1 *Training*

The digital technology sector is technical in nature and as a result, training and transfer of technical knowledge may be considered to be a key service by incubatees while in the incubation programme. As digital technologies are specialist areas with rapid ongoing developments, incubatees require an in depth understanding of the relevant digital technology to appropriately develop products and services that can be taken to market, which is often achieved through training (Duan, Mullins, & Hamblin, 2002). The benefits associated with training is not a new concept. In a

seminal paper, Smilor (1987) advised of the benefits associated with increased learning as part of a key service sought by SMEs.

Training as a service is much broader than merely technical training. Training also includes broader entrepreneurial and business development skills, which involve sales planning, marketing, leadership, and general business planning as skillsets fundamental to the growth of most businesses (Bergek & Norrman, 2008). In a study conducted by Mian (1996), a significant positive relationship was found in the areas of technology transfer programmes and education and training, thereby illustrating a link of active training for the SME. This was supported by Bruneel et al. (2012) and Messeghem et al. (2018), who respectively assert that training contributes to the incubatee knowledge by avoiding a process of trial and error, allowing the incubatees to make better and faster decisions, which positively impact their performance.

In a study conducted by Mian (1996), it was highlighted that although training as a service is offered by the incubation programme, it is the entrepreneur's prerogative as to whether or not to attend the training which would be influenced by the perceived benefits to be received by the entrepreneur. A potential reason for SME non-participation could be due to the SME and the incubator staff having differing views on the value of training, as SMEs may perceive the training to be of insufficient quality, especially if the person providing the training lacks experience, which in the digital technology sector due to its technical nature remains important (Van Weele et al., 2017).

This was also the case in a study performed by Bruneel et al. (2012), where it was found that incubatees participating in first and second generation business incubation programmes were less likely to utilise the training services while a majority of those participating in third generation incubation programmes would fully participate in the training offering.

Based on past literature as discussed above, if the training is deemed to be relevant and provided by people well versed in the subject matter, the entrepreneurs are likely to participate, and should reap the benefit associated with the training.

2.4.2 *Network development*

Networking and network development are identified as a key value add as part of the incubation process (Allen & McCluskey, 1990; Barbero et al., 2014). Ahmad and Thornberry (2018) highlights the benefit of shared workspaces for the promotion of informal networking among entrepreneurs, leading to value created through peer-to-peer problem-solving.

The focus on network development involves facilitating relationships by the incubation manager between the incubatee and the pool of various actors within the incubator's network that can support the incubatee with the incubatees growth and development (Scillitoe & Chakrabarti, 2010). Although this study considers network development holistically, it is worth noting that network development can be subdivided between internal networks and external networks, with internal networks focused on the creation of networks within the incubator, and external networks focusing on networks outside of the incubator, with some incubation programmes having a specific focus (Soetanto & Jack, 2013).

The support offered from an extended network is also instrumental in increasing SME performance, which is one of the fundamental objectives of an incubation hub (Cohen & Hochberg, 2014). Relationships to the extended network facilitated by the incubation programme is not merely seen as access, but preferential access. Although there is a subtle difference, this preferential access allows the SME access to busy experts and receiving their full attention, which is a benefit that is not readily available to just any SME (Hansen et al., 2000). In addition to preferential access to experts and to further show their commitment to the digital SMEs, the incubation programme can also establish an advisory panel comprising of various experts who are committed to the growth of the digital SME, and provide guidance to the digital SME in relation to the digital SME meeting its goals (De Beer et al., 2016).

To obtain the benefits associated with network development, the formal process of network development would need to be institutionalised within the incubation programme (Hansen et al., 2000). While access to technical know-how may be used as a driver for network development, the value of the network can extend to various other areas, such as raising finance through venture capital partners, assistance with

human resource services, legal services, as well as other areas to support the sustainability of the incubatee (Scillitoe & Chakrabarti, 2010; Cohen & Hochberg, 2014).

As highlighted by Scillitoe and Chakrabarti (2010), incubator managers play the role of technology brokers to digital technology SMEs, connecting the digital technology SME to the relevant expert who possesses the relevant knowledge and can assist in the growth and development of the digital SMEs ideas. Due to the fact that incubatees are early-stage entities and may lack credibility, the value of the incubator's brand and network further supports the incubatee in overcoming individual credibility issues that may be faced (Rice, 2002).

2.5 Performance measurement of services offered

Based on literature, there are various measures of SME performance (Dee et al., 2019). Murphy, Trailer and Hill (1996) highlight that firm performance in entrepreneurship ought to be defined when conducting a study as there are multiple measures comprising efficiency measures, or financial measures that could be used to measure performance of companies.

In addition to objective financial measures, subjective performance measures can also be utilised to measure incubatee performance, which include improved business skills, networks, and knowledge (Voisey, Gornall, Jones, & Thomas, 2006). Hackett and Dilts (2004) proposed a simplistic measure of SME performance, which is measured by whether or not an SME is surviving and profitable at the end of the incubation programme. Wiklund, Patzelt, and Shepherd (2009) add that firm growth could also be measured by the growth of financial measures such as turnover, profit, growth of assets, or non-financial measures, such as employee growth. As such, there remains no consensus on a definitive measure by means of which to assess the performance of the SME (Hackett & Dilts, 2004; Dee et al., 2019).

This study focuses on objective business performance measures in the form of turnover growth and financial capital raised. The next section will briefly discuss each of the business performance measures.

2.5.1 *Turnover*

As per the discussion earlier in this Chapter, financial measures are commonly used to measure incubator outcomes (Lange, 2018). More specifically, turnover growth is a commonly used measure to represent the growth of the SME (Wiklund et al., 2009). The use of turnover as a measure of performance is not new and dates back to the seminal paper of Smilor (1987). According to Delmar, Davidsson and Gartner (2003), turnover is a good measure of business performance and is preferential when compared to other growth indicators.

This study will utilise growth in turnover as a measure of financial performance. The turnover growth will be measured post SME graduation. The increase in turnover will be utilised as a measure of performance concerning the training and network development services received by the post-incubation graduate SME.

2.5.2 *Financial Capital raised*

SMEs require financial capital to sustain their operations as they are growing, with the lack of financial capital often reported as an obstacle to the SMEs business performance and sustainability (Van Rijnsoever, Van Weele, & Eveleens, 2017). Part of the services required by SMEs is the development of networks as well as training that will aid the SME with obtaining certain types of facilities and financial capital raising activities during and post-incubation (Smilor, 1987).

Incubation programmes are designed to address market inequalities, which include inequitable access to financial capital (Lange, 2018). Access to capital may comprise access to venture capital funds and other investors for the next stage growth of the post graduate incubatee (Barbero et al., 2014).

In a study conducted byBarbeau (2019), it was found that most South African SMEs struggle with raising funds, whether it was debt or equity, despite financial capital being an important contributor and measure of SME success.

As discussed earlier in this chapter, post-incubation graduate incubatee success is deemed to result in a financially sustainable entity. In the digital technology environment, companies may not necessarily rely on profitability as a key measure,

but would also consider other measures that are also important. Therefore, to develop a sustainable entity post-graduation, financial capital is a key measure by means of which to aid in sustainability Barbeau (2019). In addition, although not utilised in this study, the amount of financial capital raised is also seen as a performance measure for technology-based SMEs (Radojevich-Kelley & Hoffman, 2012).

This study will utilise financial capital raised as a measure of business performance, regardless of whether it is debt, equity, or a hybrid of the two that is raised. Also, the funds raised will be regarded as a business performance measure regardless of the source of funds raised, provided that it is a third party.

2.6 Incubation services and the influence on SME performance

The key services relevant to this study, being training and network development were discussed earlier in this chapter, together with the performance measures of turnover growth and financial capital raised. This section reviews the influence of the services of training and network development on the SME performance, as measured by turnover growth and financial capital raised.

2.6.1 *Influence of training on SME turnover growth*

The influence of training on SME performance is not a new relationship, and has been previously explored in literature (Jones, Beynon, Pickernell, & Packham, 2013). Customised training services to SMEs were advocated by Vanderstraeten et al. (2016) in order to yield better performance results for the SME, while Messeghem et al. (2018) draws on the relationship between training and the positive relationship with SMEs performance.

In a study performed by Chi, Wu, and Lin (2008) in relation to the impact of training on SME performance as measured by turnover growth, it was found that if training provided is matched with the training needs of the SMEs, this would result in increased performance for the SME, represented by turnover growth. This was also found to be the case in an empirical study performed by Siekei, Wagoki, and Kalio (2013), where it was found that SMEs who attended financial training courses

designed for SMEs resulted in better performance by the SME, as measured by turnover growth and financial capital raised.

Storey (2016) questions the relationship between training and turnover growth due to the difficulty involved with isolating training as a direct contributor to SME performance, as there may be other factors that are not considered, which add to the SME wisdom and ultimate performance, including turnover growth.

With this recognition, the following hypothesis is formulated in relation to training and turnover growth:

H1: Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.

2.6.2 *Influence of network development on SME turnover growth*

The relationship between network development and SME performance is well developed (Naudé, Zaefarian, Tavani, Neghabi, & Zaefarian, 2014). The relationship between an enhanced SME network and the associated SME performance as measured by turnover growth was tested prior to this study by Huggins and Johnston (2009), wherein it was found that although network development resulted in an increase in turnover for SMEs, other factors would also need to be considered. In a study performed in South Africa with a focus on network development and turnover, the effects of networking through the incubation programme had resulted in increased turnover for the SMEs (De Beer, 2012).

For purposes of this study, in relation to the influence of network development and SME turnover growth, the following hypothesis is formulated:

H2: Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.

2.6.3 *Influence of training on SME financial capital raised*

Financial capital raised as an output measure is not a new phenonmenon and is actively utilised by incubation programmes where funding by investors is a measure of success (Cohen & Hochberg, 2014).

The relationship between knowledge acquisition and financial capital raised was empirically tested in a study performed by Benjamins (2009), where it was found that increased business knowledge attained by the SME resulted in the SME raising financial capital raised. As discussed earlier, the positive relationship between training and financial capital raised was also empirically tested and confirmed in a study conducted by Siekei et al. (2013).

As a result, the following hypothesis is formulated in relation to training and financial capital raised:

H3: Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.

2.6.4 *Influence of network development on SME financial capital raised*

Based on the literature, raising of financial capital is an objective of the incubation programme, and often as a result of the networks created by the SME through the support of the incubation programme (Grimaldi & Grandi, 2005; Lalkaka, 2001).

However, incubation programmes are not always able to facilitate the raising of financial capital for SMEs through their networks. This was the case in a study performed by Barbero et al. (2014), where it was found that although SMEs through an incubation programme had access to the networks of the incubation programme, they were unable to raise necessary financial capital. In other studies, the alternative was found, where the question was not *if* the SME was in a position to raise financial capital, but *how much* financial capital it raised, which was a differentiating factor (Cohen et al., 2019).

As a result, the following hypothesis is formulated in relation to network development and financial capital raised.

H4: Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.

Based on the literature reviewed and the hypothesis developed in this chapter, Figure 2 below provides a representation of the conceptual framework utilised in this study. The conceptual framework demonstrates the relationship between the services of training and network development offered by incubation programmes and the influence of these services on the post-incubation graduate business performance of the digital technology SME as measured by turnover growth and financial capital raised.

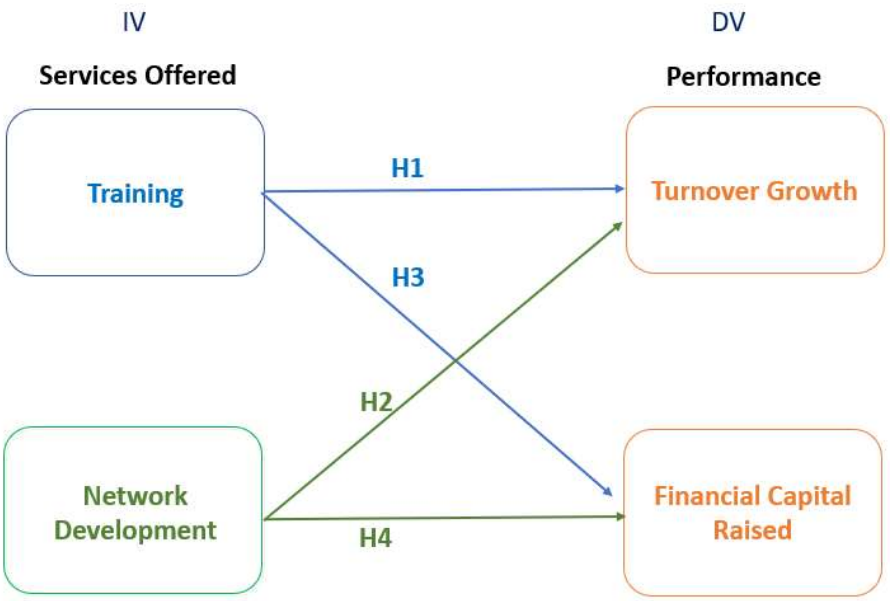


Figure 2: Conceptual Framework

2.7 Conclusion

Incubation hubs, although known by many names and lacking consensus on a universal definition, services offered or performance measures, have a generally accepted objective to promote the success of the incubatee. The literature review highlights the difference between private incubation hubs and non-private incubation hubs, and the classification thereof as a result of the incubation hub's dominant goal.

The review further explores the services offered by incubation hubs, with a focus on training and network development, as well as discusses the business performance measures of turnover and financial capital raised.

Based on the objective of the study, the following research questions were formulated:

- To what extent does training services offered by incubation hubs influence post-incubation graduate digital technology SME business performance as measured by turnover growth?
- To what extent does network development services offered by incubation hubs influence post-incubation graduate digital technology SME business performance as measured by turnover growth?

- To what extent does training services offered by incubation hubs influence post-incubation graduate digital technology SME business performance measured by financial capital raised?
- To what extent does network development services offered by incubation hubs influence post-incubation graduate digital technology SME business performance as measured by financial capital raised?

Therefore, in investigating the difference in business performance factors by incubation type, the study aims to address the following hypothesis:

H1: Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.

H2: Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.

H3: Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.

H4: Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.

