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Evaluability assessment of the Gauteng science park incubation programme

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Thesis presented in partial fulfilment for the degree of Master of Management (in the field of Public Sector Monitoring and Evaluation) to the Faculty of Commerce, Law, and Management, University of the Witwatersrand

March 2016

DECLARATION

I declare that this thesis/dissertation titled 'Evaluability assessment of the Gauteng science park incubation programme' is my own, unaided work. I have acknowledged and referenced all sources that I have used and quoted. I hereby submit it in partial fulfilment of the requirements of the degree of Master of Management (Public sector monitoring and evaluation) in the University of the Witwatersrand, Johannesburg. I have not submitted this report before for any other degree or examination to any other institution.

Kutala Pangwa

Johannesburg, March 2016

ABSTRACT

Generally, we can trace the Science Park idea to the 1950s when Silicon Valley, with the support of Stanford University, transformed an agricultural valley into a semiconductor industry. Science parks offer infrastructure and incubation support to entrepreneurs for the development of new technology based companies (Lindelöf & Löfsten, 2002; Durão et al., 2005). Specifically, The Innovation Hub project in Gauteng province is an economic development intervention, modelled on the science park idea with the aim of promoting socioeconomic development and competitiveness of the province through innovation. The Innovation Hub project delivers its services through the incubation programme whose purpose is to provide a catalytic incubator that facilitates commercialisation of research and technology ideas into new business ventures. Similar to any other development intervention, it is important to determine whether the Gauteng science park incubation programme is delivering on its objectives of creating jobs and promoting small and medium enterprises, as mandated by the Gauteng government. This study examines the evaluability of the incubation programme based on the theory of change and results chain framework to determine if the programme can achieve its desired outcomes and if the programme has adequate information to enable a credible and meaningful evaluation of the programme. A qualitative study is undertaken to clarify a theory of change for the incubation programme based on the understanding of the programme stakeholders from the Department of Economic Development and the Gauteng Growth and Development Agency as well as the perspectives of The Innovation Hub Management Company's internal managements. The study reveals that results-based management is not used within the incubation programme. The study tests if the theory of change of the programme is plausible, do-able and testable and we find that these conditions are currently not in place. The evaluability assessment recommends that the incubation programme improve by adapting results based management planning techniques to redesign as well as determine performance information for the programme. Programme implementation should improve with emphasis on providing a capacitated management team for the entrepreneurs and improving the services rendered in the programme.

Author: Kutala Pangwa

Thesis title: Evaluability assessment of the Gauteng science park incubation programme

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1 INTRODUCTION TO THE RESEARCH

1.1 Background

The study commences with an introduction to terms that we use in conceptualising the research before getting to the research problem statement (Section 1.2.1) and consequently, the purpose of this research (Section 0) as well as the research questions (Section 0). Section 1.1 introduces the research context generally and broadly, Section 2.1 has a related but more specific and detailed discussion on the research context. Section 1.2 briefly introduces the programme under study as well as accompanying key terms and concepts of focus. Similarly, Section 2.2 discusses the programme under study in detail.

1.1.1 Gauteng and characteristics of its economy

Gauteng Province is the smallest but most populated province in South Africa with a population of 12.3 million people as at the end of 2011 (StatSA, 2015). The name Gauteng means place of gold. Gauteng is recorded as the economic hub of South Africa with leading performance in the formal sector including finance, community and social services, as well as trade industries (Quarterly Labour Workforce Survey trends, 2015). According to the 'Gauteng Employment Growth and Development Strategy' (GEGDS), (2009-2014) Gauteng province developed because of the large mining resources that are found in the province. The population growth was also originally due to miners that came to work in the mines. StatsSA (2015) reports that employment growth in Gauteng steadily increased between 2008 and 2014, whilst the unemployment rate has also been on the rise. Employment in Gauteng is mostly in the formal sector. Gauteng is also regarded as the province with the most innovative activity within South Africa, with established clusters in high tech manufacturing, information technology and electrical machinery and instruments sectors, (Rogerson, 2001; Lorentzen, 2008).

Additionally, Gauteng province qualifies as a "smart region" as most of its economic activities are in knowledge-based sectors. According to Rogerson (2001), the spatial clustering of related companies and industries driven by knowledge based industries produces the smart-region phenomenon. Furthermore, Gauteng is the first province in South Africa to have an internationally accredited science park to support innovation and technology commercialisation.

1.1.2 Science Parks and Economic Growth

The science park concept can be traced back to the "1950s when Silicon Valley, with the support of Stanford University, transformed from an agricultural valley into the birthplace of the semiconductor industry" (Chan, Oerlemans, & Pretorius, 2010, p. 207).

Durão, Sarmento, Varela and Maltez (2005) define science parks as areas where innovators and entrepreneurs are provided with the best possible environment to further the development of their innovative technologies. The role of a science park is to offer infrastructure and incubation support to ensure that technology companies are able to grow and form new start-ups (Durão et al., 2005; Lindelöf & Löfsten, 2002). A science park differs from an industrial park in that it has strong operational linkages to research and higher education institutions to support the knowledge and technology transfer between these entities. A science park also has a strong management team that is able to offer management competencies, create networks and identify opportunities for tenants in the park. Science parks' activities are sustained by the real estate business of the park. Consequently, modern and state-of the art infrastructure attracts more tenants, thus generating increased revenues to support the operations of the park (Durão et al., 2005).

According to Chan and Lau (2005), science parks contribute to regional economic growth as they cluster similar companies in similar industries in close proximity, thus creating room for the spill over effect which contributes to the growth of small to medium enterprises (SMEs). Furthermore, science park systems are oriented towards addressing economic development challenges through improving the entrepreneurial base and are important regional economic growth tools as they stimulate the growth of new economic sectors through innovation, thus leading to a positive effect on employment within regions (Bigliardi, Dormio, Nosella, & Petroni, 2006; Chan & Lau, 2005).

According to Gupta, Guha and Krishnaswami (2013) and Ghazali and Yunos (2002), the SME is important in the economy as it contributes to growth in employment opportunities, export base and fosters entrepreneurship. Due to recurrent economic reforms, there is constant pressure for SMEs to perform well, deliver quality and keep operational costs low. Curan and Blackburn (1994) in Gupta et al., (2013) add that for SMEs to survive they need to create, apply and introduce innovation. Institutional arrangements as well as financial resources are believed to be the two barriers to SME growth.

1.1.3 The Innovation Hub Management Company

The Innovation Hub project finds its resonance in the Spatial Development Initiatives (SDI), operationalised in 1996 as a support pillar to the Growth Employment and Redistribution Strategy (Rogerson, 2004). The SDI was implemented to increase economic growth as well as job creation in Gauteng. The SDI was replaced by a provincial infrastructure fund in 2000, which would be used to move the province into the information age and decrease its dependence on heavy industry (Rogerson, 2004). The fund was launched as the "Gauteng's Strategic Economic Infrastructure Investment Programme" (SEIIP) which aimed to optimise Gauteng "as a smart hub of Africa by promoting strategic investment in the areas of technology, high-value added manufacturing, transport and tourism" (Rogerson, 2004, p. 77). The programme identified ten mega infrastructure projects that would lay the foundation in changing the direction of Gauteng's economy. The Innovation Hub was one of the ten mega projects. The identified goal of The Innovation Hub was to enhance Gauteng's position as a smart province and maintain the province's technological edge over the Western Cape.

Consequently, The Innovation Hub Management Company (TIHMC) was established in 2001 as the vehicle to deliver on the Innovation Hub project. The Innovation Hub project is modelled on the original science park concept and is Southern Africa's first internationally accredited Science and Technology Park and full member of the International Association of Science Parks, (TIHMC Strategic Plan, 2014-2019, p. 4). The Innovation Hub is developed on 60 000 hectares' precinct located on the "knowledge axis" between the "Council for Scientific and Industrial Research" (CSIR) and the "University of Pretoria" (see Appendix 1 for overview of the precinct). TIHMC is a subsidiary of the Gauteng Growth and Development Agency (GGDA), formerly known as the BlueIQ initiative of the Gauteng Province (TIHMC Annual Performance Plan, 2014-2015). TIHMC is funded by a grant from the "Gauteng Department of Economic Development" through the GGDA (see Appendix 2 for funding disbursements).

The mission of TIHMC, as defined in the 2015-2019 Strategic Plan, is "to promote socioeconomic development and competitiveness of Gauteng in targeted sectors through innovation by; 1) creating new business opportunities and adding value to mature companies in technology and knowledge-based sectors; 2) fostering entrepreneurship and incubating new innovative companies; 3) sourcing and implementing relevant innovations to support radical economic transformation and modernisation of the economy; 4) providing attractive spaces for emerging knowledge companies; 5) ensuring human capacity development of critical skills matching industry needs in priority sectors; and 6) enhancing the synergy between industry,

government and academic and research institutions" (TIHMC Strategic Plan, 2015-2019, p. 23).

1.2 Is the Gauteng Science Park ready for a meaningful evaluation?

1.2.1 The research problem statement

The "Gauteng Employment Growth and Development Strategy" (GEGDS, 2009-2014), identified innovation as one of the key drivers for employment and economic growth in Gauteng. Since 2001, The Innovation Hub has been the lead entity tasked with implementing innovation programmes that provide support to technology based start-up companies within Gauteng. The South African government introduced the Government Wide Monitoring and Evaluation System in 2007, to legitimise results-based management as part of governance within the country. At the time, the science park incubation programme had been in existence for almost eight years but results based management techniques were only introduced to the programme in 2011 with the introduction of the monitoring and evaluation function at The Innovation Hub Management Company (TIHMC).

Through the years, data related to the performance of the Gauteng science park incubation programme has been collected. However, an evaluation of the programme to determine whether it is able to contribute towards the desired outcomes of producing technology-based businesses that contribute to economic growth and the creation of knowledge-based sectors, has not been conducted. It is not known whether an evaluation of the science park incubation programme, as it is currently operating, would provide meaningful and credible information to inform decisions regarding the programme (Leviton, 2010). According to Wholey, Hatry, and Newcomer (2010), any intervention or programme can be evaluated. However, for an evaluation to be meaningful and useful, certain minimum preconditions have to be met by the programme. Wholey (1994, 2004), in Ostie-racine and Dagenais (2013), details these minimum conditions to include, 1) a clear logic model for the intervention aligned to the programme goals, 2) a plausible programme with conceivable goals, 3) availability and access to relevant data to inform the evaluation and 4) clarity amongst stakeholders on intended use of the information from the evaluation. This research, therefore, aims to determine if the minimum conditions are met for the science park incubation programme by understanding and clarifying the theory of change of the programme, testing the plausibility of the results chain, and making recommendations for programme

improvement using the evaluability assessment technique, and recommending any improvements that may lead to the minimum conditions being met.

1.2.2 The research purpose statement

The purpose of this study is conduct an evaluability assessment that will clarify and test the theory of change of the Gauteng science park incubation programme. Additionally, the study will determine how the theory of change is implemented and monitored for achievement of results. The study will use procedures proposed by Wholey, (2010) and Thurston and Potvin (2003), and employ multiple techniques relevant to an evaluability assessment (Bibeau, Nguyen, Sanou, & Kouyate, 2011). First, we identify stakeholders to understand the goals and objectives of the incubation programme. This is supported by a literature review to understand and propose a theory of change for the science park incubation programme. Second, we construct a results chain showing the link between inputs, activities, outputs, outcomes, and impacts. Third, we explore intervention reality and compare the developed logic chain to the current intervention reality. Fourth, we identify possible areas of improvement in programme design and implementation. Fifth, we explore evaluation designs that may be useful for the Gauteng science park incubation programme.

1.3 The research questions

An evaluability assessment is pre-evaluation research that serves to determine if a programme or intervention is ready for a useful and meaningful outcomes evaluation (Wholey et al., 2010; Bibeau et al., 2011). Literature proposes a number of stages in conducting an evaluability assessment and all these stages answer specific questions about the programme (Russ-eft, 1986; Thurston & Potvin, 2003; Wholey et al., 2010). It is in this light that the number of questions for this research report is not within the set maximum of three questions as the assessment will be incomplete if some of the questions are ignored. The evaluability assessment proposed in this study therefore aims to respond to the following questions:

1. What is the Gauteng science park intervention intended to do?
2. How is the programme currently operating?
3. Are the Gauteng science park objectives plausible, given the way the programme is currently operating?
4. What are the possible measures of programme performance?
5. Is the programme ready for an evaluation? What evaluation options are appropriate for the programme?

1.4 Delimitations of the research

The study focuses on the Gauteng science park business incubation programme and excludes the technical incubation programmes of the science park. The Innovation Hub has two additional pre-incubation programmes, namely, the Climate Innovation Centre and the BioPark. These incubation programmes have been in existence for two years and will not be part of this study as we aim to study Maxum incubation programme which has been in existence for over 8 years and has accumulated data over the years. The desired outcomes of the science park, which are graduated companies able to create jobs, are also realised from the Maxum programme and not the other technical incubators that act as a pipeline into Maxum.

The study is limited to the current Maxum participants, excluding other tenants of the Science Park precinct as a whole, as not all tenants of the park are from the incubation programme and may not be valuable to the study.

The study aims to provide a useful evaluability assessment that will serve as a foundation for programme improvement and future programme evaluations, however, focus on how the stakeholders will use information from a future evaluation will be minimal. The Gauteng Department of Economic Department (GDED), the Gauteng Growth and Development Agency as well as The Innovation Hub Management Company have not formally adopted the use of evaluations in programme management. Therefore, the utilisation of future Maxum evaluations cannot be determined until evaluations are formally institutionalised within these entities.

1.5 Justification of the research

In light of the Government Wide Monitoring and Evaluation System that is part of South African governance, it is important to have programmes that contribute towards the specified government outcomes. This results-based monitoring and evaluation system requires that all interventions have clear programme logics and have performance measures that are supported by verifiable data. This assists government with information for decision-making and increases accountability of programmes. The evaluability assessment is a formative evaluation that ensures that programmes are designed and implemented to achieve the desired goals and that there are appropriate data collected to measure the performance of the programme (Bibeau et al., 2010; Ostie-racine & Dagenais, 2013; Russ-eft, 1986; Wholey et al., 2010).

Rossi, Lipsey, and Freeman (2004) clarify that conducting a process or impact evaluation without the credible articulation of the programme theory leads to ambiguity in

interpreting evaluation results. First, the ambiguity is because the programme process is not well defined and therefore it is not clear what the programme is expected to be doing. Second, if the programme impact theory is not well defined, an impact evaluation will define the outcomes achieved, however, it will not be possible to explain what went right or wrong in achieving the outcomes and which variables of the intervention led to the outcomes being achieved or not. This type of evaluation is referred to as a black box evaluation as the assessment of outcomes is done without enough information on what is causing the outcomes achieved (Rossi et al., 2004).

This research is important because it aims to minimise the conditions that lead to black box evaluation, and aims to ensure that future evaluations of the Gauteng science park incubation programme are meaningful and useful and can be attributed to the programme.

1.6 Preface to the research report

To this end, the report has six chapters. Following this introductory chapter, Chapter 2 provides a literature review covering the intervention, the past studies of evaluations on science parks and incubation programmes and cases that present the use of evaluability assessments, the explanatory and theoretical frameworks as well as the conceptual framework that is used in the study. Chapter 3 discusses the research strategy, design, procedures, reliability and validity measures as well as limitations. Chapter 4 and Chapter 5 present and discuss the findings, respectively, while Chapter 6 summarises and concludes the research.

2 LITERATURE REVIEW

This chapter has three broad objectives; namely to understand the research context. (Sections 2.1, 2.2 and 2.3), to develop a theoretical framework for interpreting the findings (Sections 0, 2.5, and 2.6), and to conceptualise the research approach (Section 2.7). Specifically, in Sections 2.1, the study briefly describes the research context in preparation for Section 2.2 in which we detail the research intervention. In Section 2.3, literature on studies that have attempted to evaluate science parks and some cases of evaluability assessments are reviewed. With this knowledge, we situate our research within monitoring and evaluation studies, and discuss its key component and attributes in Sections 0 and 2.5. Having identified the theory of change as the most relevant explanatory framework for this research, we discuss this theory with additional supporting theories as well as the results chain in Section 2.6. The last Section 2.7 provides a road map of how this research intends to assess the programme logic of the Gauteng science park incubation programme and to conduct an evaluability assessment to determine if the intervention is ready for a meaningful outcomes evaluation.

2.1 An introduction to Gauteng Province "smart city region"

Covering 18178 km^2, that is, 1.4 per cent of South Africa, Gauteng is the smallest province in the country. It is made up of 12 local municipalities, including three metropolitans (Ekurhuleni, Johannesburg, and Tshwane) and three districts (Sedibeng and Metsweding and the West Rand). Figure 1 illustrates a map of the Gauteng province.



Figure 1: Map of Gauteng province (adapted from Google)

As at 2011, the Gauteng population was estimated at 12.3 million people making up 23.7 per cent of the South African population. The Organisation for Economic Co-operation and Developments' (OECD) Gauteng Territorial Review (2011) reports that the racial mix in the province is made up of 75.2 per cent black Africans, 18.4 per cent whites, 3.7 per cent coloured and 2.7 per cent of Indians and/or Asians.

The OECD Territorial review (2011) reports that the number of adults with formal education in Gauteng has increased over the years. In 2008, over 30 per cent of the Gauteng population was reported as being illiterate with over 50 per cent of this figure made up of Black Africans, with the Metsweding district having the highest levels of illiteracy. The GEGDS (2009-2014) showed that the levels of education in Gauteng differed across different parts of the province. Figure 2 depicts these discrepancies.

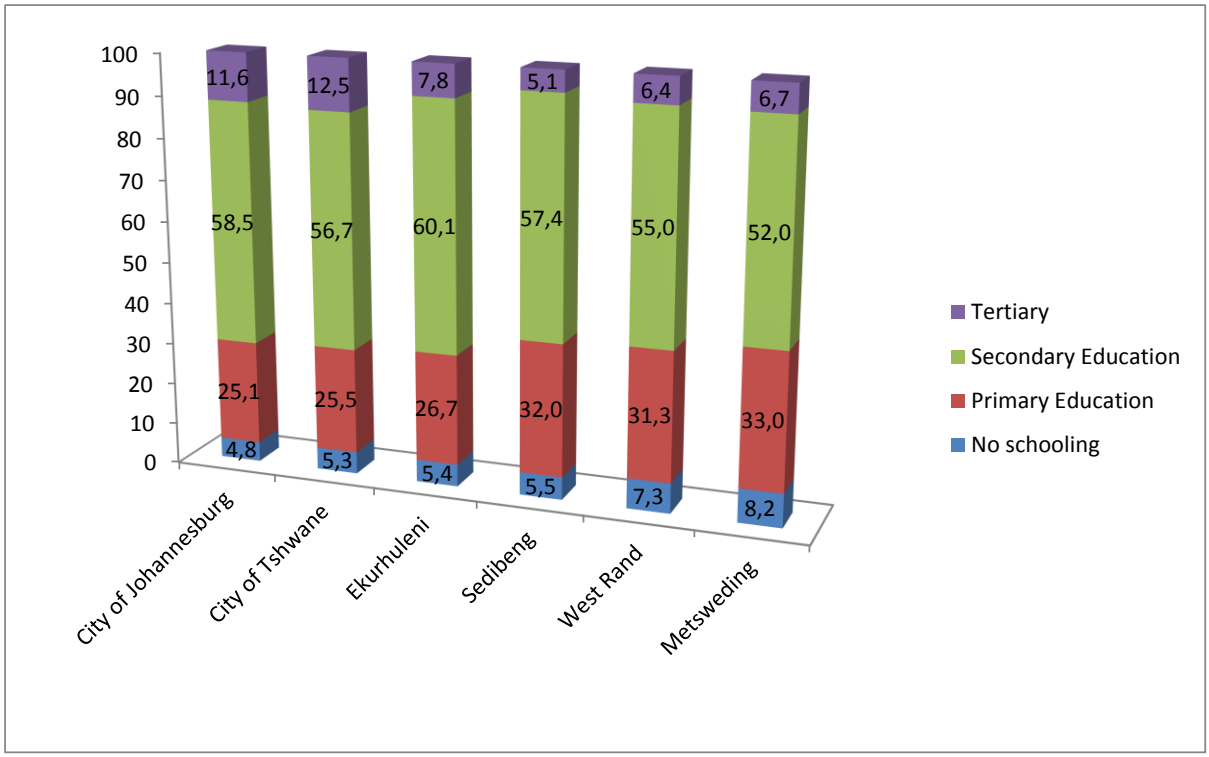

Figure 2: Education Levels for the six Gauteng Districts (adapted from the GEGDS 2009-2014)

The difference in education levels amongst people of Gauteng can be attributed to the rural/urban divide within districts, with more educated people being drawn to urban areas. Another factor is the dense concentration in some areas over others. The field of Science, Engineering and Technology studies is also the most popular in Gauteng public universities. The "Statistics on Post-School Education and Training in South Africa" report (2013) shows that approximately 15 493 undergraduates qualified in this sector in that year.

OECD and Local Government report Gauteng as South Africa's economic hub, contributing to over 38 per cent of the country's Gross Domestic Product (GDP), thus also

qualifying as South Africa's wealthiest province. The province was reported to have a growth rate of 2.7 per cent annually, which is higher than the OECD metro regions (0.9 per cent). The OECD Territorial review (2011) reports that Gauteng was leading the nation in expenditure on R&D with 52.2 per cent of the national R&D expenditure realised from Gauteng based businesses.

Lorentzen (2008) describes Gauteng as the region where most innovative activity occurs in South Africa. In his study, Lorentzen (2008, p. 6) concludes that Gauteng has four areas of specialisation in economic activity including "high-tech manufacturing with non-metal mineral products, metals and metal products and furniture, electrical machinery, and instruments". Rogerson (2001) concurs with these findings and describes Gauteng as a smart region due to its great clustering of knowledge-based manufacturing and service activities, which are suggestive of an innovative environment. Knowledge-based activities are defined by the company's use of high technology processes and technologies. In South Africa, knowledge-based activities include "information technology services, high technology manufacturing, as well as research and development" (Rogerson, 2001, p. 34).

According to Rogerson (2001), Gauteng region had 73 per cent employment of the national total, at the time, in high technology manufacturing. The four major sectors in Gauteng's high-tech manufacturing included electrical industrial machinery, radio, television and communication equipment and pharmaceuticals, as well as other machinery. The study also revealed that Information technology services are in the majority, with 78 per cent of South African employment in IT services clustered in Gauteng.

We conclude that because Gauteng is a region with the most innovative activity and the highest population growth, it is important that there is an intervention that can exploit these qualities, for the benefit of the province. The science park intervention becomes an ideal intervention in this regard, as technology-based businesses can be clustered to create spin-offs that can improve the economy of Gauteng.

2.2 The science park incubation programmes

2.2.1 History of Business incubators

Etzkowitz (2002) discerned that incubators arose from the need to systematise the evolution from invention to commercialisation of novel technologies. The source of the inventions included inventors that aim to develop their ideas, corporations that aim to commercialise R&D, spin-off technologies, not linked to their core business as well as universities with the intention of contributing to regional economic development. Etzkowitz

(2002) explained that incubators can be traced back to Thomas Alva Edison's invention factory founded in the 19th century. The invention factory aimed to systematise the invention and commercialisation of technologies. The factory created new successful ventures in film and sound recording but did not so well to produce companies that process iron ore. The factory brought in experts to develop and patent a number of technologies and develop spin-off companies to take these to market.