CHAPTER 3. RESEARCH METHODOLOGY

This chapter discusses the manner in which the research study was conducted, which includes the research approach, research design, data collection, and sampling. The research instrument, process related to the collection of data, analysis, and research limitations are also discussed.

3.1 Research approach

As the study involves the identification of variables that influence an outcome, the study has taken a quantitative research approach (Creswell, 2014). Quantitative research is considered "a means for testing objective theories by examining the relationship among variables" (Creswell, 2014, p. 295). This study adopts a positivism paradigm with a deductive approach, as the proposed hypothesis is empirically tested and allows for data to be generalised.

Based on the literature, the constructs and relationships between variables relating to the sphere of incubation are available, and can be empirically tested, independent of any influence of the researcher. This study, therefore, assumes that there is a relationship between the identified independent variables of training and network development services and the dependent variables of turnover growth and financial capital raised that can be empirically tested.

3.2 Research design

The study utilised a cross-sectional research design, utilising quantitative techniques and survey research methodology. A cross-sectional research design enabled the researcher to collect data directly from the post-incubation graduate digital technology SMEs about the services offered by the incubation programme and the respective performance as perceived by the digital technology SME. The data was collected and observed from respondents at a particular point in time.

According to Creswell (2014), questionnaires are mostly used in quantitative research studies, and are versatile in data collection enabling the researcher to collect a large amount and type of data, which allows for generalisation of data.

The study considered both sector-specific and mixed-sector incubation programmes but remained focused on SMEs who were within a digital technology focus, and had graduated from the incubation programme.

3.3 Population and sample

3.3.1 *Population*

The research population consisted of digital technology SMEs with turnovers not exceeding R26m, who were focused on a dominant digital technology and who had participated through a private or non-private incubation programme and since graduated. The study focused on urban areas in South Africa, where there are developed incubation programmes who had incubated digital technology focused SMEs. To assist with up-to-date post-graduate data comparisons, the maximum date of graduation for the SME were those SMEs who had graduated prior to the distribution of the questionnaire in the year 2020.

The researcher identified incubation hubs who were requested to electronically distribute the link to the online research instrument to the post-incubation graduate SMEs who had participated through the respective incubation programmes. The incubation hubs were advised that the requisite criteria for the sample included SMEs with a digital technology focus and who had graduated from the incubation programme prior to the distribution of the questionnaire. Certain organisations were willing to assist with the distribution of the link to the research instrument, while others declined to participate.

The researcher thereafter searched for entity names of post-incubation graduate digital technology SMEs who had participated through these programmes and created a database of these SMEs. Search methods included extraction of the SME names through the incubation hub websites, where these SMEs were categorised as technology related, press articles relating to digital SMEs who excelled in their chosen digital focus and who had graduated from incubation programmes, as well as other articles showcasing post-incubation graduate digital SMEs who were leading in digital technology.

3.3.2 *Sample and sampling method*

A purposive sampling method was adopted as the study is based on the post-incubation graduate incubatees with a digital technology focus who have participated through a private or non-private incubation programme and have since graduated. Given the criteria that graduation ought to have taken place prior to the circulation of the questionnaire in 2020, this approach was further supported. The post-incubation graduate SMEs focused within the digital technology sector who met the above-mentioned criteria were identified through the respective incubation hubs and requested to participate.

As highlighted by Galawe (2017), an efficient sampling frame for SMEs in developing countries remains a challenge that poses further challenges when representing the population. For purposes of this study, the sampling frame utilised was based on the criteria mentioned above.

According to Field (2018), some researchers utilise a preferred number of respondents for a sample based on a number of variables in the study, while others advocate for absolute numbers. If one were to consider the sample size from an absolute measure, 300 participants are deemed to be good, with 200 participants deemed to be a fair sample (Mundfrom, Shaw, & Ke, 2005). This study, therefore, sought to obtain a target sample of 300 participants, which is considered to be a good sample and is recommended for factor analysis (Field 2018).

A total of forty-eight incubation hubs with a digital focus, or who had previously incubated digital technology SMEs were approached for the distribution of the questionnaire to their post-incubation graduates of the incubation programme. These incubation hubs were located throughout South Africa. In addition, 233 SMEs with a digital technology focus were approached to participate in the study.

When issuing the link to the online questionnaire to the incubation hub manager or the digital technology SME, participants were advised that only one person from the respective SME, regardless of the person being an owner or employee, should complete the questionnaire. Certain SMEs who had participated in multiple incubation programmes were asked to choose one incubation programme as a basis for responding.

3.4 The research instrument

The research instrument that was circulated is contained in Appendix A.

The study utilised an online questionnaire for the collection of responses. The questionnaire comprised closed-ended questions and utilised Qualtrics software. The questionnaire comprised of three parts:

Part A – Collection of demographic data as well as confirmation that the respondent is eligible to participate in the survey based on the maximum revenue classification for a digital technology SME (Benjamins, 2009).

Part B – Questions relating to the services offered while during incubation with a specific focus on the constructs of network development and training (Messeghem et al., 2018; Scillitoe & Chakrabarti, 2010; Benjamins, 2009; Van Weele et al., 2017; De Beer, 2012).

Part C – Questions relating to the performance measures post-incubation and from the perspective of the former incubatee (Wiklund et al., 2009; De Beer, 2012; Galawe, 2017).

A Likert scale, which is typically used to measure perceptions and attitudes, was utilised in this study to collect nominal and ordinal data the questionnaire and to measure responses (Blumberg, Cooper, & Schindler, 2014). The questions were presented to measure each of the variables in line with the research questions. Two questions were reverse coded. The instrument comprised of a total of 16 questions for part B and Part C with a 7-point Likert scale ranging from very strongly disagree (1) to very strongly agree (7), in order to measure various perceptions of the respondents relating to training and network development while incubated and the subsequent post-graduation impact on turnover growth and financial capital raised.

To enhance understanding and avoid interpretive differences, a guiding text for each construct was presented that stated the following:

Training: "*Training is the transfer of knowledge and can take place in the form of classroom style learning, virtual learning, practical learning or any other learning that*

contribute to the incubatees knowledge and is intended to positively impact their performance."

Network Development: "*Network development is the matching of firms located in the incubator with other stakeholders such as potential customers, partners, employees, investors, service providers (accountants, lawyers, human resource specialists), and technology development partners either for a fee or free of charge."*

Turnover: *"Turnover is the amount of money generated by the firm as a result of sale of goods or providing services.*"

Financial Capital Raised: "*Financial capital refers to grants, loans, equity investments or any other form of funding received. Access to financial capital assists the business with the next stage growth of the firm.*"

Where possible, questions posed were based on past studies and adapted accordingly.

3.5 Data collection methods

Data was collected utilising a self-administered questionnaire, the online links of which were primarily made available via e-mail. Another method of distributing the online link to the questionnaire included LinkedIn (social media platform) as well as the WhatsApp messaging platform. Once the link was in the potential respondent's possession, the link would redirect the potential respondent to the Qualtrics software enabling the questionnaire to be completed by means of a computer, mobile phone, tablet or other technology enabling the data collection.

Private and non-private incubation hubs, through the head of the organisation or the project manager, were also approached in order to seek assistance with distributing the online link to the post-incubation graduate digital technology SMEs who participated through their programmes. Certain organisations were agreeable while others were non-responsive.

For those that that were unresponsive or not agreeable to distribute the online questionnaire link, a database containing the post-incubation graduate SMEs names

were created by extracting the SME details from the organisation's website. Links to the questionnaire were e-mailed to the SMEs directly.

While non-responses are inherent to the use of questionnaires as a means of data collection, additional measures were put in place, which included telephone calls to potential respondents, reminder e-mails and a redistribution of the questionnaire through the WhatsApp messaging service (Creswell, 2014).

Where it was found that digital SMEs participated in more than one incubation programme, the post-graduate digital SME was requested to complete the questionnaire only once.

The approach of data collection as discussed above was preferred during the current pandemic as it would not require engagement within proximity to respondents.

3.6 Procedure for data collection

This study utilised primary data. Self-administered online questionnaires were utilised for data collection. The advantages associated with self-administered questionnaires are that it is faster and cheaper to administer, there is no interviewer variability, and it is convenient for respondents (Bryman, 2016).

The researcher approached incubation hub managers for graduate details who met the criteria specified in this study. Due to confidentiality reasons, where these were not made available, the incubation hub managers were requested to distribute the questionnaire link to the SMEs who met the criteria for the study.

A self-administered online questionnaire link was sent to the incubation hub managers for onward distribution, or directly to the post-graduate incubatees inviting them to participate in the study. Where the online questionnaire link was sent to an incubation hub manager, a unique link associated with the specific incubation hub was created. This process allowed for the researcher to monitor the response rate associated with a specific incubation hub, and for direct follow up with the specific incubation hub where there was a low response rate.

The online questionnaire link redirected the potential respondent to Qualtrics software. As the Qualtrics software was utilised for data collection, the responses received were anonymous and could not be associated with a specific respondent unless the respondent notified the researcher that a response was submitted. Following the presentation of the questionnaire to the post-incubation graduate SMEs, bi-weekly reminders with a maximum of two e-mails were sent. Where no notification was received, the potential respondent was reminded via a telephonic call. To assist with a convenient process for the respondent, the questionnaire was provided to the respondents through the WhatsApp messaging platform at their request.

3.7 Data analysis and interpretation

Data analysis involves the process of data reduction by creating summaries, identifying patterns and applying statistical methods to interpret the data collected (Bryman, 2016).

The data collected from Qualtrics, the software utilised for administering the questionnaire, was downloaded into a Microsoft Excel file. The data was examined for inconsistencies in preparation for final analysis. As part of the examination of data, the data was screened for errors, coding, completeness, and reverse questions. The cleaned data was thereafter exported to SPSS, a statistical package that was utilised for purposes of analysing the data. The data was thereafter checked for missing values, and to test for any violations in statistical assumptions (Field, 2018). This was followed by validity and reliability testing, as well as statistical techniques, which included descriptive, correlation and regression statistical procedures for hypotheses testing.

3.7.1 *Missing values analysis*

In performing quantitative analysis, missing or incomplete information due to incomplete questionnaires is usually experienced (Field, 2018). As the online link to a questionnaire was issued using channels such as e-mail, WhatsApp, and social media, a majority of responses received were incomplete, leading to a missing values

analysis being performed. The study adopted the 10 percent rule whereby a list wide deletion of responses could take place with all responses missing more than 10 percent of observations being deleted (Little, 1988). Other responses that were deleted were those responses that did not meet the criteria of an SME.

3.7.2 *Descriptive statistics*

Descriptive statistics was used to understand the simple features of the data and to allow for quantitative analysis. Descriptive statistics was used to summarise a large amount of data and to analyse the sample data in terms of demographics such as gender, age, race, level of education, as well as the SME business characteristics.

3.7.3 *Correlation analysis*

The linear relationship between the independent variables and the dependent variables was tested using the Pearson correlation matrix. The independent variables or predictor variables in the study were training and network development, while the dependent variables or outcome variables were turnover growth, and financial capital raised.

Correlation coefficients below 0.3 suggest weak correlations between the variables while a value closer to 1 represents perfect collinearity, which is an indication of multicollinearity problems (Field, 2018). It was therefore important to first conduct the correlation analysis as a precursor to regression analysis.

3.7.4 *Regression*

The regression assumptions of multicollinearity, outliers, normality, independence of errors, autocorrelation and linearity were tested before the regression analysis could be performed. Each of the assumptions are further discussed in Chapter 4 together with the outcome of the respective assumption. The regression analysis assists in estimating the effect of the independent variables on the dependent variables. The SPSS statistical software was utilised to perform this function.

3.8 Validity and reliability

Validity refers to the fit between the construct and the empirical indicator, which is the extent to which a concept is accurately measured (Neuman, 2011). Validity comprises external validity and internal validity.

Cronbach's alpha is a measure of internal consistency, and was used to test the reliability of the scale by measuring how closely a set of items are to a group. The criterion for scales was an alpha greater than 0.7 indicating that the scale is internally consistent, where an alpha between 0.5 and 0.6 is lower, but continues to be reliable (Field, 2018).

A pilot study was conducted during August 2020 with changes made to the research instrument based on feedback received from respondents.

3.8.1 *External validity*

External validity refers to the generalisability of the findings of the study to the population (Galawe, 2017). The sample data was collected across urban areas of South Africa with incubation programmes containing digital technology participants. The data may be utilised as a generalisable view specific to digital technology SMEs who have graduated from incubation programmes. The ability to generalise was fulfilled in that the findings will be of value to incubation programmes who have digital technology incubatees and may assist in the future design of their service offering.

3.8.2 *Internal validity*

Internal validity relates to the consistency of the research instrument to continue measuring what it is meant to measure if repeatedly applied (Cooper & Schindler, 2011). The random and large sample would assist in contributing to a positive internal validity (Creswell, 2014).

Internal validity was achieved with the same questionnaire being provided to all participants regardless of the graduation from a private or non-private incubation hub. The study continued to meet internal validity measurement as the Linkert-scale questioning produced decisive answers.

3.8.3 *Reliability*

The relationship between the independent variables of training and network development, and the dependent variables of turnover and financial capital raised, have been empirically tested in the past through previous studies conducted.

To enhance the reliability or dependability, questions posed in the research instrument have been adapted from past studies in most instances.

3.9 Limitations of the study

The following limitations were relevant to this study:

- As highlighted earlier in this chapter, there was no consensus on a sample frame within the SME context in developing countries, hence the usage of an absolute target sample.
- The access to information relating to post-incubation graduate digital technology focused SMEs remained with the respective incubation hubs, for which the contact details of the SMEs was sought but only received from a few incubation hubs.
- Where contact details of the post-incubation graduate incubatees were received, contact details for certain SMEs had changed.
- Certain incubator managers refused to forward the questionnaire to their past participants on the premise that these requests were received from numerous students on a weekly basis.
- The impact as a result of the SMEs who had met the criteria to participate in the study and received the questionnaire, but refused to participate in the study.

3.10 Demographic profile of respondents

As the study is focused on the post-incubation graduate incubatees, the most relevant information relates to the qualification criteria for this study. The criteria related to past participation in an incubation programme with subsequent graduation, as well as the upper limit of turnover, for the purposes of being classified as an SME. The participant

was also required to provide information relating to the digital technology SMEs main focus within the digital technology sector.