The second stage of the incubator concept development was characterised by the development of the venture capital firm. Etzkowitz (2002) details that venture capital firms originated in New England during the 1930s and 1940s. After attempts on a number of regional development models, the New England Council accepted the proposal by Massachusetts Institute of Technology's (MIT) President Karl Compton to rather build upon the region's research strengths and establish an entity that would assist the formation of firms from the academic institutions. This second phase differed from the invention factory in that the focus was on attracting technologies from a wide variety of persons as opposed to focusing on the technical and business vision of an individual.

The third wave in the development of the incubator concept, as explained by Etzkowitz (2002), was the broadening of the corporate R&D lab. Some projects that had potential but were not aligned to the core competencies of the business were removed from the lab and taken to undercover sites, referred to as "skunkworks". The champions of the R&D would be given space to develop the technology to its full potential whilst still in the employment of the corporate. Such projects were discontinued when funding became a constraint. This type of incubation is referred to as corporate incubation, is episodic, and reappears when corporate entities require additional revenue from their R&D.

According to Etzkowitz (2002), private incubators have recently emerged and are most often established by entrepreneur or a group of entrepreneurs. The private incubator provides capital as well as business assistance services and at times, even offers the business concept. Peters, Rice and Sundararajan (2004) explain that private incubators can take equity to as much as 70 per cent in the new venture. The private incubator emphasises synergies amongst resident firms.

The last wave of incubator development is the university business incubator. Etzkowitz (2002) explains that university business incubators were established to systematise the creation of the venture capital firm. Firm-formation from university dates back to the 17th century from pharmaceutical research at German universities and in the late 19th century from chemical research. Firm-formation in scientific instrumentation occurred in the late 19th

century in the United States around Harvard and MIT. The formation of electronics and radio firms occurred in the 1920s and 1930s at MIT and Stanford and this forms the basis of regional clusters.

Peters et al. (2004) have distinguished between three types of incubators, non-profits, for-profit and university linked incubators. Non-profit incubators are usually linked with a development agency and focus on diversifying the local economy. Incubators linked to universities provide a mechanism to systematise the process of firm-formation and also serve to diversify the economy. For-profit incubators are private incubators. This typology is most commonly used to refer to business incubator models. Smilor (1987), in Peters et al., (2004), suggests that most often incubators serve technology firms and aim to link talent, technology, funding and expertise to accelerate commercialisation of technology.

2.2.2 Characteristics of business incubators

Hackett and Dilts (2004) posit that incubators are rooted in the literature on market failure debates. Market failure occurs when the competitive space for the sale of goods fails to produce desired results. Furthermore, Grimaldi and Grandi (2005) explain that incubators are used as a tool to prevent failure of start-up companies by providing supporting services. According to Lindelöf and Löfsten (2002) and Peters et al. (2004) in Bergek and Norrman (2008), incubators can be either public or private organisations that provide resources to enhance the founding of small businesses and provide support environments for start-up companies.

Grimaldi and Grandi (2005) posit that many local economic development agencies and other public agencies have adopted the use of incubators to prevent potential market failures of start-up companies. Incubators funded by governments aim to reduce the cost of doing business by providing a range of services to support start-up companies. The primary source of profit for a public incubator is the fees paid by entrepreneurs and public funding (Grimaldi & Grandi, 2005). According to the International National Business Incubation Association (INBIA), the average cycle times for an entrepreneur in the incubation programme are two and three years. Lindelöf and Löfsten (2002, p. 862) list the key elements of incubators as: (i) services provided; (ii) financing; (iii) goals and structure; (iv) resources and support to new firms, and (v) creation of an entrepreneurial milieu". Bergek and Norrman (2008, p. 21) identify four common characteristics of incubators including; "1) shared office space; 2) shared support service; 3) professional business support and 4) networks provision".

Thompson and Downing (2007) highlight enabling roles that can be offered in an incubator. These include talent spotting, counselling, advising, training, performance coaching,

mentoring and personal (life coaching). Talent spotting is about identifying people with entrepreneurial potential. Counselling is helping people identify their true potential. Advising is more directive and assists people to identify opportunities and how to obtain them. Training is about imparting knowledge. Performance coaching is also directive and involves working with a person to improve performance. Mentoring is a non-directive approach to working with a person to improve performance. St-jean and Audet (2012) define mentoring as a support relationship between a learner entrepreneur and an experienced entrepreneur. The role of mentorship is to assist mentees in their personal development. According to the study conducted by these authors, the mentor-mentee relationships works best when the mentor takes a maieutic approach. Maieutic mentors allow the entrepreneurs to discover a solution on their own through asking intelligent questions instead of offering a solution (directive style). This approach is recommended as it allows the entrepreneur autonomy in decision-making (St-jean & Audet, 2012). The outcomes of a mentoring relationship include increased self-confidence, increased entrepreneurial self-efficacy and development of leadership skills. Business outcomes are an indirect result of the relationship as the mentor only intervenes with the entrepreneur (St-jean & Audet, 2012). Lastly, life coaching concerns working with a person in a business to help them improve personal performance.

The International Business Incubation Association (INBIA) developed an assessment tool used to determine whether an incubation programme is aligned to industry best practice. Table 1 shows some of the categories that are considered in this tool.

Table 1: Industry best practise criteria for business incubators (adapted from INBIA)

Area	Description of criteria
Governance	Determines whether an incubator has a clear mission statement that is known, and supported by stakeholders. Also looks at the representation in terms of skills base of the incubator board members.
Staffing	Aims to understand whether the incubator staff has the right skills and access to appropriate skills to meet client needs.
Incubator Finances	Aims to determine whether the incubator is financed properly and adequately, and has plans and manages its financial resources appropriately.
Selecting clients	Aims to understand whether the incubator has an effective application and screening criteria whereby clients will be able to fit in the programme and comply with the programme's requirements for providing impact data to the incubator on an on-going basis.
Serving Clients	Aims to understand if the programme offers comprehensive services that assist the companies with raising finance, capacity, networking opportunities as well as regular monitoring to determine progress of companies.
Graduation Policies	Aims to assess whether the incubator has clear graduation policies in place with established criteria The focus is also on monitoring and effective management and communication of progress to clients.
Marketing and Press Relations	Aims to assess whether there is an effective platform and plan to reach out to stakeholders and also to promote the activities of clients.
Facilities Management	Aims to determine whether the incubator offers appropriate space to support the clients, as well as, suitable communication infrastructure and equipment.
Measuring economic impact	Aims to assess whether the incubator measures impact data on an annual basis to support its mission. The data includes revenue and employment data from current clients and graduates for a period of at least five years.
Environmental impact	Amis to assess whether the incubator has energy efficient practices and takes advantage of sustainable green economy practices.

The table above illustrates that there are strategic and operational foundations that are required for an incubator to meet best practice standards. It is also worth mentioning that the criteria described in the table may not be applicable to all incubators as they differ depending on the legal form of the incubator. Ndabeni (2008) identified a number of factors that contribute to the success of business incubators as in Figure 3 .

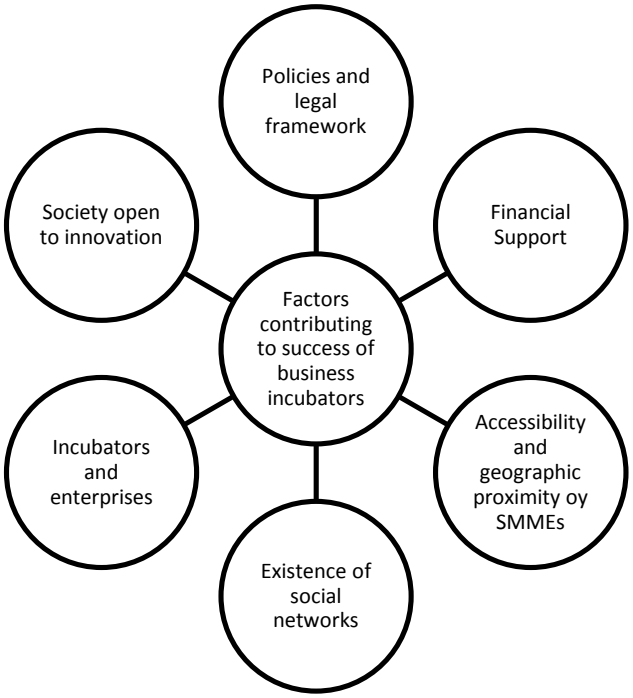

Figure 3: Factors contributing to the success of business incubators (adapted from Ndabeni, 2008)

Figure 3 illustrates that there are a number of critical elements at play in making sure that business incubators make the desired impacts to entrepreneurs and the economy.

2.2.3 The Gauteng Science park incubation programme

The Innovation Hub Management Company (TIHMC) annual report (2001-2002) discloses that Maxum incubation was established in 2001. It is the first programme within the science park that was established whilst the park was in the pilot phase. Maxum is part of the enterprise and skills development unit of TIHMC whose vision is "To be the leading entrepreneurship and innovation ecosystem development institution in the world" (Enterprise and Skills Development Strategy (ESD), 2014-2019, p. iv). This document also states that the mission of the programme is as follows; "We will achieve our vision through goal driven creative excellence and a system of innovation that focuses on enterprise and skills development through collaborative partnerships with government, academia and the private sector rooted in the performance and people values of TIH for the delivery of socio-economic

growth in Gauteng and South Africa embracing our strategic themes of innovation4development" (ESD Strategy, 2014-2019, p. vi). The operations of the Maxum incubation programme are illustrated in Figure 4.

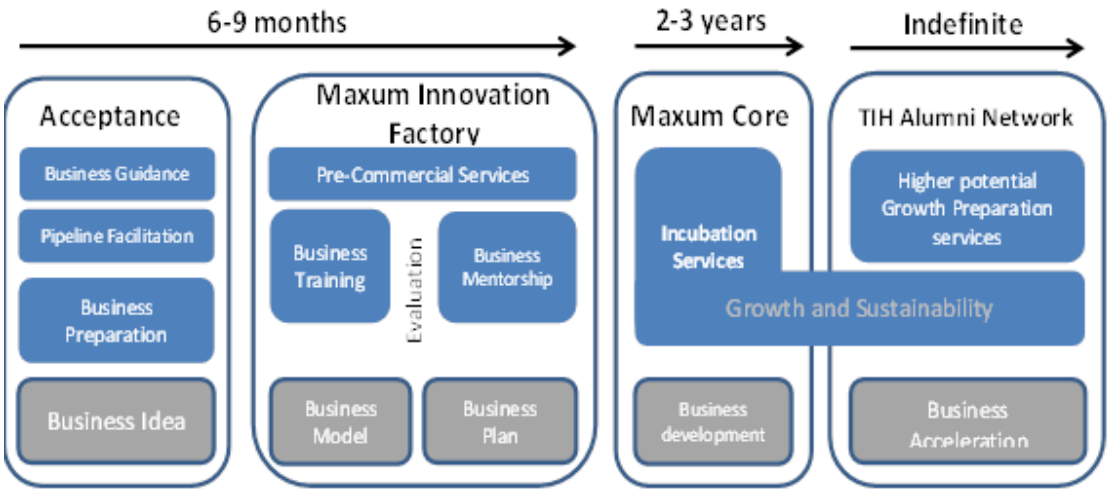

Figure 4: Overview of Maxum

TIHMC Annual Performance Plan (2014-2015) highlights the three phases of the Maxum programme. Maxum innovation factory (Maxum pre-incubation) is for early stage companies that have a business idea or concept but need assistance with commercialising their technologies. The Maxum Core programme supports companies that have developed technologies and made a sale and need to upscale their business operation and grow. The Maxum Alumni Network caters for companies that have successfully graduated out of Maxum Core and have growing companies but want to remain part of the incubation networks. Maxum provides a variety of business support services including business mentorship and coaching, legal and intellectual property support as well as training and funding support. The infrastructure and facility within The Innovation Hub is part of the offering as the incubated entrepreneurs have access to office space, access to boardrooms, access to internet and telephones lines as well as shared access to printing facilities. (TIHMC Annual Report, 2001-2002). The key offering of the programme is the mentoring services. Maxum has a selection criterion in place to screen applicants for the programme. The criteria looks at the dimensions presented in Table 2.

Table 2: Selection criteria of Maxum

Category	Criteria	Total Possible score
Business Model	What is the customer value proposition? Is there a clear need or is the product/service solving a large problem? Is there a clearly defined profit model that can be maximised with a business process, human and financial capital	25
Market Potential	Is there a clearly defined target customer? Is there a large enough market and how does the new product/service stack up in the competitive landscape?	20
Team and Skills	Is the current skill set appropriate and are there adequate and relevant skills available in the team or in the market to grow the business?	20
Innovation	Is the product or service introducing a new way of solving a customer problem? Is there a need for intellectual property protection/ development?	20
Entrepreneurial Edge	Does the entrepreneur inspire confidence in the business? Will you invest in the business with this entrepreneur leading it?	15

The performance of the programme is measured on a performance scorecard used by the organisation. Table 3 illustrates the performance measures and achievements of the programme over the past five years.

Table 3: Maxum Performance indicators and performance achievements

Performance Indicator	2010-2011		2011-2012		2012-2013		2013-2014		2014-2015	
	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
Number of entrepreneurs in incubation	-	-	-	-	8	9	16	16	16	23
Number of entrepreneurs in pre-incubation	-	-	-	-	26	22	26	31	41	26
Number of innovations commercialised	-	-	5	2	7	0	9	10	10	12
Number of jobs created	-	-	-	-	-	-	-	-	40	69
Number of SMEs graduating from the incubator programme	3	0	-	-	-	-	-	-		

- Means that an indicator was not measured in that specific year or the information does not provide concrete interpretation of achievement.

Table 3 illustrates that the programme has been consistently achieving some of its performance measures over the past 5 years. This study aims to understand whether these achievements are aligned to the results chain of the programme and whether they will lead to the desired programme outcomes. In the next section, the study reviews past studies that have attempted to evaluate the performance of science park incubation programmes to better understand how to approach the study.

2.3 Methods, data, findings, and conclusions studies and evaluations of Science Parks

This section aims to discuss similar past and current studies that will assist the study to identify past knowledge gaps, research methods, as well as findings from past studies of science park incubation programmes. This section proceeds with a review of studies undertaken in evaluating science parks globally. The literature review did not come across an evaluation of a science park within the African context. The second section highlights evaluability assessments studies conducted on different topics globally. During the literature review, we did not come across an evaluability assessment conducted in a science park context. Lastly, current academic literature on evaluability assessments in all areas is limited and as a result, some of the studies presented were published 20 years ago.

2.3.1 Evaluation research on science parks and incubators

A number of studies have been undertaken to evaluate performance of science parks and their incubation programmes. Research conducted by Albahari, Catalano and Landoni (2013) on the Italian and Spanish science park systems, Bergek and Norrman (2008) in Swedish

incubation programmes, Bigliardi et al. (2006) in science parks in Italy and Chan and Lau (2005) in Hong Kong incubation programmes, all identify the lack of a holistic performance assessment framework as the knowledge gap when it comes to evaluating science parks and their incubation programmes.

In conducting their evaluations, these researchers use literature to design appropriate frameworks and apply these to the different cases. The research procedures mostly used in past studies is the qualitative strategy using case study as a research methodology. The results of the studies have, therefore, all been context specific and cannot be generalised. The studies mentioned however, have not used results-based management principles and tested the theory of change of science parks incubation programmes, but only focused on determining how best to assess the performance of science parks. The studies also used a number of frameworks but have not explicitly used the results chain framework to assess performance of incubation programmes The current study uses a similar technique, in terms of case study methodology and using qualitative research design. However, the study uses the theory of change as a theoretical framework and applies principles of the logical framework to determine if the incubation programme is well designed and able to meet its desired outcomes. In the next section, examples of the past evaluability assessments, a technique that will be used in the study, are presented.

2.3.2 Evaluability Assessment Studies

Russ-eft (1986) wrote a paper describing the process and results of an evaluability assessment conducted on the Adult Education Programme (AEP) between January and September in 1981. The assessment followed a five-stage process, guided by a question for each stage. The questions for the evaluability assessment were 1) "what was the AEP supposed to look like? 2) what did the programme under way look like; 3) were the objectives of the AEP plausible given the programme as it was operating; 4) what were possible measures or indicators of programme performance; and 5) could the programme be evaluated and what management and evaluation options could be undertaken for programme improvement?" (Russ-eft, 1986, p. 40)

Data sources used for the evaluability assessment included document analysis and extensive interviews with key stakeholders. The information from these techniques was initially used to define an agreed-upon intended version of the programme and the nature of information required about the AEP was identified. Site visits were used to obtain information about the actual programme through additional interviews. The information from the data collection activities was used as a basis for identifying possible programme performance

measurements, suggesting improvements on the program operations and making recommendations on management and evaluation options for the programme.

A report by Basile, Lang, Bartenfeld and Clinton-Sherrod (2005) presented the background, process and findings of an evaluability assessment of the "Rape Prevention and Education (RPE) Programme". The National Centre for Injury Prevention and Control (NCIPC) acquired the RPE programme in 2001 from the Health Services Block Grant. To better understand the programme, the NCIPC commissioned an expanded evaluability assessment to establish baselines, and understand the activities, goals and performance measures of the RPE programme. The assessment had three main areas; "1) to document the goals and objectives of RPE grant programme; 2) assess the use of funds within states and 3) assess the challenges and needs related to the implementation of the RPE grant"(Basile et al., 2005, p. 203). The data collection methods used in the assessment included a closed-ended web-based survey, and site visits to 14 states where face-to-face interviews were conducted. Focus groups with programme staff were also conducted. The selection of states to visit employed purposeful sampling based on census region, amount of grant award and partnership agreements in each state. The data from the web-based interview were analysed using SAS, descriptive analyses were also used. The data from interviews and focus groups were analysed using NVivo, a qualitative programme (Basile et al., 2005).

The literature review came across two evaluability assessments carried out on programmes in West Africa. Bibeau et al., (2011, p. 303) conducted an "Evaluability Assessment of an immunization improvement strategy in rural Burkina Faso". The "immunization improvement strategy funded by the International Development Research Centre (IDRC)" aimed to improve the immunisation rates in Burkina Faso. An evaluability assessment was commissioned to determine the evaluability of the strategy prior to a full-scale evaluation when implementing the strategy in other districts. An internal evaluability assessor position was adopted, as described by Thurston and Potvin (2003).

Bibeau et al., (2011, p. 304) report that the data collection tools used included "document analysis, literature reviews, field visits, individual interviews, meetings and focus group discussions". According to Bibeau et al. (2011), the intervention protocol was used to identify the relevant stakeholders. Document analysis and interviews with stakeholders revealed that the primary goal for the strategy was to improve the immunisation coverage rate. The stakeholders also agreed that reducing diseases related to vaccines as well as morbidity and mortality were the other key goals of the strategy. The evaluable outcome documented was the improvement of antibody levels in children.

Ostie-racine and Dagenais (2013) also conducted an evaluability assessment of a strategy implemented in West Africa. The evaluability assessment was of a "West Africa based Non-Governmental Organisation's (NGO) progressive evaluation strategy" (Ostie-racine & Dagenais, 2013, p. 71). The evaluation strategy was developed to support the "health care user-fee exemption programme based in Niger and Burkina Faso". The study aimed to conduct an evaluability assessment to ensure that the conditions for Evaluation use were in place before a full-scale evaluation on conditions that affected evaluation use could be conducted. According to Ostie-racine and Dagenais (2013) empirical findings show inconsistent use of evaluation results and the use-promoting factors have not been tested within an NGO context. The article describes challenges as well as the evaluation steps undertaken using Wholey's (1994) framework to conduct the evaluability assessment.

Ostie-racine and Dagenais (2013) used a qualitative case study and twenty evaluation partners were interviewed in Niger and Burkina Faso as part of the data collection process. The study employed a two purposive sampling strategy to select participants. The intensity sampling strategy was used to select the evaluator and the NGOs' head of mission. A snowball sampling strategy was also employed where each participant was asked to recommend other participants with useful information. Ostie-racine and Dagenais (2013) report that the study used semi-structured interviews that included open-ended questions. The interview guide was not pretested due to the qualitative nature of the study; instead the interview guide was flexible and could evolve during the course of the evaluability assessment. All interviews were recorded and transcribed for analysis. Documents relevant to the evaluation were collected and reviewed to compliment the information from the interviews to triangulate data sources and maintain validity of the study. Interviews were analysed using thematic content analysis from themes that emerged from the interviews and from literature (Ostie-racine & Dagenais, 2013).

In determining the plausibility, Ostie-racine and Dagenais (2013) consulted literature to determine factors that affect or influence evaluation use. The analysis and findings of the study were grouped using Alkin and Taut's (2003) three categories of factors that influence evaluation use which are evaluation, context and human factors. From the interviews, the study determined that the evaluation and evaluator factors that are needed to influence evaluation use are already in place thus achieving the desired outcomes would be plausible. The contextual factors that came out of the interviews included, inter alia, the politicians' slow uptake of evaluation information. However, the study reported that the global political pressures to improve maternal health would also increase the pressure on politicians to seek out evidence-based information on maternal policies. These factors would influence

receptivity to the NGOs documentation and advocacy activities. An analysis of the human factors to determine the plausibility of the programme showed that the human factors supported the goals of the evaluation strategy. The study also found that there is an emerging evaluation culture at the NGO and that evaluation partners are willing to provide information and material for examination of evaluation use. Access to meaningful data is readily available, thus rendering the programme evaluable.

The studies clarify that the evaluability assessment approach is applicable in any programme or intervention and can be used to understand both programme design and implementation. The results of an evaluability assessment are an assessment of the interventions theory of change and recommendations of improvement for the intervention Going forward, this research employs a qualitative case study methodology and uses evaluability assessment techniques to conduct a formative evaluation of the Gauteng science park incubation programme.

2.4 An introduction to monitoring and evaluation studies

In this section, we discuss monitoring and evaluation as the broad field of study of the research. To describe the field comprehensively the following areas are focused on; 1) describing the field of study; 2) the purpose of evaluation; 3) major components of the field of study; 3) processes in evaluation; 4) established facts in evaluation; 5) key issues and debates in evaluation.

2.4.1 Describing monitoring and evaluation

Monitoring and Evalution (M&E) are distinct separate fields that are complementary (Görgens & Kusek, 2009). Kusek and Rist (2004) quoted the definition of monitoring and evaluation from the Organisation for Economic Cooperation and Development (OECD, p21, p. 27) as follows:

> "Monitoring is a continuous function that uses the systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds.
>
> Evaluation is the systematic and objective assessment of an ongoing or completed project, programme or policy, including its design, implementation and results. The aim is to determine the relevance and

> fulfillment of objectives, development efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful enabling the incorporation of lessons learnerd into the decisionmaking process of both recipitents and donors."

The "South African Policy Framework for the Government Wide Monitoring and Evaluation System" (2007) simply describes monitoring as the process of collecting, analysing and reporting data on inputs, activities, outputs, outcomes and impacts as well as external factors to support effective management. Govender (2013) explains that monitoring and evaluation systems provide information that allows government to make evidence-based policy assessements and therefore improve the governance of the public sector.