Additional information that was sought from the digital technology SME is the number of employees employed by the SME as an indicator of firm size.

3.11 Ethical considerations

To ensure that ethical practices are adhered to, an introductory letter was used explaining the purpose of the study, confirmation that the participant's response would be confidential, as well as confirming the participant's right to anonymity. Furthermore, the researcher confirmed to abide by the code of ethics as published by WITS Business School. Prior to the collection of data, the researcher sought consent from the participants by the participant clicking an option on the instrument agreeing to participate before being allowed to participate in the questionnaire.

In addition to the above, the following was adhered to:

- principles of honesty and integrity were applied;
- non-disclosure of participant personal information was upheld;
- respondent personal information was not used in the study removing any potential for bias; and
- the collection of data only commenced following the receipt of a clearance certificate from the university.

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

This chapter summarises the results from the data collection as obtained by means of a survey. In the first part of this chapter, data screening results and the sample characteristics are presented. This is followed by the reliability of the measurement scales and the regression and correlation analysis results pertaining to the hypotheses tested.

4.2 Data Quality and Screening

A total of 218 responses were received, where 80 of these were excluded as these responses contained more than 10 percent missing values (mainly as a result of incomplete responses) leaving 138 complete responses (Little & Rubin, 1989). Further screening showed that there were eight responses that were required to be excluded from the analysis, as these did not meet the criteria for the SME category. The potential implication of list wide deletion in response to missing values is that it may lead to a loss of valuable information as well as reduced statistical power (Kalkan, Yusuf, & Kelecioğlu, 2018). However, as the data is considered to be missing completely at random (MCAR), the deletion of responses will have “no impact on statistical significance nor consistency” (Madden, Vicente, Rappoport, & Banerjee, 2017, p. 8).

As a result of the exclusions as discussed above was that there were 130 observations, which was considered to be a good sample size for further analysis.

Two questions were reverse coded. These were reversed back. The researcher ensured that all coding reflected positive responses from 1 very strongly disagree, to 7 very strongly agree.

The challenges experienced with data collection were heightened as a result of the Covid-19 pandemic, where many incubation hub managers were unreachable for the

request to distribute the questionnaires on office telephones due to work from home policies that were implemented, and in most instances were unresponsive to e-mails. Where responses were received from the incubation hub managers, caution was provided that post-incubation graduate SMEs were more likely to be focused on SME survival during the pandemic and may not be willing to participate in questionnaires.

4.2.1 *Response rate*

When performing quantitative research, challenges of very low response rates are experienced, thereby encouraging the researcher to target larger samples than required. The response rate for this study was estimated to be 18%, due to the larger number of unsolicited e-mails and WhatsApp messages sent (Black, Babin, & Anderson, 2010).

As per Galawe (2017), in a study concerning incubation hubs and SMEs, use of an estimate response rate rather than actual response rate is acceptable, as the study cannot determine the actual response rate with certainty due to the unsolicited distribution, as most people will not respond.

4.3 Sample Characteristics

This subsection is divided into two parts. The first part deals with the characteristics of the respondents as entrepreneurs, while the second part deals with the characteristics of the digital technology SME.

4.3.1 *Demographic profile of respondents*

The study collected information relating to the age, gender, ethnicity, and highest qualification of the participants.

The gender distribution of the respondents is presented in Table 2. Based on the results obtained, a total of 100 respondents were male representing 76.9%, while 30 respondents, or 23.1% of the sample, were female.

Table 2: Gender distribution of respondents

Distribution of gender of respondents		
	Respondents	
	Frequency	Percent
Male	100	76.9
Female	30	23.1
Total	130	100

The age distribution of the respondents is presented in Table 3. The age groups of respondents are represented in six intervals. Each interval apart from the 18-25 year and 45+ age category represents a five-year range. The majority of the respondents, 73.1%, were under the age of 41. Table 3 shows that the age group with the most respondents were within the 36-40 year age group (24.6%), followed by the 31-35 year age group (21.5%), 26-30 year age group (20.8%), and 41-45 year age group (18.5%), respectively.

Table 3: Age distribution of the respondents

Distribution of age of respondents		
Age	**Respondents**	
	Frequency	**Percent**
18 to 25	8	6.2
26 to 30	27	20.8
31 to 35	28	21.5
36 to 40	32	24.6
41 to 45	24	18.5
45+	11	8.5
Total	130	100

The ethnicity of the respondents is presented in Table 4. The ethnicity of the respondents is represented in five intervals which are Black, White, Coloured, Indian / Asian, and Other. A majority of the respondents are Black (63.8%), followed by White (15.4%), Indian / Asian (14.6%), Coloured (5.4%), and Other (0.8%).

Table 4: Ethnicity distribution of respondents

Distribution of ethnicity of respondents		
Ethnicity	**Frequency**	**Percent**
Black	83	63.8
White	20	15.4
Coloured	7	5.4
Indian / Asian	19	14.6
Other	1	0.8
Total	130	100

Figure 3 below displays the highest education level of the respondents. Based on the responses received, a combined 65.4% of respondents were degreed graduates comprising of a bachelor's, honour's, master's and doctorate degrees. Most respondents held a bachelor's degree (27.7%) as their highest level of education, followed by a combined second between an honour's degree (20.8%) and a post matric certificate or diploma (20.8%), followed by 15.4% with a master's degree. Respondents holding a Grade 12 as their highest education level was at 13.1% with doctorate qualifications at 1.5 percent.

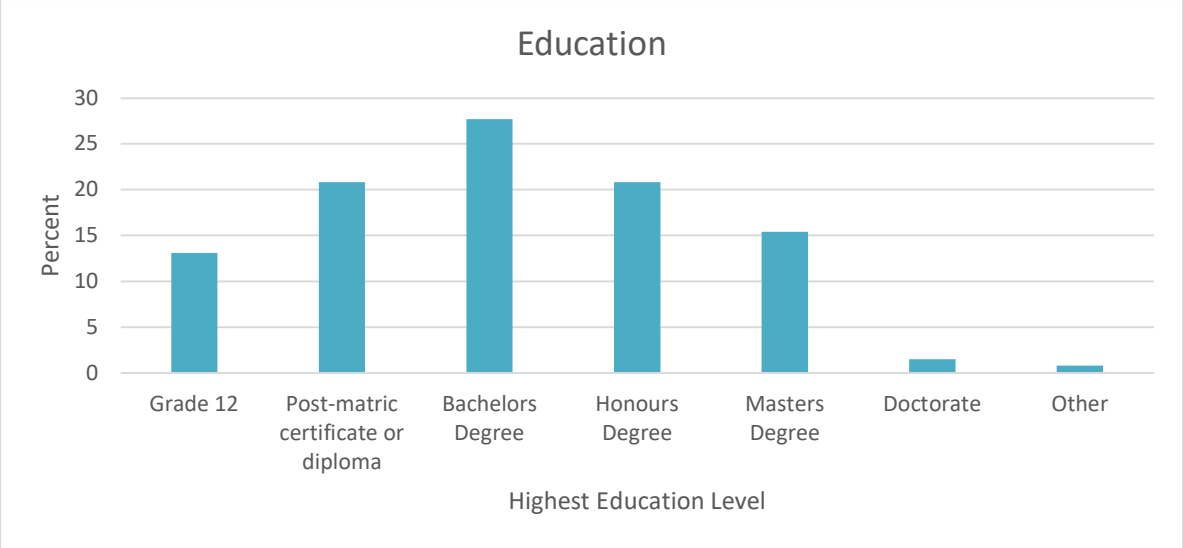


Figure 3: Level of education

Source: Primary Data

4.3.2 *Business Profile/Characteristics*

Figure 4 displays the year that the respondent firm was established. A majority of the respondent firms (77.7%) were established between 2013 and 2020. From this majority, most firms were established between 2016–2018 (35.4%), followed by 2013–2015 (24.6%).

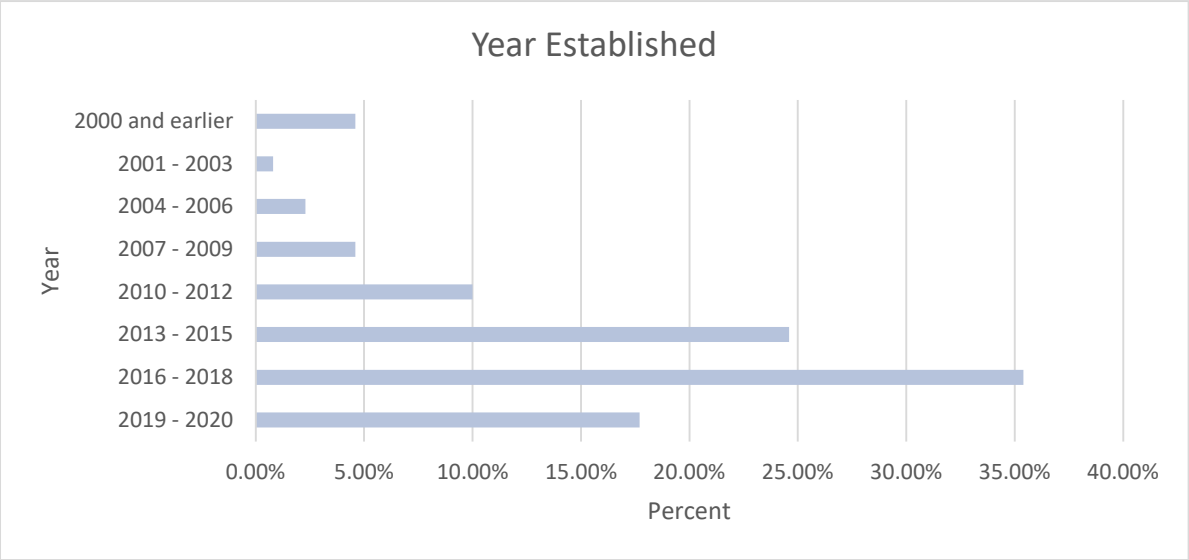


Figure 4: Year respondent firm was establishment

Source: Primary Data

Figure 5 below presents the number of years that the firm had spent in an incubation programme before graduating. Of the total respondents, 90.7% of the respondents spent between 0-3 years in an incubation programme before graduating. From this majority, most firms, 39.2%, spent between 1-2 years in an incubation programme before graduating. This was followed by 36.9% of firms spending less than a year, followed by 14.6% spending between 2-3 years in an incubation programme before graduating.

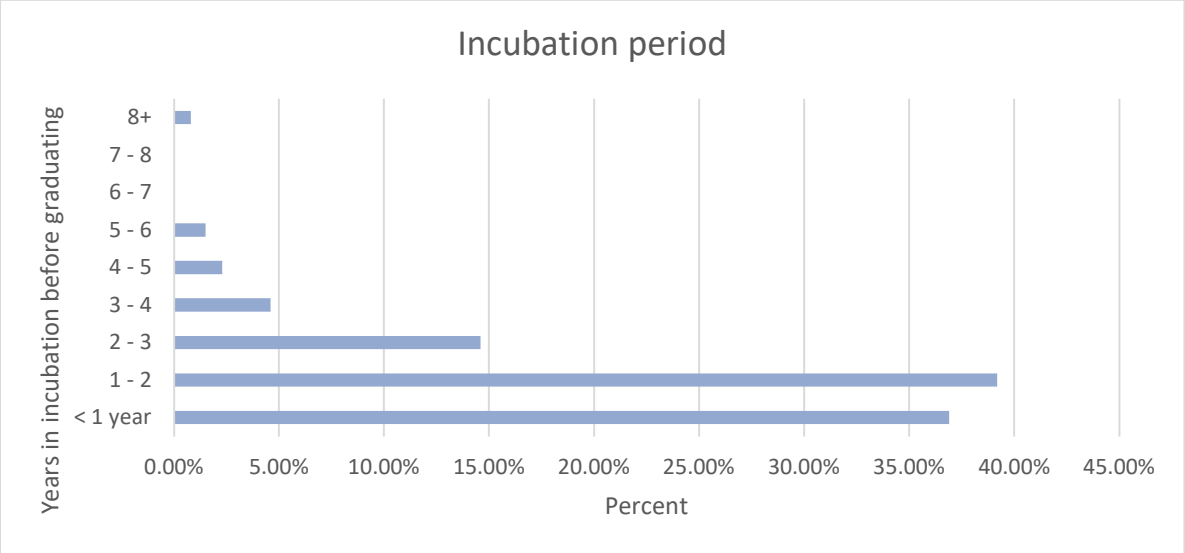


Figure 5: Years in incubation programme before graduating

Source: Primary Data

Figure 6 presents the number of full-time employees employed by the firm, which includes the owner. More than half of the respondents, 56.9%, had less than five full-time employees, followed by 30.8%, who had between 5-10 full time employees.



Figure 6: Respondent full-time employees

Source: Primary Data

The main digital technology focus of the respondent firm is presented in Figure 7. Analytics was the main focus of 15% of the respondents, followed by cloud computing, network security, and social media, each of which represented 10% of the sample distribution. This was followed by internet of things (8.5%) and big data (7.7%). Digital technology is quite broad, with the all options not being listed. Based on the responses received, 25% of respondents indicated that their main digital focus was “Other”, indicating that their main digital technology focus was not represented by the possible choices presented.