2.4.2 Describing evaluation

Programme evaluations alternatively referred to as evaluations originated in the United States of America in the 1960s, (Mouton, 2007). According to Rossi and Freeman (1994) in Mouton (2007), the first programme evaluation was in the field of education and health in the mid-eighteenth century. Mouton (2007) explains that evaluations became an acceptable social research field in the 1960s with Lyndon Johnson's War on Poverty and other government interventions. In South Africa, programme evaluations began in the 1980s with evaluations conducted in the field of education (Mouton, 2007). Dassah (2007) describes evaluation as a retrospective assessment that looks at the worth, merit and value of government interventions.

2.4.3 The purpose of evaluation

The key purposes of evaluations are to improve on programmes and to increase accountability in programme management. Posavac and Carey (1985) argue that the main purpose for evaluations is to gain feedback on social systems, and the feedback aims to improve programmes or to raise programme outcomes. In the same light, Sanderson (2001) explains that evaluations have a dual role of promoting accountability for performance and on the other hand, aim at improving management of programmes and allocation of resources. Rossi, et al. (2004) concur that the purpose of an evaluation is generally to improve on programmes, increase accountability and additionally, to generate knowledge. Evaluations conducted to contribute to knowledge describe the nature and effects of an intervention (Rossi et al., 2004). Davisdon (2005) summarises that the two main purposes of an evaluation are either to determine areas of improvement on programmes or to assess the overall quality or value of an intervention.

The is general agreement in evaluations literature that they aim to increase programme accountability, improve on programmes' performance, assess quality of programmes and also to generate knowledge. It is important to know the purpose of an evaluation before conducting an evaluation as this helps with choosing the right methodology to use (Davidson, 2005; Rossi, et al., 2004).

There are some debates on whether evaluations contribute to organisational learning. Greiling and Halachmi (2013) highlight that acountability cannot be expected to lead to organisational learning. Rist (2004), in Sanderson (2001), argues that evaluation does not contribute to organisational learning while Torres et al. (1996) in the same article, argues that evaluations have the potential to contribute to organisational learning. This leads to Sanderson (2001) concluding that evaluations can contribute to organisitional learning and to do so evaluation practice must develop as an "internalised, continuous process imbeded in organisational structures, processes and culture" Evaluation information can serve a number of purposes. Kusek and Rist (2004, p. 115-116) identify six uses of evaluation information namely; "1) to assist in making resource allocation decisions; 2) to assist with rethinking the cause of a problem; 3) to identify emerging problems; 3) to support decision making on competing or best alternatives; 4) to support public sector reform and innovation; and 5) to build consensus on the causes of a problem and how to respond".

2.4.4 Major components of formative evaluations

Evaluations can be classified by the approach taken during the evaluation, the role played by the evaluator and the stage of the programme or intervention being evaluated. Each evaluation is a combination of these three aspects. The approaches to an evaluation differ depending on the purpose of the evaluation and the involvement or roles played by the stakeholders in the planning and execution of the evaluation. Görgens and Kusek (2009) distinguish between impact and outcome evaluation as two separate types and further identify formative evaluation and economic evaluation as additional types of evaluation. The South African government recognises six types of evaluations, as described in the National Evaluation Policy Framework, 2011, namely, 1) diagnostic evaluation which aims to understand, root causes to a social problem and possible solutions, 2) design evaluation which aims to interrogate the strength of programme design, 3) implementation evaluation which reviews tasks and procedures of implementing a programme, 4) impact evaluation that aim to prove without a doubt that an intervernion is the cause of the observed outcome(Rossi, et al., 2004), 5) economic evaluationto detemine the value for money and efficiency of programmes (Görgens & Kusek, 2009; Wholey et al., 2010) and 6) evaluation synthesis which is the

statistical synethsis of data from separate but similar studies (Wholey, et al.,2010). Figure 5 depicts the different evaluation types linked to each stage of the programme or intervention. The diagram is not conclusive as there are many other terms in literature to refer to evaluations.

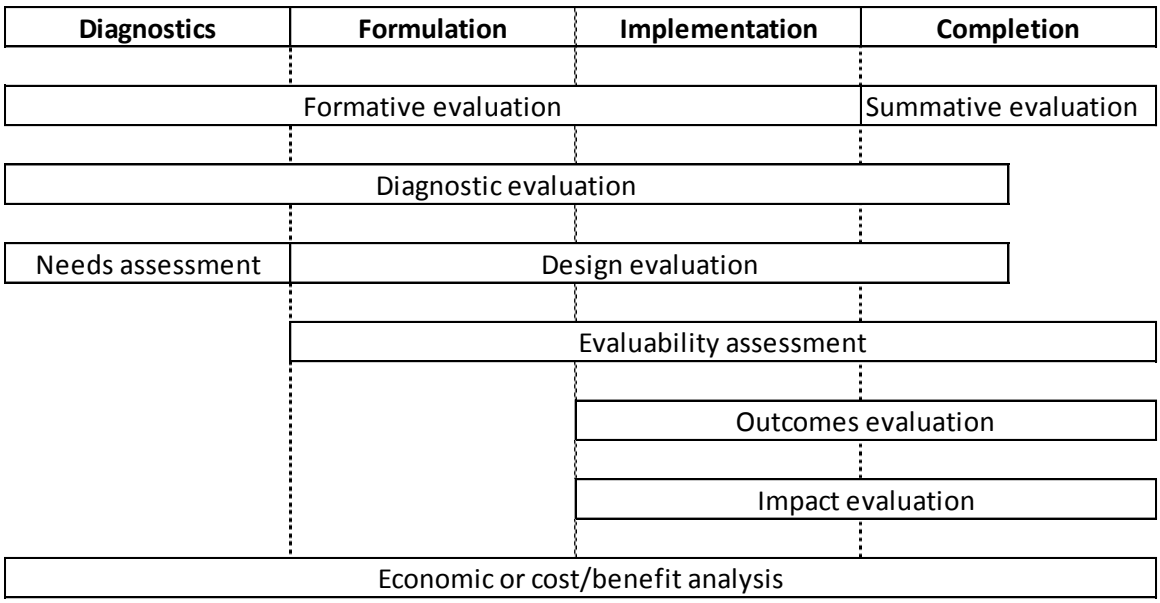

Figure 5: Evaluation Types

Clarke and Dawson (1999), Rossi et al. (2004), Görgens and Kusek (2009) and Wholey et al. (2010) all agree that formative evaluations assess the strengths and weaknesses of a programme for improvement. There is no agreement amongst these authors on the timing of a formative evaluation. Clarke and Dawson (1999) highlight that information for a formative evaluation is gathered at both the design stage and at the implementation stage. Gorgens and Kusek (2009) state that information for formative evaluations is needed before implementation of a new programme or an existing programme in a new setting. Wandersman (2009), in Katz et al. (2013), elaborates that formative evaluations aim to minimise failures to program theory, implementation and evaluation (Katz et al., 2013).

According to Tessmer (1993), in Brown and Kiernan (2001), a key issue with formative evaluations is that they are often limited and only use a small non-representative sample. Brown and Kiernan (2001) explain that formative evaluations are also not frequently used, as there is lack of empirical evidence to demonstrate their subsequent effects. There are few researchers that actually demonstrate the effect of formative evaluations by comparing the data from initial programmes to that of the final programme to show whether any changes were observed in programme implementation and impacts (Brown & Kiernan, 2001).

Literature identifies a number of evaluation types that can be classified as designs for the purposes of formative evaluation. The Department of Performance Monitoring and Evaluation (DPME) guidelines (2014) define diagnostic evaluation as preparatory research to

determine the current situation conducted prior to an intervention. This guideline identifies a needs assessment as a methodology used in a diagnostic evaluation. Rossi et al. (2004) define a needs assessment as a set of procedures used by evaluators and other social researcher to describe and determine social needs. The DPME guidelines (2014) highlight four key purposes of a diagnostic evaluation including 1) to understand the current context, 2) To understand the root causes that lead to a social problem, 3) to identify possible solutions to the root cause and 4) to test the feasibility of options.

Literature on design evaluation is very limited and this may be due to terminology. A concept very similar to that of a design evaluation is an evaluability assessment. Both evaluability assessments and design evaluation aim to interrogate programme design by testing the plausibility of the programmes' theory of change, however, evaluability assessments mainly use primary data from programme stakeholders whilst design evaluations use mainly secondary data. Evaluability assessments do not end at improving the programme design, but also assess for the collection and availability of accurate performance data to enable meaningful evaluations of the programme. Both types of evaluations can also be used as part of an implementation evaluation.

Another type of evaluation used for formative purposes is a process or implementation evaluation. All the literature reviewed, in an international and local context, is consistent in describing this stage of evaluation. Brousselle (2004, p. 157) introduces that there is no agreement on the definition of implementation evaluation and it is defined through either process analysis or "is the study of production conditions of the effects".

Patton (2002) and Gorgens and Kusek (2009) explain that implementation evaluation pays attention to inputs, activities, processes and structures and reviews tasks and procedures of implementing a programme. Implementation evaluation allows decision makers to ensure that policy is operationalised according to design. To conduct implementation evaluation, requires detailed descriptive information about what the programme is doing (Patton, 2002).

According to Rossi et al., (2004), process evaluations are directed at responding to whether a programme is reaching the targeted population and whether programme functions are consistent with programme design specifications. Process evaluation requires the evaluator to describe programmes performance and to assess whether the performance is satisfactory. The DPME guidelines (2014), explain that such an evaluation focuses on activities undertaken, how these contribute to outputs and serve to determine whether the assumptions and the theory of change are working in practice.

Wholey et al. (2010) elaborates that programme implementation evaluations focus on details of programme processes, understanding of programme structure and context in which the programme operates, programme management, as well as the ways clients enter and exit the programme. In conducting process studies, programme services or client interactions have to be delineated into discreet components, and how these components fit together need to be documented. In this light, Wholey et al. (2010) describe process evaluation as a subcategory of implementation analysis. Implementation studies are compex and require the use of conceptual frameworks to help the evaluator stay organised and avoid information overload as there can be many components to analyse (Wholey et al., 2010). Weiss (1998) also highlights the importance of frequency of collecting data during an implementation evaluation, especially when dealing with routine procedures in programmes.

The evaluability assessment reviews both aspects of design and implmentation of a programme to determine whether iyt can undergo a successgful summative evaluation. Section 2.5 details the key attributes and processes of an evaluability assessment which is the focus of this study.

2.4.5 Key issues in the study of evaluation

In the field of evaluation, there is a lack of precision in terminology as highlighted by Patton (1982), in Clarke and Dawson (1999). This has led to formative evaluation being linked to process orientated evaluations and summative evaluation being linked to outcome-focused evaluations. Weiss (1998) distinguished between formative-process and summative-outcome. According to Weiss (1998), the terms formative and summative relate to the intention of the evaluator, the purpose of conducting the evaluation. Process and outcome relate to the stage of the programme or intervention in question and are not related to the evaluators' role.

Some evaluators hold the view that the formative/summative distinction introduced by Schriven (1967) is of limited value and cannot be considered to accommodate the wide range of programme evaluations used nowadays, (Chambers et al., 1992 in Clarke & Dawson, 1999). Evaluation research conducted for purposes of generating knowledge cannot be classified as either formative or summative. Chen (1996) in Clarke and Dawson (1999) also agrees that a broader framework to categorise the new types of evaluations is needed. Patton (1982) in Clarke and Dawson (1999) describes another classification used to categorise the different types of evaluation as developed by the former Evaluation Research Society. The classification identifies six basic types of evaluations namely, 1) formative evaluation, 2) front-end analysis, 3) evaluability assessment, 4) programme monitoring, 5) evaluation of evaluation and 6) impact evaluation (Clarke& Dawson, 1999).

Clarke and Dawson (1999) highlight another evaluation classification developed by Chambers et al. (1992) based on the premise that social programmes have different aspects and each aspect constitutes a different type of evaluation. Five broad types of evaluations were developed in this regard including, 1) studies of programme outcomes; 2) cost-effectiveness studies and cost benefit analysis, 3) consumer satisfaction studies, 4) implementation studies, and 5) needs studies.