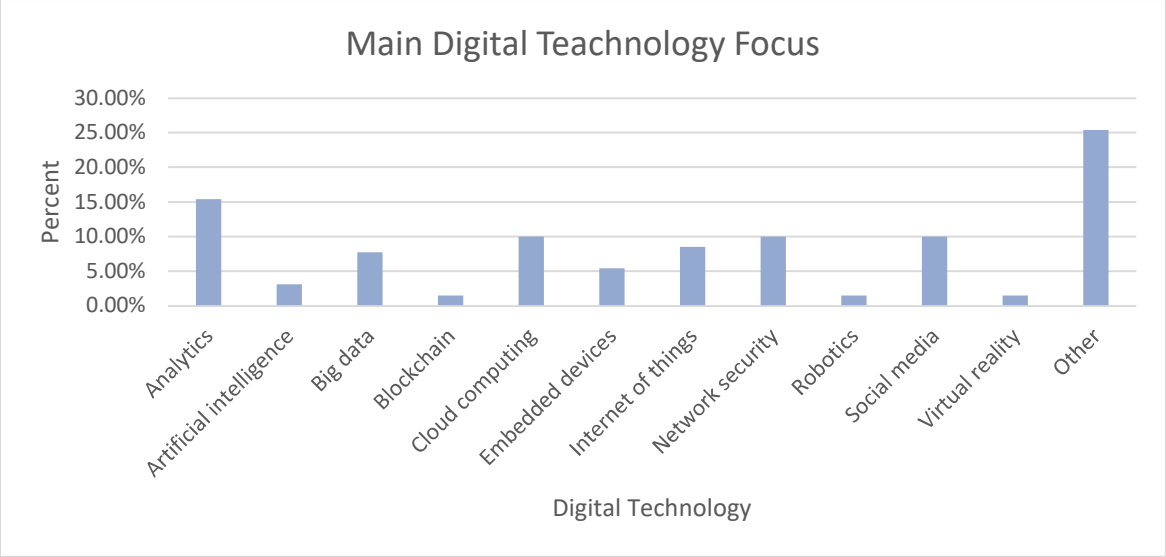


Figure 7: Respondent main digital focus

Source: Primary Data

Figure 8 shows that the majority of respondents, 56.2%, participated through a private incubation hub. The distribution relating to respondents who participated through a government incubation hub was 27.7%, non-governmental organisation 11.5%, while 4.6% of the respondents indicated that they had participated through other incubation hubs.

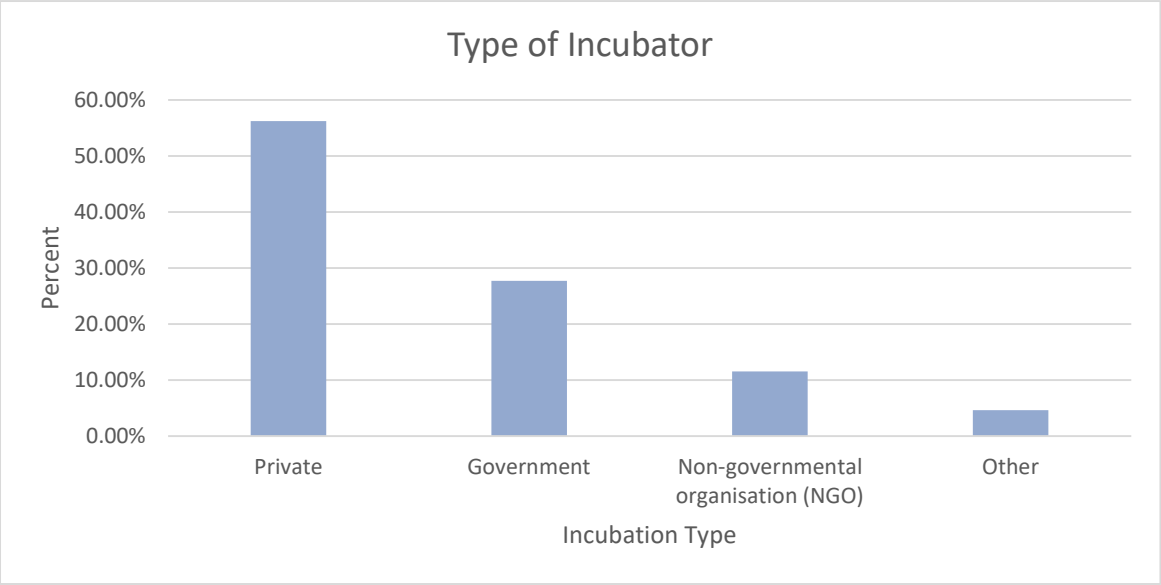


Figure 8: Type of incubator in which the respondent participated

Source: Primary Data

Table 5 below presents the digital SME turnover as achieved in the previous financial year. Turnover intervals are presented within a five million Rand range, apart from the last interval, which represents a six million interval. As displayed in Table 5, 81.5% of respondents fall within the R0 to R5m range representing a clear majority, followed by 11.5% within the R5m to R10m range.

Table 5: SME Turnover – previous year

Turnover Previous Year

			Frequency	Percent	Valid Percent	Cumulative Percent
Valid	R0 -	R5m	106	81.5	81.5	81.5
	R5m -	R10m	15	11.5	11.5	93.1
	R10m -	R15m	4	3.1	3.1	96.2
	R15m -	R20m	4	3.1	3.1	99.2
	R20m -	R26m	1	.8	.8	100.0
	Total		130	100.0	100.0	

4.4 Validity - Exploratory Factor Analysis

The study contained four constructs. Network development and training were the independent variables and financial capital raised and turnover growth after graduating were dependent variables.

Before proceeding with factor analysis, it was important to first test for sample adequacy, for which the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was utilised. Table 6 below presents the results of the KMO measure of sampling adequacy. The sample yielded a KMO measure of 0.865 which is above the minimum criteria of 0.5 and is deemed to be a great sample (Field, 2018).

Bartlett's Test is used to provide an indication on whether the correlation matrix is significantly different from an identity matrix (Field, 2018). Based on the result of the Bartlett's test, as the result of 0.000 is less than 0.05, the result is significant, providing further support that exploratory factor analysis can be utilised.

Table 6: Sampling adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.865
Bartlett's Test of Sphericity	Approx. Chi-Square	764.025
	df	66
	Sig.	.000

From the 17 items in the study, the principal axis factoring (paf) method was utilised to extract the factors. The paf method was selected as the factors are expected to be correlated as suggested by literature. Obligue Rotation with Promax was used to rotate the items in order to optimise the factor structure.

The leftmost section of Table 7 below shows the variance explained by the initial solution. According to Kaiser's criteria, it is recommended that all factors with eigenvalues greater than one be retained. Three factors have eigenvalues greater than 1 and were therefore extracted and retained for further analysis. Together these three factors account for approximately 67.8% of the variability in the original variables which is above the minimum of 60 percent.

The second section of the table, Extraction Sum of Squared Loadings, shows the variance explained by the extracted factors before rotation. The cumulative variability explained by these three factors in the extracted solution is approximately 57%, a difference of approximately 10%, when compared to the initial solution. This difference of 10% of the variation explained by the initial solution is lost, due to latent factors unique to the original variables and variability that can't be explained by the factor model.

Table 7: Total Variance explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.286	44.050	44.050	4.926	41.051	41.051	4.380
2	1.659	13.827	57.877	1.107	9.222	50.273	4.098
3	1.199	9.989	**67.866**	.838	6.985	57.259	1.082
4	.769	6.407	74.273				
5	.659	5.494	79.767				
6	.516	4.296	84.063				
7	.464	3.868	87.931				
8	.388	3.236	91.167				
9	.359	2.993	94.160				
10	.280	2.334	96.494				
11	.250	2.082	98.576				
12	.171	1.424	100.000				

Extraction Method: Principal Axis Factoring

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Scree plot was used together with eigenvalue rule greater than 1 to decide on the number of factors to extract. Each factor had to have three or more items loaded and the cut-off for factor loading equals to, or more than 0.4, was used to decide on good loadings (Stevens, 2002).

On the scree plot, the point of inflexion before the curve flattens suggested that three factors should be retained. This is demonstrated in Figure 9 below. This was consistent with the total variance explained, which had also indicated that three factors should be retained.

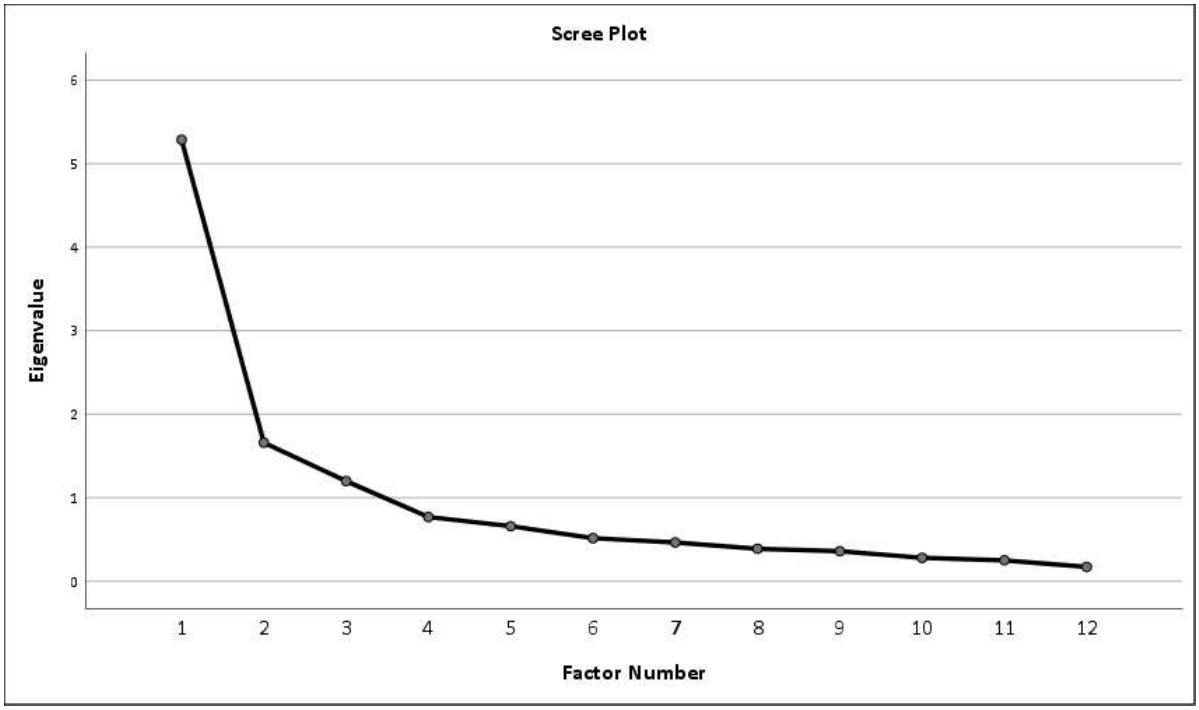


Figure 9: Scree plot indicating three factors should be retained

Items relating to dependent variables were run separately from independent variables, as certain dependent variable items were loading in independent variable factors. All items for independent variables were run together, resulting in clear convergence and divergence. After a few iterations, all items converged into specific factors. There was no divergence from other factors.

The pattern matrix was analysed together with total variance explained, which had to explain ideally 60% of the variability in the dataset. The pattern matrix is presented in Table 8 below. As Turnover being the dependent variable that was run independently, the result thereof is presented in the Factor Matrix titled Table 9.

The Principal Axis Factoring method was utilised for this analysis. The Promax with Kaiser Normalisation method was utilised with the rotation converging in five iterations for the three factors and 11 iterations for the Turnover Growth factor, which was independently run. Of the seventeen items used in the study, one item relating to Financial Capital Raised was removed, as it did not load properly. Apart from this identified item, as reflected in Table 8 and Table 9, the remaining items loaded sufficiently, with a criteria of above 0.4 and was utilised for further analysis (Stevens, 2002).

Table 8: Pattern Matrix

Pattern Matrix[a]

	Factor		
	Network Development	**Training**	**Financial Capital Raised**
Training01		.926	
Training02		.783	
Training03		.782	
Training04		.585	
Network01	.791		
Network02	.700		
Network03	.807		
Network04	.882		
Network05	.620		
FinancialCap01			.433
FinancialCap03			.523
FinancialCap04			.765

Extraction Method: Principal Axis Factoring
Rotation Method: Promax with Kaiser Normalisation.[a]
a. Rotation converged in 5 iterations.

Table 9: Factor Matrix - Turnover

Factor Matrix[a]

	Factor
	4
Turnover01	.798
Turnover02	.642
Turnover03	.450
Turnover04	.652

Extraction Method: Principal Axis Factoring
a. 1 factors extracted. 11 iterations required.

Therefore, the factors extracted were labelled as Factor 1 – Network Development with five items, Factor 2 – Training with four items and Factor 3 - Financial Capital Raised with three items. Although items relating to Turnover Growth was run

independently, we refer to Turnover Growth as Factor 4, although it was run from the independent pattern matrix.

The four factors were further tested for measurement scale reliability.

4.5 Reliability Analysis - Internal Consistency

To test the reliability of each scale, Cronbach's alpha was used. The criterion for scales was an alpha greater than 0.7 indicating that the scale is internally consistent, however, an alpha between 0.5 and 0.6 is lower, but continues to be reliable (Field, 2018). The results are presented below in Tables 10-13. Training, Network Development, and Turnover Growth all had high reliabilities. However, Financial Capital Raised as presented in Table 12 had an alpha of 0.57 which was lower than the recommended 0.7, but remains reliable (Field, 2018). The reliability of the Financial Capital Raised scale was further supported by additional statistical tests as discussed below.

Table 10: Factor 1 – Network Development

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.888	.888	5

Table 11: Factor 2 - Training

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.866	.866	4

Table 12: Factor 3 – Financial Capital Raised

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.575	.575	3

Table 13: Factor 4 – Turnover Growth

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
.729	.727	4

The inter-item correlation matrix presented a correlation coefficient or r>0.3 for all constructs except for Financial Capital Raised and was positive, suggesting that the scale is reliable and convergent (Field, 2018). The inter-item correlation for Financial Capital Raised loaded and converged and was therefore accepted.

The Cronbach alpha if deleted indicated that there was no need to delete an alpha as the alpha was excellent. Deleting an item that was marginally higher within a construct would reduce the items in the construct, while not significantly improving the Cronbach alpha for the construct.

After completing the validity and reliability tests, the average of all the items per factor were added so as to compute the factor mean, which is hereafter representative of the construct for further analysis.

4.6 Correlation Analysis

The Pearson correlation matrix was utilised to perform the correlation analysis. The Pearson's correlation measures the linear relationship between two variables with a value of -1 representing a negative linear relationship, +1 representing a positive linear relationship, and a value of 1 implying perfect collinearity. Correlation coefficients below 0.3 suggest weak correlations between the variables. As displayed in Table 14, all the significance values are below p<0.01, except for the construct relating to Financial Capital Raised.

Table 14: Correlations

Correlations

		TRAINING	NETWORK	FINANCIAL _CAPITAL	TURNOVER
TRAINING	Pearson Correlation	1	.625**	.119	.570**
	Sig. (2-tailed)		.000	.177	.000
	N	130	130	130	130
NETWORK	Pearson Correlation	.625**	1	.062	.610**
	Sig. (2-tailed)	.000		.484	.000
	N	130	130	130	130
FINANCIAL_CAPITAL	Pearson Correlation	.119	.062	1	.253**
	Sig. (2-tailed)	.177	.484		.004
	N	130	130	130	130
TURNOVER	Pearson Correlation	.570**	.610**	.253**	1
	Sig. (2-tailed)	.000	.000	.004	
	N	130	130	130	130

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the results in Table 14, all of the variables are positively correlated. Training, the independent variable, is significantly positively correlated with the dependent variable of Turnover Growth with a correlation coefficient of ($r=0.57$, $p<0.01$). Turnover Growth is also significantly positively correlated with the independent variable of Network Development ($r=0.61$, $p<0.01$). It is also worth noting that there is a significant positive correlation between Training and Network Development ($r=0.625$, $p<0.01$), which are the two independent variables in the study.

The construct of Financial Capital Raised has a small correlation with both of the independent variables, which are Training ($r=0.119$, $p<0.01$) and Network Development ($r=0.062$, $p<0.01$).

4.7 Testing regression assumptions

The regression assumptions included multicollinearity, outliers, normality, independence of errors, autocorrelation, and linearity.

4.7.1 *Multicollinearity*

Based on the correlation coefficients between constructs, the correlations are all less than 0.8, indicating that there are no serious problems with multicollinearity. The Tolerance between the Independent Factors (Networking and Training) and the dependent factors each yielded a Tolerance of 0.609 and VIF of 1.609, which is above the minimum cut off values of 0.2 and 5, respectively, indicating that there are no multicollinearity problems (Menard, 2002).

4.7.2 *Outliers*

The box plots contained extreme values which were the data points marked with an asterisk (*) in Figure 10.

There were two outliers on Turnover, which were removed. The box plot before and after the removal of the outliers are represented in Figure 10 and Figure 11, respectively.

Boxplots including outliers

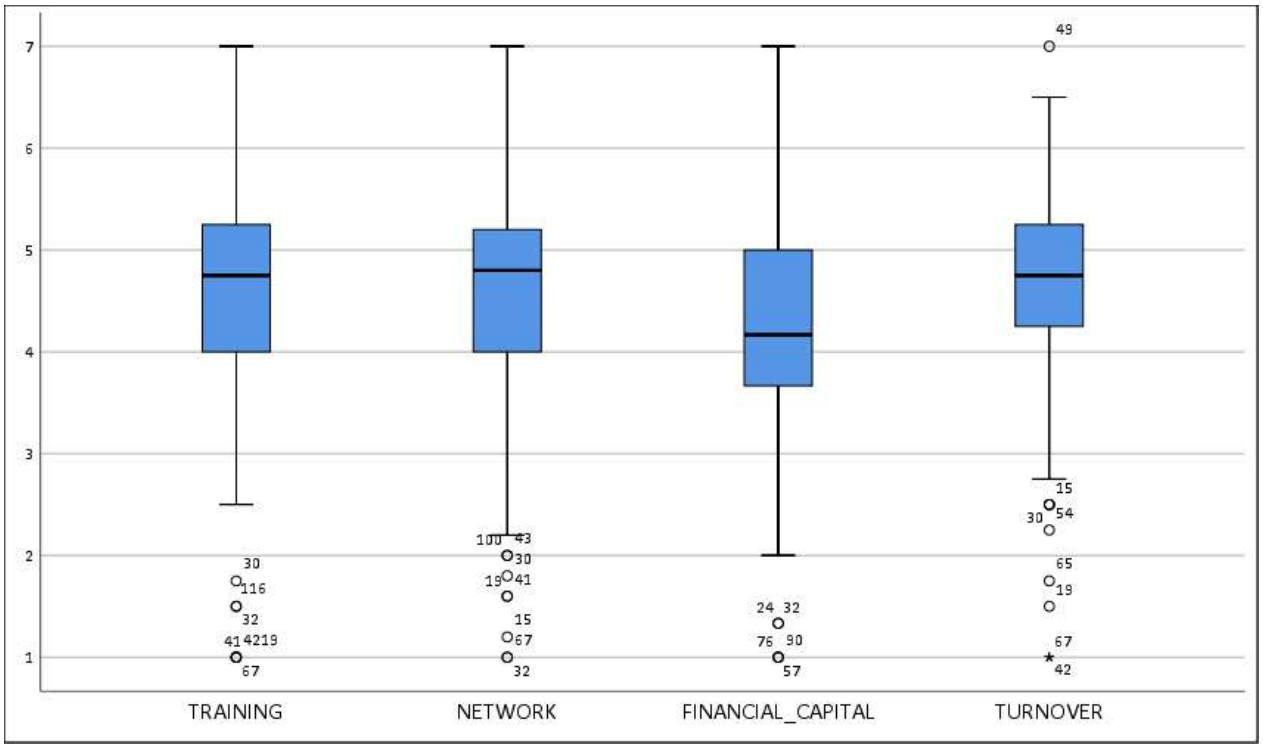


Figure 10: Box Plot including outliers

Boxplots after removal of outliers

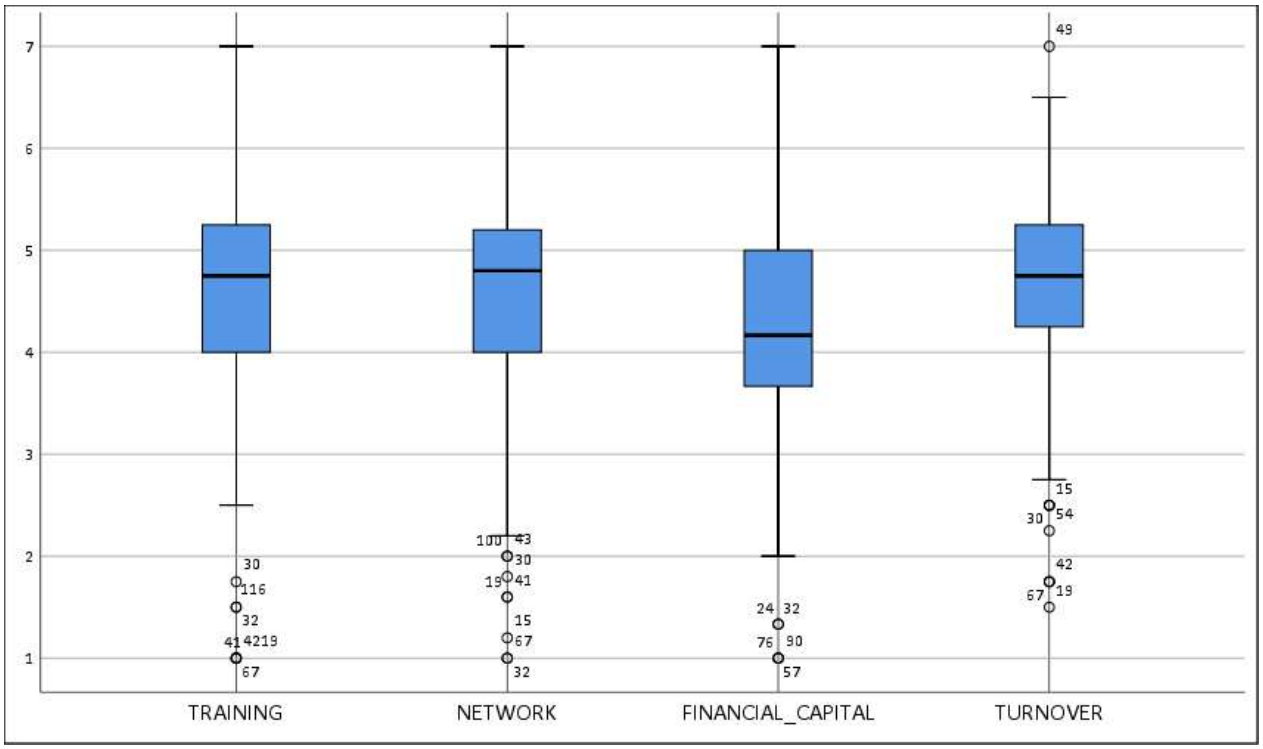


Figure 11: Box Plot after removal of outliers

4.7.3 *Normality and independent errors*

The normality of the variables was tested using a numerical method with a focus on the skewness and kurtosis of the variables. Although skewness and kurtosis have a normal distribution value equal to zero (Field, 2018), skewness and kurtosis values between -2 and +2 are considered acceptable (George & Mallery, 2003). Table 15 shows that all variables are slightly negatively skewed, with only Turnover having a kurtosis of greater than one, but still within the cut-off range. The variables are therefore close enough to be treated as normal distribution.

Table 15: Statistics

Statistics

		TRAINING	NETWORK	FINANCIAL _CAPITAL	TURNOVER
N	Valid	130	130	130	130
	Missing	0	0	0	0
Mean		4.6731	4.5200	4.1692	4.6404
Std. Error of Mean		.11815	.10695	.10343	.09051
Median		4.7500	4.8000	4.1667	4.7500
Mode		4.50	5.00	4.33	4.50
Std. Deviation		1.34714	1.21938	1.17924	1.03195
Variance		1.815	1.487	1.391	1.065
Skewness		-.559	-.787	-.244	-.687
Std. Error of Skewness		.212	.212	.212	.212
Kurtosis		.696	.694	.680	1.021
Std. Error of Kurtosis		.422	.422	.422	.422
Range		6.00	6.00	6.00	5.50
Minimum		1.00	1.00	1.00	1.50
Maximum		7.00	7.00	7.00	7.00
Sum		607.50	587.60	542.00	603.25

4.7.4 *Independent errors*

Independent errors were tested with ZRESID and ZPRED, the results of which indicate that the errors are independent. The P-P plots for the dependent variables of financial capital raised and turnover growth are reflected in figures 12 and 13, respectively. The plot of residuals are close to the diagonal line in each of figures 12 and 13, implying that the errors are normally distributed. As a result, the homoscedasticity assumption was not violated.