Another key issue in evaluation is the role of the evaluator. The issue, in this regard, is whether an evaluation should be carried out independently or internally using the programme designers or staff. Davidson (2015) proposes that if the evaluation if for accountability purposes then it is best carried out by an independent consultant. Davidson (2015) also mentions that in areas where independence is not required as for purposes of organisational learning, then the evaluation can be hosted internally.

Additionally, the alleged non-use of evaluation findings is an issue in the field of evaluations. Dassah (2007) observes that evaluation literature indicates that evaluation findings are underutilised, especially in developed countries like the USA. According to Dassah (2007), the utilisation debate ia also termed the Weiss-Patton debate, developed in 1987. The debate ensued when Weiss commented that evaluators had indifferent success in getting their results used for decision-making and concluded that evaluation information alone cannot be solely used to make decisions in a democratic society as there are other factors that influence decision-making. Dassah (2007) reports that Patton offered a different view that states that evaluators should promote and cultivate use. Evaluators should negotiate upfront the use for the evaluation with the intended user to make the benefits worth the cost.

One reason that leads to underutilisation is the "frequent finding of negative and null evaluation results" (Dassah, 2007, p 119). Guba and Lincoln (1989) highlight the many possible reasons for non-use of evaluation findings. According to these authors, evaluators have failed to provide information that warranted use due to poor quality. Second, Weiss (1973), according to Guba and Lincoln (1986), cautioned that evaluation information should be placed in the political arena of decision-making for it to be used. Third, the issue of competing evaluations generating conflicting information also led to poor acceptance of evaluation results. The most important reason that has led to non-use is that evaluators provide information that they believe to be relevant and no one else does. In other instances, evaluators provide information that is relevant to the evaluation sponsors and/or funders and do not take into account the interests of the concerned parties (Guba & Lincoln, 1986).

Timing of evaluations is another issue of debate amongst the evaluation circles. Görgens and Kusek (2009) describe that formative evaluation occurs before the implementation of a project or programme or before the programme is applied in a new context. Chambers (1994), in his articles, tries to explain the difference between summative and formative evaluation as the two are debated to overlap. The author concludes that the purpose and not the timing of the evaluation determine whether it is a formative or a summative evaluation. If the intention of the evaluation is to improve a programme on-going or completed with the aim of improving the programme, then the evaluation is a formative evaluation.

2.5 Key attributes of evaluability assessments

This section aims to detail the variables and attributes of an evaluability assessment (EA). Evaluability is the extent to which an activity or project can be evaluated in a reliable and credible manner. Davies and Payne (2015) define evaluability from three perspectives, namely 1) evaluability as seen in project design, 2) evaluability as seen in availability of data and 3) the utility and practicality of an evaluation. Evaluability assessments is a concept developed by Joseph Wholey and his team at the Urban Institute (Trevisan, 2007). Wholey et al. (2010) describe an evaluability assessment as an assessment of whether a programme is ready for a meaningful and credible evaluation. They argue that an evaluation is likely to be useful if it 1) has agreed upon programme goals which are realistic; 2) "information needs are well defined; 3) evaluation data are obtainable and 4) intended users are willing and able to use evaluation information" (Wholey et al., 2010, p. 83).

The purpose of evaluability assessment is to help programmes to meet these four evaluability standards. Thurston and Potvin (2003) further define an evaluability assessment as the starting point of programme evaluations that can be used at any time to review and plan evaluations. The product of an evaluability assessment is a thorough description of a programme, and an agreement amongst stakeholders of the main questions to be addressed during an evaluation and an agreed upon evaluation plan (Thurston & Potvin, 2003). Rossi et al. (2004) detail that an evaluability assessment has three main activities including 1) describing a programme model with emphasis on defining programme goals and objectives; 2) assessment of how well defined and evaluable the model is and 3) identifying stakeholder interest in the evaluation and the likely use of the findings.

As mentioned earlier, the use of evaluability assessments declined over the years as compared to the 1970s and 1980s. Rog (1985), in Trevisan (2007), attributes this decline to the

departure of Joseph Wholey, a key government official who promoted the use of evaluability assessments, from federal government. Smith (2005), in Trevisan (2007). adds that the use of evaluability assessments may have declined for the following reasons; 1) the development of programme logic as independent evaluation strategies, 2) those conducting evaluability assessments not publishing their work, 3) the realisation that programme design, its implementation and evaluation do not flow in an orderly manner, 4) vague articulation of the evaluability assessment concept, and 5) poor defined methodology for evaluability assessments.

According to Davies and Payne (2015), evaluability assessments are not needed when a project is unevaluable meaning that the theory of change and monitoring and evaluation data are unusable. Another condition that affects the need of evaluability assessments is cost. Small projects with small evaluation budgets may not need to have evaluability assessments as these are also not compulsory. Davies and Payne (2015) also identify alternatives to evaluability assessments, which include expanding the quality assurance process used for the approval of new projects for funding to include a criteria relating to evaluability. Another alternative is to use independent procedural audits to review the workings of the project monitoring system.

Figure 6 depicts the different stages in undertaking an evaluability assessment as identified by different authors.

AUTHORS	STAGES IN AN EVALUABILITY ASSESSMENT					
Wholey, Hatry and Newcomer (2010)	Involve intended user	Clarify programme design	Explore Programme reality	Assess plausibility of programme	Reach agreement on needed changes to programme design or implementation	Reach agreement on evaluation focus and inteded use
Thurston and Potvin (2003)	Select and evaluability assessor	Indentify Stakeholders	Identify and assess key documents	Develop programme logic and evaluation plan	Agreement to proceed with evaluation	Identify time and other resources required
Davies and Payne (2015)	Define the project boundaries and scope of evaluability	Identify documents and stakeholders for evaluability assessment	Review documents	Engage with stakeholders	Develop conclusion and make recommendations	Feedback Findings and conclusion to stakeholders

Figure 6: Stages in evaluability assessments

The next section highlights key attributes and components of an evaluability assessment. The attributes are used as themes for the analysis of the empirical results.

2.5.1 Utilisation and Use

It is important to highlight utilisation as an attribute in evaluability assessment because the approach is designed to ensure that evaluation information is used by key programme stakeholders. The study paves the way for future evaluations for the science park incubation

programme and it makes recommendations on how evaluation information pertaining the incubation programme can be used going forward.

Ginsberg and Rhett (2003), in Dassah (2007), consider an evaluation to be useful if it provides timely, relevant evidence to increase the chances of policy decisions to improve performance. Grasso (2003), in Dassah (2007), highlights the key to utilisation is meeting the expectations of those that commission evaluations and maximise the use of those in the programmes to use the evaluation information. Connolly and Porter (1980), in the same article by Dassah (2007), hypothesise, based on their study, that evaluations are likely to be useful if they respond to a "specific informational need of a specific decision maker, and also when the timing, generation and dissemination of the results are under his or her control", (Dassah, 2007, p. 124). The objectives of use to include 1) findings about programmes processes and outcomes that decision-makers can use to make decisions, 2) the second object is enlightenment, as the programme staff can use the lessons from the evaluation without necessarily using the findings, and third object for use is that it shows good management and accountability.

Evaluation information can also be misused or wrongly utilised. According to Alvin and Coyle (1998, p. 336), in Dassah (2007), misutilisation can occur at three stages, "misuse when commissioning the evaluation, misuse of the evaluation process and misuse of evaluative findings".

2.5.2 Stakeholders

Thurston and Potvin (2003) express that it is an important task to understand the politics of accountability within an evaluation, as the evaluation provides an opportunity for systems of domination to be understood. In this light, stakeholders cannot be treated as if they are all equal and differences are denied. Instead, the evaluators need to be clear about the differences in stakeholders (Thurston & Potvin, 2003). Ristock and Pennell (1996), in Thurston and Potvin (2003), view the politics of accountability as respecting separate identities and being accountable to each. It is therefore important that evaluations of social change should focus on empowerment and be utilisation-focused, designed to meet the needs of the stakeholders (Thurston & Potvin, 2003). Stakeholders are important in evaluability assessments as they assist in clarifying programme goals and activities, therefore this group will assist in fulfilling the research questions posed.

The important attributes of an EA are those of the intervention logic and a framework that guides performance management. For the purposes of this study, the theory of change and the results chain and framework are used as guiding frameworks. The attributes in the

following sections are also those of the theoretical frameworks that are discussed at a high level in Section 2.6.

2.5.3 Programme Beneficiaries

The LogFrame Handbook (n.d) highlights that a key area that is often overlooked in the planning of development projects is the people who will be affected by the project. It is important to understand the needs and expectations of the beneficiaries early on in the planning process and during the implementation stage. It is important that development projects represent the needs of society and not the needs of the institution. It is therefore important to analyse and understand the needs of the beneficiaries and categorise them so that those with high priority can receive attention.

2.5.4 Goals

The Norwegian Agency for Development Cooperation (NORAD) (1996) describes a goal as the objective towards which the project is expected to contribute. A goal is an anticipated long-term objective to which the project contributes. Thurston and Potvin (2003, p463) argue that goals should be "SMART: specific, measurable, achievable, realistic and time limited". Programme goals identify the realistic state that the programme actions could achieve. In determining goals for an evaluability assessment, the line of questioning should not directly ask about goals but instead about consequences. Goals that describe the changes the programme aim to bring about relate to programme impact theory (Rossi et al., 2004). For the purposes of this study, the first step requires the clear identification and articulation of goals for the science park. The goals must be understood by all stakeholders and there should be agreement on the goals. This attribute assists in developing and analysing the programme theory of the intervention. The causal linkages that lead to the achievement or non-achievement of the goal is also assessed.

2.5.5 The inputs

NORAD (1996) describes inputs as raw materials required to produce the desired outputs in a project. The inputs are a necessary and sufficient condition to undertake the planned activities. Inputs can be expressed in terms of funds, personnel, goods. It is important to determine what inputs are given to a programme to enable it to function, thus, knowing the inputs will assist in determining whether they are sufficient before activities can be undertaken. Weiss (1998) describes inputs as resources that are determined at the outset and that go into a programme. They include the organisation that runs the programme, the budget allocated to the programme and programme staff. The "Policy Framework for the Government Wide

Monitoring and Evaluation System" (2007, p. 2)[1] simply describes inputs as the "things used to do the work".

For the purposes of this study, the inputs assist in describing the programme and highlighting characteristics of the programme (Weiss, 1998). The inputs also help to determine if there are any changes over the course of the programme. The evaluator needs to check whether the inputs have remained the same over the period or whether there have been changes that can lead to an observed outcome. This review or assessment of inputs is used to review the programme logic of the programme and to determine its plausibility.

2.5.6 The activities

Norad (1996) describes an activity as an action. These actions are expressed as processes and are necessary to convert inputs into planned outputs within a specified period. In determining the plausibility of the programme logic, it is important to determine whether the activities are sufficient in the type, "quality and quality to produce the desired outcomes", (Smith, 1989, in McKinney, 2010. p. 312). The "Policy Framework for the Government Wide Monitoring and Evaluation System" (2007, p. 2) describes activities as the "what we do". The LogFrame handbook (n.d) explains that activities are required to produce project outputs. The activities guide the implementation, therefore knowing the activities will guide planning for implementation.

Information on activities is sourced from programme stakeholders, programme operational staff, planners and beneficiaries. For the purposes of conducting the evaluability assessment, we determine whether the activities being carried out are supported by inputs and if they are appropriate to deliver on the agreed upon goals. From an implementation perspective, the study determines if there are appropriate processes to support the required activities.