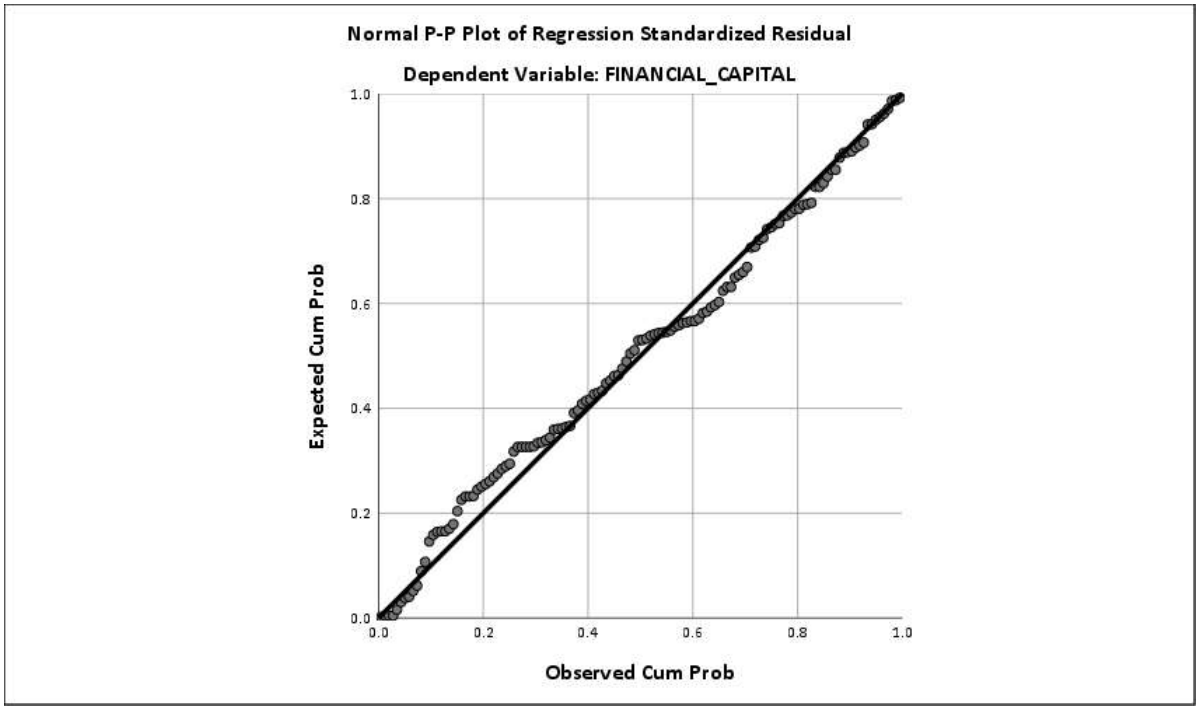


Figure 12: Normal P-P Plot: Financial Capital

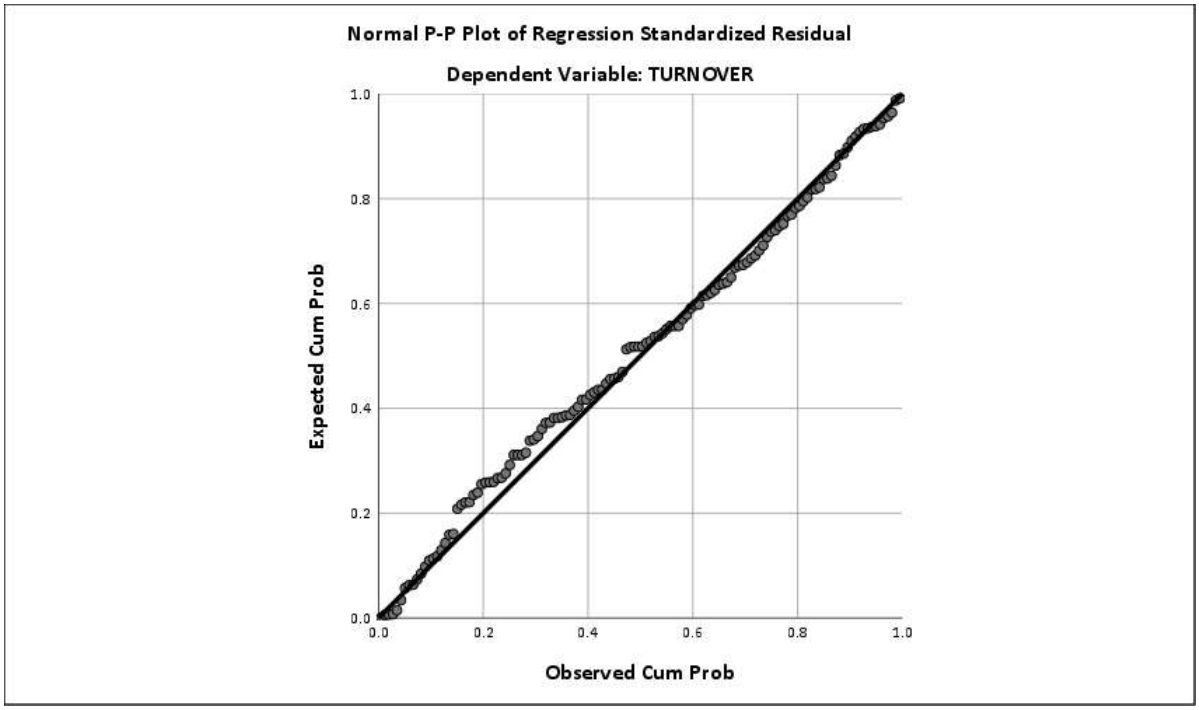


Figure 13: Normal P-P Plot: Turnover

4.7.5 *Autocorrelation*

The Durbin-Watson test was used to detect for autocorrelation, which is serial correlations between errors. The test statistic is required to be between 0 and 4, with a value greater than two, indicating a negative correlation and less than two indicative of a positive correlation, with an area for concern if the result was less than one or greater than three (Field, 2018). The Durbin-Watson static for the independent variables correlated with the dependent variables of Financial Capital Raised and Turnover Growth, as reflected in Table 16 and Table 19, resulted in a value of 1.641 and 1.844, respectively. The result indicated that there is no reason to suggest that the errors are correlated.

4.7.6 *Linearity and residuals*

The linearity test is used to determine whether there is a linear relationship between the independent variables and the dependent variables. The Pearson Correlation matrix was used to test the linearity. Based on the results as previously presented in Table 14, the variables meet the minimum requirements for correlation and linearity.

4.8 Hypothesis Testing using Multiple Regression

This section is concerned with the use of regression analysis of the variables to determine whether the hypotheses can be supported or should be rejected. The model presented in Table 16 examines the relationship between the two independent variables of Network Development and Training, and the dependent variable of Financial Capital Raised. The model presented in Table 18 examines the relationship between the same independent variables and the dependent variable of Turnover Growth.

Table 16: Model Summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.120[a]	.014	-.001	1.17985	1.641

a. Predictors: (Constant), NETWORK, TRAINING
b. Dependent Variable: FINANCIAL_CAPITAL

Based on the results in Table 16, two predictor variables (Network Development and Training) were entered into the regression model with Financial Capital Raised as the dependent variable. The value of the R-square is 0.014, which implied that network development and training accounted for about 1.4% of the variations in financial capital, thus, 98.6% is explained by other factors outside the model. This implies that the model was a poor fit. Table 17 below presents ANOVA.

Table 17: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.599	2	1.299	.933	.396[b]
	Residual	176.789	127	1.392		
	Total	179.388	129			

a. Dependent Variable: FINANCIAL_CAPITAL
b. Predictors: (Constant), NETWORK, TRAINING

The ANOVA table provides details about the overall significance of the model. The results presented in Table 17 show that the F-statistic is 0.933 with a p-value of 0.396, which is greater than the five percent level of statistical significance. Based on the results presented, it can therefore be concluded that the model was insignificant. Regression coefficients for the model are presented in Table 18 below.

Table 18: Coefficients

Coefficients[a]

Model		Unstandardised Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	3.719	.427		8.706	.000	2.874	4.564		
	TRAINING	.116	.099	.132	1.171	.244	-.080	.311	.609	1.642
	NETWORK	-.020	.109	-.021	-.184	.855	-.236	.196	.609	1.642

a. Dependent Variable: FINANCIAL_CAPITAL

Table 18 above presents the regression coefficients. Based on the results, it can be seen that the standardised coefficient for training 13.2% is positive but statistically insignificant, since the t-statistic is insignificant (p>0.05). The coefficient for network development is negative and statistically insignificant. Therefore, it can be concluded that training and network development have no influence on financial capital raised.

The following section presents the regression results for the second model, which had turnover growth as the dependent variable.

Table 19: Model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.656[a]	.430	.421	.78492	1.844

a. Predictors: (Constant), NETWORK, TRAINING
b. Dependent Variable: TURNOVER

Table 19 shows that the dependent variable is turnover growth, which is predicted by network and training. The R-square, which measures the goodness of fit of the model, is 0.43, suggesting that 43% of the variations in turnover are explained by the

variations in network and training. Therefore, the predictive power of the model was good. The adjusted R-square, which measures the quality of the R-square is 0.421, and is slightly different from the R-squared, implying that the model was of good quality. Table 20 below presents the ANOVA for the second model.

Table 20 : ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.131	2	29.566	47.988	.000[b]
	Residual	78.244	127	.616		
	Total	137.375	129			

a. Dependent Variable: TURNOVER
b. Predictors: (Constant), NETWORK, TRAINING

The ANOVA table shows that the F-statistic is 47.988, which is statistically significant at 5 percent level ($p<0.05$). Therefore, it can be concluded that the overall model is valid at a five percent level of significance. Table 21 below presents regression coefficients for the second model.

Table 21: Model coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	1.939	.284		6.825	.000	1.377	2.502		
	TRAINING	.237	.066	.310**	3.609	.000	.107	.367	.609	1.642
	NETWORK	.352	.073	.416**	4.851	.000	.209	.496	.609	1.642

a. Dependent Variable: TURNOVER, **p<0.05, **p<001*

The regression results presented in Table 21 above shows that both training and network development are significant predictors of turnover growth. The standardised coefficient of training (31%) is positive and statistically significant at a five percent level ($p<0.05$). Network development has a positive coefficient (41.6%), which is also statistically significant at a five percent level ($p<0.05$). Therefore, it can be concluded that training and network development have a positive influence on turnover growth.

The following sections present a detailed discussion of the results pertaining to the hypotheses formulated.

4.8.1 *Hypothesis 1:*

Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.

This study tested the influence of training on the performance of post-incubation graduate SMEs as measured by growth in turnover. The results as presented in Table 21 show that training has a significant positive influence on the performance of SMEs. The result implies that if training increases by one percent, then turnover growth increases by 31 percent. Therefore, hypothesis 1 was supported.

4.8.2 *Hypothesis 2:*

Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.

Network development was also regressed on turnover growth in order to test hypothesis 2. As indicated by the results in Table 21**,** network development significantly predicts turnover growth. The result implies that if network development increases by a 1%, then turnover growth increases by 41 percent. Thus, hypothesis 2 was supported, and it can be concluded that network development positively influences the performance of post-incubation graduate SMEs in the digital technology sector.

4.8.3 *Hypothesis 3:*

H3: Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.

Hypothesis 3 was tested by regressing training on financial capital raised of post-incubation graduate SMEs in the digital technology sector. As per the results presented in Table 18**,** the coefficient of training was positive, but statistically insignificant, implying that training does not influence the performance of post-incubation graduate SMEs as measured by financial capital raised. Therefore, hypothesis 3 was not supported.

4.8.4 *Hypothesis 4:*

Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.

The results, as outlined in Table 18, indicate that the standardised coefficient of network development is negative but statistically insignificant. This implies that though network development has a negative influence on financial capital raised, the impact is insignificant. Hypothesis 4 was therefore not supported, concluding that network development has no influence on the financial capital raised of post-incubation graduate SMEs in the digital technology sector.

4.9 Summary of the results

The study started with an initial response of 218 observations and utilised 130 observations after excluding incomplete responses or responses that did not meet the criteria of an SME.

The sample revealed that the respondents were highly educated, with 65.4% of respondents holding a minimum of a bachelor's degree. Most businesses, 77.7% of the sample, were established between 2013 and 2018. It is also worth noting that

76.1% of the sample spent less than two years in an incubation programme, with a spread in focus of digital technology.

Before the hypotheses could be tested, validity and reliability analysis of the constructs was conducted. Exploratory factor analysis (EFA) was conducted to extract items that belong to the same factor. To test the internal consistency of the measurement scale, Cronbach's alpha was used. After conducting EFA, a model comprising three factors were extracted. Correlation analysis was thereafter performed to measure the strength and direction of the relationship between the variables comprising of the independent variables of training and network development, and the dependent variables of financial capital raised and turnover growth. All the variables were positively correlated, although financial capital raised was found to have a small correlation with both of the independent variables.

The regression assumptions of multicollinearity, outliers, normality, independence of errors, autocorrelation and linearity were tested before moving onto the regression models.

Based on the first model that was utilised to test the relationship between network development and training as independent variables and financial capital raised as the dependent variable, it was found that the model was a poor fit resulting in the rejection of hypothesis 3 and hypothesis 4.

When the regression model was utilised to test the relationship between network development and training as independent variables and turnover growth as the dependent variable, it was found that the model was a good fit, resulting in the acceptance of hypothesis 1 and hypothesis 2.

The table below represents a summary of the hypotheses tested in this study as well as the results of the hypotheses.

Table 22: Summary of hypotheses

	Hypothesis	Result
H1	Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.	Supported
H2	Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.	Supported
H3	Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.	Not Supported
H4	Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.	Not supported

Based on the above, it can be stated that the services of training and network development has a positive influence on turnover growth of post-incubation graduate SMEs, while there is no evidence to support the influence of training and network development on the SMEs ability to raise financial capital following their graduation from the incubation programme.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

The study investigated the influence of the incubation hub services of network development and training provided through an incubation programme to digital technology SMEs, and the associated post-incubation graduate digital technology SME business performance as a result of these services received. The business performance of the post-incubation graduate digital technology SME was represented by an increase in turnover or financial capital raised. The central aim of the study was to investigate whether the services of network development and training influenced the performance through financial viability of the digital technology SME.

This chapter focuses on a discussion of the results while making use of the literature reviewed and the hypotheses formulated. The demographic profile of respondents is first discussed followed by a discussion of each hypothesis before reaching a conclusion to the chapter.

5.2 Demographic profile of respondents

The respondent demographics were presented in Chapter 4, with this chapter discussing the key findings.

Based on the analysis of the respondents, there was a clear majority of male respondents when compared with female respondents, which is also consistent with other studies performed in South Africa (Masutha & Rogerson, 2014). According to the GEM 2020 report, this is also the case in most countries, as men were traditionally more likely to start businesses compared to women (Bosma et al., 2020). Due to policy promotion in South Africa, which includes the promotion of black women owned enterprises as well as previously marginalised groupings through the BBBEE codes and government incubation programmes, it is expected that this statistic will change to a balanced result in future (Department of Trade and Industry, 2019; Masutha & Rogerson, 2014).

In terms of the respondents' age demographic, 48.5% of respondents were 35 years of age, or under-representing a large youth category. This was followed by 43.1% of respondents between the age of 36 and 45. The age profile of respondents is particularly encouraging, especially in a country that is trying to encourage youth entrepreneurship.

The respondents were also well-educated, with 86.9% of respondents having a minimum of a post-matric qualification. This is also consistent with past studies conducted in South Africa and appears to be part of a growing global trend where more entrepreneurs hold tertiary qualifications (Galawe, 2017; Bosma et al., 2020). The post-matric qualifications as represented by the sample is usually a requirement for the entrepreneurs operating with the digital landscape, due to the technical and complex nature of operations (Westerman, Bonnet, & McAfee, 2014a).

In relation to the SMEs, 76.1% of SMEs participated in an incubation programme for less than two years. Due to the nature of incubation programmes, this is within range which, according to literature, is within six and thirty-six months (Dee, Livesey, Gill, & Minshall, 2011; Cohen & Hochberg, 2014). A majority of respondents within this sample participated through private incubation programmes. This, coupled with the entrepreneur demographics, which indicate that a majority of respondents were black entrepreneurs, is another indication of private sector following the lead set by Government for the development of previously disadvantaged entrepreneurs and SMEs.

It is worth noting that most SMEs are very small businesses, with 81.5% achieving a turnover of less than five million rand, and 56.9% of respondents having less than five employees, which include the owner. This, coupled with 82.6% of respondents operating their businesses for more than two years, and 49.3% for more than five years, is a clear reflection of slow growth rates, as well as other challenges experienced by small businesses, limiting the transition from a very small to a medium enterprise (Rogerson, 2004). The slow growth rates may also be representative of a larger problem relating to transferring of skills to enable effective operation of businesses by entrepreneurs.

As discussed in Chapter 2, digital technology is a broad topic with multiple streams of specialisation. The sample is representative of this diversity, with no stream of specialisation achieving a clear majority. Although most respondents indicated that their main digital technology focus of the SME was analytics, this specialisation only accounted for 15% of respondents, followed by cloud computing, network security, and social media, each accounting for 10 percent. As the evolution into digital technology is relatively young when compared to other established sectors, based on the responses received, there is an indication that entrepreneurs do not only view one stream of specialisation as a potential value enhancing area, which is great for the development of the digital technology sector in South Africa.

5.3 Discussion pertaining to Hypothesis 1

Hypothesis 1: *Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.*

Technical training and business training provided to SMEs participating through incubation programmes are provided with the aim of increasing the SMEs knowledgebase and as a result the performance of these SMEs (Bruneel et al., 2012). To measure the contribution of training toward sustainability of the SME post-graduation, growth in turnover, which is representative of the growth of the SME was used as a performance measure (Wiklund et al., 2009).

Based on the regression results, there is a positive and significant relationship between training received during the incubation programme and the turnover growth of the post-incubation graduate digital technology SME, thereby supporting the hypothesis.

This result was further supported in a study conducted by Colombo and Grilli (2005), where it was found that training sessions contributed to the knowledge base of founders in new technology based firms, resulting in larger growth and performance of the respective firms. More closely aligned to this study was a study conducted by Pena (2004), where it was found that training was directly associated with turnover growth.

Therefore, the findings of this study support current literature in suggesting that training offered by incubation programmes has a positive influence on the post-incubation graduate digital SMEs business performance as measured by turnover growth.

5.4 Discussion pertaining to Hypothesis 2

Hypothesis 2: *Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.*

The results of the study show that network development services received by digital technology SMEs while in the incubation programme has a significant influence on the business performance of the post-incubation graduate SME, as demonstrated by turnover growth. This may be as a result of the nature of network development which has inherent benefits inferred upon the digital technology SME. These would include relationships with key stakeholders within the digital technology SME domain of operation, who can assist with concept validation and construction, business model guidance, and access to technologies that would be usually be affordable to only large companies and have a significant impact on the SMEs performance (Grimaldi & Grandi, 2005).

The results obtained in this study are, however, contrary to the results obtained in a study performed by Pena (2004), where, although it was found that networking opportunities provided during an incubation programme contributed positively to firm mortality, this could not be found to significantly impact turnover growth.

However, consistent with this study, the relationship between network development and firm performance was empirically demonstrated by Zhao and Aram (1995), where it was concluded that the intensity of networking was positively associated with turnover growth. This result was also supported by De Beer (2012), where it was found that networking facilitated by government-funded incubation hubs had a positive influence on turnover of incubated SMEs.

As discussed in Chapter 2, network development is utilised to support the incubatee with the incubatees growth and development (Scillitoe & Chakrabarti, 2010). Based

on the results of this study, for which past studies also reflect similar results, we can conclude that network development services offered by the incubation programmes has a positive influence on the performance of the digital technology SME as reflected by the increase in turnover of the digital technology SME.

5.5 Discussion pertaining to Hypothesis 3

Hypothesis 3: *Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.*

While an aim of this study was to investigate the influence of training provided to the digital technology SME in the incubation programme, and the raising of financial capital post-incubation graduation as a performance measure of the training that was provided, the results of the study show that the hypothesis was not supported, indicating instead that there is a positive but insignificant relationship between training and financial capital raised.

In a study conducted in the United States of America by Lange (2018) discussing the value perceived by incubatees participating through incubation programmes, it was found that raising of financial capital was highly regarded as a key performance measure of the association with an incubation programme. Although the raising of financial capital is highly regarded by the SME, an important observation was made in the literature, which states that it is ultimately the prerogative of the SME to choose when to raise financial capital (Chan & Lau, 2005). In a study conducted by Chan and Lau (2005), it was noted that although training through an incubation programme is deemed to be valuable, some digital SMEs actually prefer utilising their own funds to sustain the entity without approaching debt providers or venture capital firms, as the SMEs perceive the prospect of giving up equity at an early stage to be too expensive.

Based on literature and results from past studies reviewed, access to financial capital and the experience of the SME may be dependent on the specific region in which the SME operates, as well as the practices within the specific regions (Lange, 2018; Olawale & Garwe, 2010). In South Africa, the digital SME may desperately require capital in the form of bank finance or softer loans, but due to the size and stage of the digital SME, it may be very difficult for the digital SME to raise bank finance (Clarysse

& Bruneel, 2007). Contrary to the situation in South Africa, in the United States of America, SMEs who have participated through incubation programmes appear to receive more support from a funding perspective (Cohen et al., 2019).

The difficulty of raising financial capital from funding institutions in South Africa was further highlighted in a study conducted by Olawale and Garwe (2010), where it was found that institutions view SMEs as high risk borrowers, who seldom have means to provide guarantees to secure the funding, thereby limiting their propensity to raise financial capital. In a study conducted by Barbeau (2019) in relation to the influence of business incubators on the post-incubation graduation success of SMEs, it was also found that SMEs who approached large corporates were not able to raise funding, due to the large list of requirements and lengthy turn-around times, which is not conducive to SMEs who face time critical pressures. This is contrary to an objective of incubation programmes, which is to help secure funding for incubatees and is also seen as a performance measure (Aernoudt, 2004; Lose et al., 2016).

In relation to training, in a study conducted by Brink, Cant, and Ligthelm (2003), the author highlighted that there was lack of practical training relating to the problems experienced by South African SMEs, which if addressed, would provide the SMEs with a better chance of raising efficient financial capital. This notion was also highlighted in an empirical study conducted by Barbeau (2019), where it was found that training services were not conducted with the SME in mind, resulting in a misalignment between the training provider and the SME, which may also play a role in the inability to raise financial capital.

While this study expected to show that the post-incubation graduate digital SME would be able to attract financial capital as a performance measure as a result of the training received by the digital technology SME, based on the results of this study, this could not be supported.

5.6 Discussion pertaining to Hypothesis 4

Hypothesis 4: *Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.*

Networking confers benefits to the digital technology SME in that the digital technology SME is no longer dependent on its own relationships, but can attain leverage from the relationships introduced by the incubation programme (Bøllingtoft & Ulhøi, 2005). This is further supported by literature, which notes a relationship between networking and raising of financial capital as part of the objectives of an incubation programme (Lalkaka, 2001; Lose & Tengeh, 2015).

Based on the results of the study, the relationship between network development and financial capital raised was negative and insignificant, which did not support the hypothesis. The results of this study is consistent with a global study conducted by Al-Mubaraki and Busler (2010) into the services valued by SMEs participating through incubation programmes. In the study, it was found that all but a negligible few SMEs participating through incubation programmes valued the networking services offered, and although rated these services very highly, were unable to raise financial capital (Al-Mubaraki & Busler, 2010). These results were further supported in a South African study on the factors that contributed to incubatee success post-graduation, where it was found that the SMEs were provided to access to networks but a majority were unable to raise financial capital (Barbeau, 2019). As discussed earlier in this chapter, the challenge relating to the raising of financial capital may be deep rooted into the culture of organisations within South Africa, where, although SMEs require the financial capital for survival, the SMEs find it the toughest to raise due to the strenuous requirements.

Contrary to the results of this study, in a study performed by Van Rijnsoever et al. (2017), it was found that there was a strong correlation between network development services within an incubation programme and financial capital raised. This was also the case in a study performed by Cohen et al. (2019), where it was not a question of whether SMEs raised financial capital post-graduation, but whether SMEs raised the

largest amount of financial capital due to the association with the type of incubation hub and the associated background of the incubation manager.

It is also worth noting that there appears to be a knock-on effect, as a result of the initial networks created. An example of these effects are SMEs who have raised initial capital through venture capital companies as a result of the network introduced to them by the incubation hub, and thereafter, go on to raise additional capital and attract key personnel due to the relationship promoted by the venture capital company (Snyman, Kennon, Schutte, & Von Leipzig, 2014). However, raising financial capital through venture capital companies is not always easy, as these companies seek larger transactions due to the associated costs of performing due diligence and management of the investment, which may be significant when compared to the amount to be invested (Clarysse & Bruneel, 2007).

Another view is also highlighted in a study conducted by Colombo and Grilli (2005), where the point is underscored that SMEs who have their own capital to invest in the business actually grow better. The argument about some SMEs being too small to raise external financial capital is further highlighted by Colombo and Grilli (2005), due to an inability to provide sureties or other security.

Although this study sought to show the influence that networking services provided to the SME during incubation had on the performance of the SME, as measured by financial capital raised, this hypothesis could not be supported.

5.7 Conclusion

This chapter commenced with a discussion relating to the demographic data of the respondents. It is worth highlighting that the respondents were well educated, with 86.9% holding a minimum of a post-matric qualification, which would be expected for the level of skill required to meaningfully participate in the digital technology sector. The profile of the SMEs was also discussed. Most SMEs were very small businesses generating turnovers of under five million rand, having less than five employees employed by the SME, and participating in the incubation programme for a period of less than two years through a private incubation programme. The SMEs were also

involved in a broad range of digital technology specialisation, with no specific category representing more than 15% of the sample.

The results as discussed in this chapter suggest that the services of training and network development provided through the incubation programme has a positive influence on the business performance of the digital technology SME, as reflected by turnover growth. This result was expected, due to the fact that the training provided to the entrepreneurs was expected to increase their knowledge base, positively influencing the turnover of the business as a result thereof. The results presented in this study are consistent with past literature as discussed above, while contrary results were also presented creating doubt of the existence of a significant relationship between networking and turnover growth (Pena, 2004).

Although it was hypothesised that the services of training and network development would positively influence the performance of the digital technology SME, as reflected by financial capital raised, these hypotheses were not supported.

Based on literature as explored in this chapter, there may be a number of factors that have an influence on financial capital raised by the SME (Clarysse & Bruneel, 2007; Olawale & Garwe, 2010). Although part of the objectives of the incubation programme is to assist the SME in raising financial capital, the environment may not be conducive in doing so, due to the strenuous requirements associated with the fund raising process (Aernoudt, 2004; Olawale & Garwe, 2010). In addition, the willingness of the digital technology SME to raise financial capital is also an important point to be considered especially if the entrepreneur chooses to utilise their own funds for the development of the SME (Colombo & Grilli, 2005). These factors may also include the lack of facilitation of introductions between the SME and relevant external networks that may assist the SME with raising financial capital (Rice, 2002).

Having discussed the findings of the study, the next chapter concludes the study by providing recommendations as well as suggestions for future research.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This chapter provides a summary of the study by discussing the conclusions of the study and referencing these conclusions to the literature review discussed earlier in it. The key findings of the study are discussed followed by recommendations and suggestions for future research.

6.2 Conclusions of the study

As discussed in Chapter 2, the objective of an incubation programme is to nurture incubatees who will graduate from the incubation programme as a successful and financially viable firm (Aernoudt, 2004). As part of creating a financially viable SME, SMEs require financial capital and continuous growth in turnover to sustain their operations as they are growing, which are also regarded as performance measures in this study (Brink et al., 2003).

Although graduation is regarded as a performance measure for the incubation hub manager and incubation hub, there remains uncertainty regarding the services that contribute to the performance of the digital technology SME post-graduation, from the perspective of the digital technology SME (Adlesic & Slavec, 2012). As a result, the main objective of this study was to investigate whether the business performance of post-incubation graduate SMEs was positively influenced by network development and training services as received by digital technology SMEs who participated in an incubation programme. The study was performed to obtain the perspective from the post-incubation graduate digital SME and not that of the incubation hub manager.

While there are many services provided by incubation hubs through their incubation programmes, extant literature cites network development and training as part of the commonly found services offered by incubation programmes, which are deemed to be valuable services for SMEs (Hackett & Dilts, 2004). As part of the benefits of training, digital SMEs are able to expand their knowledge, allowing the digital SME to make better and faster decisions, which is in turn expected to positively impact the

performance of the digital technology SME (Messeghem et al., 2018; Bruneel et al., 2012).

Just as there are benefits associated with providing training services to SMEs, so too are there benefits associated with the services of network development provided to SMEs. Part of the main benefits inferred upon the young digital technology SME attributable to network development is that the digital technology SME gains credibility as a result of having been associated with the incubation programme, and is also afforded preferential access to experts for purposes of obtaining technical and business guidance (Hansen et al., 2000; Rice, 2002).

Based on the results of this empirical study, post-incubation graduate digital technology SMEs who previously participated through incubation programmes found that the services of training and network development resulted in a positive influence on the turnover growth of the respective digital technology SMEs. The relationship between training received by the SME and turnover growth is reasonably expected, as SMEs would gain additional insight into various aspects that ultimately increase the knowledgebase of the entrepreneur. The results of this study in relation to training services offered and turnover growth is also consistent with other studies conducted, which include Colombo and Grilli (2005), and Pena (2004).

It is worth noting that in the same study conducted by Pena (2004), it was found that network development did not significantly impact turnover growth. Contrary to the abovementioned result, and in support of Hypothesis 2, Zhao and Aram (1995) and De Beer (2012) drew conclusions in support of the link between network development and turnover growth.

While there appears to be a strong relationship between the services of training and network development on the digital technology SME performance as measured by turnover growth, the relationship relating to the same services on the digital technology SME performance, as measured by financial capital raised, provided a different result. While it was expected that the services of training and network development would result in a positive influence on post-graduate SME business performance as measured by financial capital raised, the results of this empirical

study could not support these hypotheses. As a result, hypothesis 3 and hypothesis 4 could not be supported.

The result of this study in relation to networking and financial capital raised is consistent with a study performed by Al-Mubaraki and Busler (2010), as well as a South African study performed by Barbeau (2019), where it was found that although SMEs participating through incubation programmes valued the networking services, most SMEs were unable to raise financial capital post-graduation. Although Van Rijnsoever et al. (2017) obtained contrary results to this study, showing a strong correlation between network development and financial capital raised, the question relating to the ease of raising financial capital for the SME market has to be raised and further explored.

In relation to the relationship between training and financial capital raised, a result similar to that discussed above was obtained, where no correlation was found between training and the financial capital raised. In a study performed by Brink et al. (2003), the author raised concern over the lack of practical training provided by the incubation hubs relating to the problems experienced by the SMEs, resulting in a further challenge in raising efficient financial capital.

While raising of financial capital is associated with part of the objectives of incubation in other regions, it appears that the raising of financial capital in South Africa presents more of a challenge, adding to further constraints faced by the digital technology SMEs (Lange, 2018; Cohen et al., 2019; Olawale & Garwe, 2010).

6.3 Recommendations

This study contributes to the literature by highlighting the performance from the perspective of the digital technology SME, who received the services of network development and training, while participating through an incubation programme and had since graduated. In addition to the literary contribution that this study has made, there are various stakeholders, which include incubation hub managers and funders, policy makers, and other ecosystem partners that could benefit from this study.