2.5.7 The outputs

NORAD (1996) describes outputs as objectives that the management team must achieve and sustain within the life of the project. When outputs are completed, they should be sufficient to lead to immediate outcomes. Outputs are the guaranteed results of a project because of its activities (Wholey et al., 2010). The Policy Framework for the Government Wide Monitoring and Evaluation System (n.d) describes outputs as immediate services or products produced by the organisation. All outputs have to be feasible within the resources provided

(NORAD, 1996). Wholey et al. (2010) explain that data sources for outputs are based on transactional data kept by the organisation on an on-going basis. Data sources for outputs are readily available within an organisation and are maintained in management information systems (Wholey, 2010). For the purposes of this study, the outputs are assessed to determine whether the programme is being implemented and managed adequately to produce the intended outputs. The study investigates what outputs, if any, have been achieved in the organisation. The study also assesses how the achievement or non-achievement of outputs is documented. The achievement of the outputs is also used to determine which evaluation is appropriate for the intervention.

2.5.8 The outcomes

NORAD (1996) refers to outcomes as purpose, and describes the purpose as the intended effects of the projects for the beneficiaries. Each project should have one immediate objective. According to Wholey et al. (2010), outcomes represent the kind of results that a programme is intended to produce. The Policy Framework for the Government Wide Monitoring and Evaluation System (2007) describes outcomes as the medium-term results, which are a direct result of achieving outputs specified. Outcomes are "what we wish to achieve", (The Policy Framework for the Government Wide Monitoring and Evaluation System, 2007, p. 2).

Outcome measures are expensive and challenging to operationalise because they are realised after the beneficiary has completed the programme and therefore require follow-up with clients (Wholey, et al., 2010). Outcomes require data collection procedures developed specifically to measure performance. Methods of data collection can include direct observations of clients, post-tests to measure effectiveness, follow-up interviews and client surveys at certain time intervals after programme completion (Posavac & Carey, 1985; Wholey et al., 2010). Outcomes have an intermediate period. Kusek and Rist (2004) state that outcomes determine whether success has been reached. It is important to determine outcomes through a consultative process with stakeholders. The Logical Framework Handbook (n.d) articulates that outcomes are represented by a change in behaviour of the project behaviours. This change can be seen in behaviour, systems performance or institutional performance.

This study determines the outcomes of the programme from reviewing programme planning documents and also from interviews with key stakeholder interactions. The articulation of the desired outcomes from the stakeholders' perspectives is used to draw out the programmes logic model which is tested for plausibility.

2.5.9 The Impact

Impacts are long term-programme effects that are produced by a development intervention directly or indirectly (Kusek & Rist, 2004; Rossi, et al., 2004). Impacts can be positive or negative and/or primary or secondary. Rossi, et al., (2004) describe a programme effect as the part of an outcome that can be directly attributed to the programme. A programme cannot be directly attributed to a result with certainty but with varying degrees of confidence. Impact assessments are comparative in nature, comparing a control group to the group that receives the intervention. Experimental designs are often used for impact assessments (Rossi, et al., 2004). Guerra-López and Toker (2012, p. 223) describe that the term impact refers to the ultimate results produced by an intervention on its environment. Kaufman (2006), in Guerra-López and Toker (2012), refers to impact as "societal consequences produced by the organisation".

2.5.10 Risks and Assumption

NORAD (1996) describes assumptions as the condition that must exist if the project is to succeed. The project management either does not have any control over the factors or chooses not exert any control over them (World Bank, 1997). Assumptions can present a certain level of risk and includes the events, conditions, or decisions which are necessary for project success, but are beyond the control of project management (NORAD, 1996). Dale, (2003) describes the assumptions as the conditions under which fulfilment at one level is expected to convert to fulfilment at the next level.

It is important to understand the underlying risks made when planning for programmes as these also give sense of the programme logic. The assumptions and risk are contextual variables including "political, economic, institutional, and environmental factors and the socio economic characteristics of the target communities"(Bamberger, Rugh, & Mabry, 2006, p. 42). For this study, we determine the risks and assumptions as determined by the stakeholders, so that these can be tested in the design of the programme logic. According to Brousselle (2011), it is the role of the evaluator to question the validity of the interventions causal chain and to test the scientific plausibility thereof. This logic analysis forms part of the study and literature is used to determine the scientific plausibility of the science park programme logic. The inputs, activities, outputs and outcomes establish the foundation of determining if the programme model is plausible and are linked in the results chain as depicted in Figure 7 (McKinney, 2010).

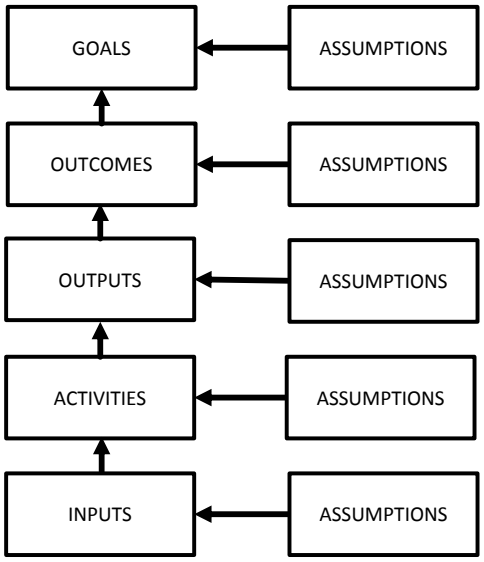

Figure 7: Logical Framework Approach Sequence of Events

2.5.11 Indicators

Norad (1996) defines indicators as the performance standard that must be attained in order to achieve the goal, the purpose and the output of a project. Dale (2003) explains that indicators are specified during planning to assist the programme intervention in assessing its performance and achievements at a later stage. According to NORAD (1996, p. 49), indicators should specify target group; "quantity; quality; time and location". Indicators provide the basis for monitoring and evaluation. NORAD (1996) describes that a good indicator has the following characteristics; 1) it is substantial; 2) independent; 3) factual; 4) plausible and 5), based on obtainable data. Rist and Kusek (2004, p. 68) extend on these characteristics and define that a good indicator should be "clear, relevant, economic, adequate, and monitorable".

Kusek and Rist (2004) describe indicators as qualitative or quantitative variables that provide a simple and reliable means to measure achievement, to reflect the changes connected to an intervention or to assess the performance of an organisation against the stated outcome. Indicators are developed for all levels of the results-based monitoring and evaluation system. There are a number of types of indicators including, economic, social, demographic, environmental, health, education governance and quality of life indicators (World Bank).

In this study, during the programme exploration phase, we also assess the performance management system used and the appropriateness of its indicators to measure performance of the programme as it currently exists. We also design a results-based framework, based on the logical framework approach to support the programme logic that was agreed upon with the stakeholders. All the attributes identified from Section 2.5.3 to Section 2.5.10 together make up the logical framework that is used as a project-planning tool.

2.5.12Programme Logic Models

Thurston and Potvin (2003) point out that programme logic models developed through an evaluability assessment aimed to point out the current stage of development of a programme. The EA process aims to clarify programme theory and questions for an evaluation for a particular programme at a particular stage. It is important to observe the programme in action when assessing the programme logic or to engage stakeholders in an analysis of how closely the model captures real life. It therefore needs to be known before an evaluation can be conducted whether there is a link between planning and implementation of the programme. Rossi, et al. (2004) detail possible outcomes that can result from the assessment of programme theory. Firstly, a programme may be weak in conceptualisation with poorly defined program theory thus making the programme not evaluable. In this instance, the programme needs reconceptualization that may include 1) clarification of programme goals and objectives; 2) restructuring of the programme components; and 3) together with stakeholders redefine the logic that connects the activities to the desired outcomes (Rossi, et al., 2004). Secondly, according to Rossi, et al. (2004), if the programme impact theory is poorly defined and an impact evaluation continues nonetheless, it would be difficult to attribute the outcomes achieved to the actual programme itself. This is referred to as Black Box evaluation as the assessment of outcomes achieved is made without insight into what caused the outcomes (Rossi, et al., 2004). The programme chain is either defined implicitly or explicitly and can be sourced from stakeholders or programme documents. It is important to develop a programme logic and to analyse the current programme logic in conducting an evaluability assessment.

Figure 8 illustrates a logic model of a business incubation programme adapted from Hackett and Dilts (2004), in their study that attempted to develop a theory of factors that affect business incubation performance.

Antecedents	Inputs	Activities	Outputs	Initial Outcomes	Intermediate Outcomes	Long-term outcomes
Pre-venture initiation activities	Entrepreneurs	Incubation: New venture development + New products Development + Selection+Monitoring +Business Assistance+Resource Munificence		Incubatee is surviving & growing profitably		Increased organisation population churn
Community Support for Entrepreneurship	Enabling Technologies/Innovations (including incubator)		Incubated companies	Incubatee is surviving and growing but not yet profitable	Viable/Becoming viable companies	
Exogenous Conduct of Basic research	Critical technologies/Innovations			Incubatee is suviving but not groeing and not profitable/marginally profitable	Dead/Dying companies	
Events incresing individual Entrepreneruial orientation	Strategic technologies/innovations			Incubatee operations teminated while in the incubator; losses minimised		
Incubator feasibility study				Incubatee operations terminated while still in the incubator; large losses		

Figure 8: Logical model of a business incubation programme (adapted Hackett & Dilts, 2004)

Rogers (2007) differentiates between the different logic models based on complicated and complex interventions. Simple logic models are best used for tightly controlled interventions. Complicated programme logics have simultaneous causal strands or alternative paths of causal strands. These interventions may also be implemented through multiple agencies. Rogers (2007) further describes recursive causality, whereby one logic model will create an initial success and create conditions for further success. Another important yet challenging aspect of logic models is that of emergence, whereby "specific outcomes and means to achieve them emerge during the implementation of the intervention" (Rogers, 2007, p. 39).

2.6 The theory of change, results chain and framework

In this section, the study discusses theoretical frameworks that are used to interpret the findings. The theory of change, which is a prominent analytical framework used in evaluation studies is discussed supported by theories that are applicable to the logic of the science park incubation programme. The results chain and framework is also discussed as a theoretical framework that is used to support the theory of change. Lastly, the section discusses the 12 components framework as a key framework that assists with recommendations for the science park incubation programme.

2.6.1 The theory of change

Weiss (1998) describes programme theory as the ideas and assumptions that link programme inputs to the attainment of the programme goals. Theory, in this context, refers to the set of beliefs that underlie an action. The theory is a hypothesis and does not have to be correct (Weiss, 1998). Brouselle (2011) lists the "terms associated with programme theory, including theory-based, theory-driven, theory-orientated, theory-anchored, theory of change intervention theory, outcomes hierarchies, intervening mechanism, programme logic" (Donaldson, 2007; Rogers, et al., 2007 in Brouselle 2011 p. 71). Rogers, et al. (2007) define the theory of change as developing causal chains that link inputs and activities to outcomes to guide evaluations.

Rossi, et al. (2004, p. 146) remarks that the programme theory explains "why a programme does what it does and provides the rationale for expecting that doing so will achieve the desired results". The programme theory also serves as a basis for formulating evaluation questions, designing evaluations and interpreting evaluation findings. Brousselle (2011) explains that the role of evaluators is to interrogate the validity of the programmes' chain of action and to test the scientific plausibility of programme theory. The logic model is a tool used to depict the theory of change (MacKenzie & Blamey, 2005).

According to Weiss (1997), theories of change have two components, implementation theory and programme theory. Implementation theory describes the steps to be taken in the implementation of the programme. Programmatic theory is the mechanisms in the form of responses to the activities that enable the programme to occur. Implementation theory is based on the assumption that if activities are conducted as planned, with sufficient quality, intensity and commitment to the plan, then the desired results should be forthcoming. The focus of implementation theory is on the delivery of programme services. It is both the program theory and the implementation theory that make up a programme's theories of change. Bamberger, et al. (2012) highlight the importance of an implementation strategy which is the way in which the inputs are utilised to produce outputs. These are referred to as activities, however, different organisation may have the same activities and achieve different results due to the strategies they employ and quality of carrying out the activities.