While this empirical study contributes to the theoretical body of knowledge by focusing on the perspective of the post-graduate digital technology SME in relation to the services of networking and training and the influence on the post-graduate digital technology SME performance, there is a significant managerial impact that should be considered. The result of this study is consistent with other empirical studies performed in South Africa and presents insight into a larger problem that has managerial significance, which is the difficulty of raising financial capital by digital technology SMEs who participated through incubation programmes and have since graduated (Barbeau, 2019). The reduced risk appetite by funders toward South African SMEs would need to be actively considered by the incubation programmes when designing the service offerings within the respective programmes, with the incubation hubs taking a focused approach to introduce services that enhance the image of post-graduate SMEs from a funding perspective and inherently has an impact on reducing the perceived risk associated with funding digital technology SMEs.

Having considered the literature as well as the results obtained from this study, the following recommendations are made:

- As incubation hubs have the objective of developing firms that ultimately leave the incubation programme financially viable (Ahmad & Thornberry, 2018), hub managers should offer services that assist digital technology SMEs with raising financial capital. This is a key point that ought to become part of the key performance areas on which incubation programmes are assessed, as most SMEs fail due to lack of financial capital raised (Galawe, 2017). Further to this, if it is already not being performed within the specific incubation programme, training in relation to financial topics ought to be provided to entrepreneurs so as to increase their knowledge on assessing various forms of financial capital, and on benefits associated with financial capital received, such that they can evaluate the benefit of parting with equity versus obtaining a cash injection.
- To further assist with the ease of raising financial capital for digital technology SMEs, policy makers would need to work with the relevant parties in developing new financial models by means of which to fund these young

entities that usually present a higher risk, and do not have the security to place as collateral for the funds borrowed (Olawale & Garwe, 2010). These may take the form of government backed loans, or a further consideration toward tax-based incentives for donors or funders, and may also include stronger relations with the venture capital community.

- Researchers would need to focus on clearly defining the various forms of incubation hubs, which will then allow practitioners to form different programmes based on the needs of the participants. This will assist these entities in identifying the best incubation hub that meets their requirements.
- While the evaluation of incubation hub managers and the incubation hubs were traditionally performed on the number of SMEs that have graduated (Bergek & Norrman, 2008), sponsors, together with the incubation hubs, would need to agree on key metrics in order to focus on in assessing the contribution of the incubation hub on the SMEs financial viability through an increase in turnover and financial capital raised as a result of the services offered. Sponsors would also need to hold the incubation hubs accountable by tracking the performance of and survival rates of digital technology SMEs post-incubation graduation.
- Incubation hub managers, assisted by corporates, would need to co-operate with each other in identifying network development opportunities between young digital technology start-ups and other stakeholders for purposes of secondary mentorship, and to provide increased credibility to the young digital technology SMEs.

6.4 Limitations of the study

Though this study makes a contribution to literature in relation to incubation programmes, as well as the factors associated with business performance from the perspective of the digital technology SME, the study does contain certain limitations. This study had limitations in achieving all the objectives and future research should take these limitations into account.

- The study utilised various means of distributing the questionnaire to potential respondents which included the distribution of the online questionnaire link through the incubation hub manager, messaging platforms and social media.

The total number of questionnaires issued could not be verified as a result of the channels utilised for distribution. A large number of responses could not be utilised as these were incomplete and may have not been applicable to the potential respondent resulting in a high non-response rate.

- The focus of the study was on the services of training and network development and not open to all services provided by incubation programmes.
- The study did not focus on selection criteria of incubation programmes. In addition, there was no differentiation between a sector specific or a mixed-sector incubation hub.
- Although respondents indicated the type of incubation programme in which they had participated in, there was insufficient date to perform an analysis of the services offered and performance measures by incubator type being a private or non-private incubation hub. In addition, there was also insufficient data to identify whether the SME had participated through an incubation programme for the first time, or on multiple occasions.

6.5 Suggestions for further research

This study examined the services of training and network development provided through an incubation programme and the associated performance of the digital technology SME. Research is recommended in this regard on the services that contribute to successful financial capital raising for digital technology SMEs who participated through incubation programmes in South Africa; the difference in business performance of post-incubation graduate digital technology SMEs who have participated through private and non-private incubation programmes; and both whether and for what reason there may be a need for digital technology SMEs to participate in more than one incubation programme.

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APPENDIX A

Research instrument

INFORMATION SHEET AND CONSENT FORM

My name is Hasheel Govind and I am completing a Masters of Management in Digital Business through Wits Business School.

I am conducting academic research to understand the influence of incubation hub services on post-graduation business performance. The study is targeted toward Digital Technology SMEs in South Africa.

As part of this questionnaire, the term **incubator is broadly used to refer to business accelerators, enterprise centres, innovation centres, hives, ideas labs, managed workspace, venture labs and network incubators and other similar organisations.**

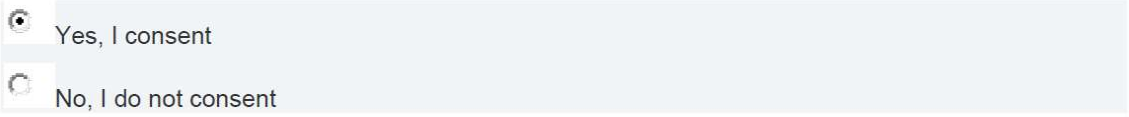
The research is focused on the services of Network Development and Training offered by incubation hubs, although there may be other services offered by the respective organisations.

I would like to request your participation in my research by completing the questionnaire. Your participation is voluntary. The questionnaire will take approximately 7 minutes to complete. Responses will be confidential and interpreted at an aggregate level. I confirm that I will abide by the research ethics and confidentiality as stipulated in the Wits Business School code of ethics.

Wits Business School has approved this research. If you have concerns or questions about the research, you may contact my research supervisor Dr. McEdward Murimbika on Email: mcedward.murimbika@wits.ac.za.

STATEMENT BY PERSON AGREEING TO PARTICIPATE IN THIS STUDY

I hereby agree to participate in this research on the influence of incubation hub services on the post-graduation business performance of Digital Technology SMEs in South Africa. I understand that I am participating based on my own will. I understand that this is a research project that will not benefit me personally but may make a contribution to literature and society. I understand that my participation will remain confidential. I freely and voluntarily choose to participate in this study.



SECTION A – RESPONDENT DEMOGRAPHIC

Q2 What is your gender?

- ○ Male
- ○ Female
- ○ Other

Q3 What is your age?

- ○ 18 to 25
- ○ 26 to 30
- ○ 31 to 35
- ○ 36 to 40
- ○ 41 to 45
- ○ 45+

Q4 What is your ethnicity?

- ○ Black
- ○ White
- ○ Coloured
- ○ Indian / Asian
- ○ Other

Q5 What is your highest qualification?

- ○ Lower than grade 12
- ○ Grade 12
- ○ Post-matric certificate or diploma

- ○ Bachelor’s Degree
- ○ Honours Degree
- ○ Master’s Degree
- ○ Doctorate
- ○ Other

Q6 In which year was your firm established?

- ○ 2019 - 2020
- ○ 2016 - 2018
- ○ 2013 - 2015
- ○ 2010 - 2012
- ○ 2007 - 2009
- ○ 2004 - 2006
- ○ 2001 - 2003
- ○ 2000 and earlier

Q7 How long have you participated in the incubation programme before graduating?

- ○ Less than 1 year
- ○ 1 - 2

- ○ 2 - 3
- ○ 3 - 4
- ○ 4 - 5
- ○ 5 - 6
- ○ 6 - 7
- ○ 7 - 8
- ○ 8+

Q8 How many full-time employees including the owner currently work for the firm?

- ○ Less than 5
- ○ 5 - 10
- ○ 11 - 20
- ○ 21 - 30
- ○ 31 - 40
- ○ 40+

Q9 What is the main digital technology focus of your firm? Please select one option from the list below. If you have multiple technology focus areas, please choose the primary focus area.

- ○ Analytics

- ○ Artificial intelligence
- ○ Big data
- ○ Blockchain
- ○ Cloud computing
- ○ Embedded devices
- ○ Internet of things
- ○ Network security
- ○ Robotics
- ○ Social media
- ○ Virtual reality
- ○ Other _____

Q10 What type of incubator did you participate in?

- ○ Private
- ○ Government
- ○ Non-governmental organisation (NGO)
- ○ Other

Q11 What was your Turnover during the previous financial year? *Turnover is the amount of money generated by the firm as a result of sale of goods or services.*

- ○ R0 - R5m
- ○ R5m - R10m
- ○ R10m - R15m
- ○ R15m - R20m
- ○ R20m - R26m
- ○ R26m+

SECTION B: **Services received from the incubation hub**

TRAINING
Business incubators sometimes provide training to firms located in the incubator either for a fee or free of charge. Training is the transfer of knowledge and can take place in the form or classroom style learning, virtual learning or practical learning that contributes to the incubatee's knowledge and will positively impact their performance.

Q13 Please provide a response in relation to your experience with training at the incubator. On a scale ranging from 'very strongly disagree' to 'very strongly agree', please indicate:

	Very Strongly Disagree	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Very Strongly Agree
My firm received training from the incubator	○	○	○	○	○	○	○
The incubator had specialised internal training facilitators	○	○	○	○	○	○	○
Incubator had access to the right people who assisted me in acquiring skills that I needed	○	○	○	○	○	○	○
I attended all training that was provided	○	○	○	○	○	○	○

Q14 ***NETWORK DEVELOPMENT*** *Network development is the matching of firms located in the incubator with other stakeholders such as potential customers, partners, employees, investors, service providers (accountants, lawyers, human resource specialists), and technology development partners either for a fee or free of charge.*

Q15 Please provide a response in relation to your experience with network development through the incubator. On a scale ranging from 'very strongly disagree' to 'very strongly agree', please indicate:

	Very Strongly Disagree	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Very Strongly Agree
Valuable external contacts were introduced through the business incubator	○	○	○	○	○	○	○
I consulted with service providers introduced by the incubator network when making important decisions	○	○	○	○	○	○	○
Incubator had formal collaboration systems	○	○	○	○	○	○	○
Incubator personnel offered new contacts to my firm	○	○	○	○	○	○	○
I received benefits because I was associated with the incubator brand	○	○	○	○	○	○	○

SECTION C: Performance after graduating from the incubation hub

TURNOVER

Turnover is the amount of money generated by the firm as a result of sale of goods or services.

Q17 Please provide a response in relation to the Turnover of your firm following graduation from an incubation hub. On a scale ranging from 'very strongly disagree' to 'very strongly agree', please indicate:

	Very Strongly Disagree	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Very Strongly Agree
Turnover of my firm has grown after graduating from the incubation hub	○	○	○	○	○	○	○
I believe that the Turnover of my firm is larger than my competitors	○	○	○	○	○	○	○
Growth in my firm's Turnover is important to me	○	○	○	○	○	○	○
As a result of the services offered by the incubation hub, I expect my firm's Turnover to grow	○	○	○	○	○	○	○

FINANCIAL CAPITAL RAISED

Financial capital refers to facilities or investments by third parties into the firm, which will assist the growth of the firm. Access to financial capital includes investments by investors, debt raised or a mixture of debt and equity which is required for the next stage growth of the firm.

Q19 Please provide a response in relation to the financial capital raised by your firm following graduation from an incubation hub. On a scale ranging from 'very strongly disagree' to 'very strongly agree', please indicate:

	Very Strongly Disagree	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Very Strongly Agree
I have received financial capital since graduating (grants, loans, equity investments etc.)	○	○	○	○	○	○	○
Investors and debt providers are ready to invest if my firm meets short term profitability or technology milestones	○	○	○	○	○	○	○
I have applied for funding but never received from any of the institutions.	○	○	○	○	○	○	○
I do not have enough cash for day to day operations and providing services	○	○	○	○	○	○	○

APPENDIX B

Consistency Matrix

Sub-Aims/Objectives	Literature Review	Hypotheses /Propositions	Research questions	Variables(In dependent & Dependent)	Source of data	Type of data
To investigate the **influence** of **training** services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by **turnover** growth	Mian (1996) Bruneel et al. (2012) Wiklund, Patzelt, and Shepherd (2009) Smilor (1987)	*H1:* Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.	To what extent does training services offered by the incubation programme influence post-incubation digital technology SME business performance as measured by turnover growth?	IV1= Training Services DV1= Business Performance (Turnover)	Questionnaire (Q9-Q12)	Ordinal Data (7 Likert Scale)

Sub-Aims/Objectives	Literature Review	Hypotheses /Propositions	Research questions	Variables (Independent & Dependent)	Source of data	Type of data
To investigate the **influence** of **network development** services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by **turnover**.	Rice, (2002) Scillitoe & Chakrabarti (2010) Wiklund, Patzelt, and Shepherd (2009) Smilor (1987)	H2: *Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on turnover growth.*	To what extent does network development services offered by the incubation programme influence post-incubation graduate digital technology SME business performance as measured by turnover growth?	IV2= Network Development DV2= Business Performance (Turnover)	Questionnaire (Q13-Q17)	Ordinal Data (7 Likert Scale)

Sub-Aims/Objectives	Literature Review	Hypotheses /Propositions	Research questions	Variables (Independent & Dependent)	Source of data	Type of data
To investigate the **influence** of **training** services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by **financial capital** raised.	Mian (1996) Bruneel et al. (2012) Wiklund, Patzelt, and Shepherd (2009)	H3: *Training services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.*	To what extent does training services offered by the incubation programme influence post-incubation graduate digital technology SME business performance as measured by financial capital raised?	IV3= Training Services DV3= Business Performance (Financial Capital Raised)	Questionnaire (Q18-Q20)	Ordinal Data (7 Likert Scale)

Sub-Aims/Objectives	Literature Review	Hypotheses /Propositions	Research questions	Variables (Independent & Dependent)	Source of data	Type of data
To investigate the **influence** of **network development** services offered by the incubation programme on the business performance of the post-incubation graduate digital technology SME as measured by **financial capital** raised.	Rice, (2002) Scillitoe & Chakrabarti (2010) Wiklund, Patzelt, and Shepherd (2009)	H4: *Network development services offered to digital technology SMEs in incubation programmes in South Africa have a positive influence on financial capital raised.*	To what extent does network development services offered by the incubation programme influence post-incubation graduate digital technology SME business performance as measured by financial capital raised?	IV4= Network Development DV4= Business Performance (Financial Capital Raised)	Questionnaire (Q21-Q24)	Ordinal Data (7 Likert Scale)