MacKenzie and Blamey (2005) explain that it is best to develop the theory of change during the planning phase of an intervention. It is believed that at this point, stakeholders are more open to acknowledge gaps between their expectations and reality of implementing a programme. A project's theory of change is developed in a number of steps. First, the long-term outcomes that the intervention seeks to achieve are identified. Second, the short-term

outcomes and contextual features under which the long-term outcomes will be achieved are identified. Third, the activities and the contexts required to meet the short-term outcomes are specified. Fourth and lastly, resources that are required to make the goals a reality have to be explicitly identified.

According to Connell and Kubisch in MacKenzie and Blamey (2005), a good theory of change is one that is plausible, do-able and testable. Plausibility refers to the extent at which there is logic and strong links between the planned activities and the problems identified and the desired outcomes. Do-able relates to the extent at which the activities can be done within the timescales, context, as well as resources available to the programme. A testable theory of change is specified adequately to allow for verification of progress and for measurement of the intended outcomes. In a study conducted by MacKenzie and Blamey (2005), it was found that defining outcomes can be a challenge in most programmes. Difficulties in articulating programme outcomes can be a consequence of a poor evaluation culture or lack of evidence based approach within an entity as well as the lack of baseline data.

Furthermore, MacKenzie and Blamey (2005) highlight that the theory of change also strengthens attribution between programme implementation and achieved results. This is based on the premise that if all relevant stakeholders have agreed on the activities and outcomes as being plausible and programme delivery occurs according to the agreed upon plan within the expected context, then causal attribution is strengthened. In this instance, attribution is improved because the programme is delivered according to stakeholders' agreement and plan and therefore attribution may also be independent of secondary measures. There is greater confidence in attributing outcome changes when there is a strong evidence base for the activities and also when the extent of change is as predicted. A clearly articulated theory of change guides performance measurements that should be in place and data that should be collected from an intervention to enable evaluations.

MacKenzie and Blamey (2005) point to a number of challenges that can be identified in using the theory of change as a planning framework. Firstly, it is expensive and requires dedicated time from a number of stakeholders. Second, using the theory of change may lead to a linear approach to planning and evaluating. This linearity may distort the way most organisations learn from strategy and implementation.

Weiss (1995), in Stame (2004), states that the assumptions and tacit understanding of programmes make up the theory of change of a programme. All the theories need to be brought together and consensus has to be reached on which theories need to tested in an evaluation. Brousselle (2011) concurs and advances that the programme theory does not

reflect how the intervention produces the intended outcomes, but rather, reflects the stakeholder's perceptions and beliefs on what will produce the intended outcomes. It is therefore important that the programme logic is tested for scientific plausibility.

Birckmayer and Weiss (2000) define a theory-based evaluation is as an approach that covers what the activities are being conducted. what effect each activity has, how the programme goes forward, and what the expected outcomes will be. The evaluation follows each step through the sequence to see if the expected results materialise. Theory based evaluation assumes that if the theory on which a programme is based is solid, the evaluation can track the link in the chains of assumption. The results of the evaluation should show which links are strongly supported by the data collected and which chain of assumption breaks down and where in the chain it breaks. Chen and Rossi in Stame (2004) highlight that black box programmes are such as they have no theoretical basis, their goals are unclear and their measures are false. The black box in this case represents the empty box. (Birckmayer & Weiss, 2000) Pawson and Tilly (1997) in Stame (2004), offer a different view with their realistic evaluation approach and posit that the components of the theory should be made up of the context and the mechanisms which lead to the outcome. Both authors confirm the need for theory as a basis for evaluations even though the theory plays a different role (Stame, 2004).

Campbell (1996), in Weiss (1998), advances that the viability of a programme theory can be tested through pattern matching. In this process, the expectations generated by theory are compared with those from the empirical data to determine how well they fit. The theories presented in the following sections are used to analyse the science park incubation programmes' theory of change.

2.6.1.1 The knowledge Spill-over theory of entrepreneurship

Audretsch ,Carlsson, Braunerhjelm and Acs (2009) posited the knowledge spill-over theory to explain the origin of entrepreneurial opportunities. The theory is an extension of the Schumpeter's (1934) growth theory, which posits that entrepreneurial opportunity arises when incumbent firms create, but do not exploit, new knowledge. The theory provides an explanation for the role of the individual and the firm. The theory posits that new product innovations can come both from incumbent firms, and/or start-ups. Incumbent firms rely on incremental innovation from the flow of knowledge to improve their products. Start-ups with entrepreneurial talent and access to the stock of knowledge are likely to engage in innovation that can lead to new industry development or to replacing existing products. The theory posits that radical technological innovation comes from new start-up companies (Audretsch et al., 2009).

The model contains three assumptions namely, 1) an increase in knowledge has a positive effect of entrepreneurship levels, 2) the more efficiently knowledge flows are exploited, the smaller the consequence of new knowledge on entrepreneurship, and 3) greater regulation and market intervention by government decreases entrepreneurial activities.

Entrepreneurship thus leads to economic growth as it acts as a channel upon which knowledge created from large firms can spill over to agents that endogenously create new firms. The entrepreneurial opportunities are realised when incumbent firms invest in but do not commercialise new knowledge. Entrepreneurs then respond to these opportunities through the creation of new start-ups. The theory postulates that entrepreneurial activity is higher where there is great investment in new knowledge. The knowledge source in this theory can either be a university or research laboratory in an incumbent firm. This theory also brings to light the need to re-evaluate intellectual property rights. If intellectual property protection is too strong and the full benefit go the producer, this will reduce intra-temporal knowledge spill-overs leading to less innovation and growth. Audretsch, et al. (2010) further describe entrepreneurship as the missing link in endogenous growth theories.

2.6.1.2 Theory of co-production

Rice (2002) employs the co-production theory to explain the relationship between the incubation manager and the entrepreneurs in the incubation programme. The theory is based on three elements of the co-production equation namely, inputs of the consumer, outputs and elasticities. In the incubator manager-entrepreneur relationship, the incubator manager is the regular producer, the incubated entrepreneur is the consumer producer and the output is business assistance. The incubation manager and the entrepreneur engage in co-production to make up for the firm's knowledge gap, resource gaps and competencies. The theory posits that there are four factors that affect the output elasticities, namely, 1) the amount of time that the incubator manager dedicates to co-production, 2) intensity of co-production by the incubation manager, 3) the broader range of modalities used by the incubation manager in engagement, and 4) the readiness of the entrepreneur to engage in co-production.

According to the theory, an incubator manager that invests more hours in co-production activities and engages with entrepreneurs using broader modalities of co-production has a positive impact in developing the entrepreneur. Incubators that have greater impact also use a variety of co-production modalities, including reactive co-production, used to a short–term problem initiated by the entrepreneur, continual and proactive, where the efforts are focused on the continuous developmental needs of the entrepreneur. Lastly, entrepreneurs that exhibit greater readiness to participate in co-production benefit positively

from co-production activities. The theory highlights the importance of the incubation manager in developing the entrepreneur and also suggests that structuring an incubator should ensure that the incubator manager is able to dedicate more time to co-production activities rather than non-co-production activities.

2.6.1.3 The real options-driven theory of business incubation

Hackett and Dilts (2004) developed an incubation process model and used a variety of theories to ground the model. The study interrogated a number of theories to explain the relationship between the process of selection, monitoring, resource allocation and business assistance within an incubation programme. The real-options driven theory explains factors that affect business incubation performance based on the options theory used in investment decision. Hackett and Dilts (2004) used the options theory to develop a business incubation theory, and posited that "Business incubation performance-measured in terms of incubatee growth and financial performance at the time of incubator exit-is a function of the incubators ability, developed over time and with the accumulation of new venture development capabilities and resources, to create options through the selection of weak but promising intermediate potential firms for admission to the incubator, and to exercise those options through monitoring and counselling, and the infusion of resources while containing the cost of potential terminal option failure" (Hackett & Dilts, 2004, p. 48).

This theory is based upon four propositions which serve as the basis for the theory. The theory proposes that the options lens is an appropriate theoretical approach for developing a theory that can explain and predict business incubation outcomes. The second proposition made in this theory is that business incubation performance is positively related to selection criteria performance. In this instance, the incubator is seen to act as venture capitalists and emphasises the importance of the management team characteristics, market and product features and expected financial outcomes. The third proposition postulates that incubation performance is positively affected to intensity of monitoring and business assistance efforts. This third proposition of monitoring and business assistance assesses the degree to which the incubator helps the incubatees develop. The features of monitoring and business intensity include the time intensity of support provided, the comprehensiveness and the quality of the support provided.

The last proposition postulates that incubation performance is positively linked to an abundance of incubation resources. Resources, in this instance, refer to funding of the incubator, management competencies of the incubator team, impeccable networks of the

incubator and access to a selection pool of good quality innovations, experienced entrepreneurs with experienced management teams.

2.6.1.4 Company survival and growth theories

According to Jasra, Khan, Hunjra, Rehman and Azam (2011), there are five key growth determinants for small and medium enterprises. The determinants include financial resources, marketing strategy, technological resources, government support, information access, business plan and entrepreneur skills. Of these determinants, financial resources were highlighted to be the most important. Enterprise growth can be defined in terms of revenue generated, expansion in terms of the volume of the business and value addition. Growth can also be measured qualitatively in terms of quality of products and market position. The growth of each enterprise is dependent on understanding what the firm is.

Additionally, Gupta, Guha and Krishnaswami (2013) explain that there are two schools of thought when it comes to the growth of entrepreneurs. Some scholars theorise that the growth path of enterprises is linear, can be determined and is invariant. Churchill and Lewis (1983); Casson (1982) in Gupta et al., (2013, p. 9) define the stages in this path as "existence, survival, success, take-off, maturity and reinvention or death". The competitiveness of the enterprise is believed to grow through to maturity and to the decline stage at which point the enterprises should upgrade itself or risk death.

The opponents of the linear model posit that the growth path of an SME cannot be predicted and cannot be uniform. The sequences of stages are seen as being heterogeneous and are influenced by unpredictable intervening factors like "absorption capabilities, knowledge and technology, appropriateness of founders judgement and the competitive environment" (Gupta, et al., 2013, p. 9). This school of thought emphasises that describing the growth of entrepreneurs through stages is like saying an organisation grows like an organism. This school of thought believes that enterprise growth depends on the entrepreneurs' vision and the motivation of the entrepreneur. Gupta, et al. (2013) further postulate and conclude that the growth path of enterprises is affected by both internal factors as well as external factors. Enterprises operate under unique social economic conditions and will therefore have varying characteristics across the different geographies.

2.6.1.5 Social Capital Theory

Social capital is defined as a state when an entrepreneurs' contacts are able to contribute to the entrepreneurs goals (Greve & Salaff, 2003). Entrepreneurs require skills, information and resources to start their business ventures and most often complement their capabilities by

accessing their contacts. According to Bøllingtoft and Ulhøi (2005), the theoretical foundation of social capital theory rests on the premise that socially driven relationships are as important as economic-contractually driven relationships. Social capital is made up of both individual and collective networks that can help an individual access information and know-how. Bøllingtoft and Ulhøi (2005) posit that being part of an incubator represents part of social capital which reduces perceived risks within projects to potential investors. Lyons (2000), in Bøllingtoft and Ulhøi (2005), highlights that incubatees use both internal and external networks. The networking opportunities, amongst tenant companies, presented within an incubation programme are considered a very important offering of the incubator. An incubator may assist in building social capital that can serve the entrepreneurs' private concerns as well as economic and social interests. The fact that incubatees operate under one roof makes it easier to foster collaboration amongst actors. Interpersonal relationships are also important to consider in facilitating networks. Business incubators can be seen as mechanisms to address market failure by providing administrative support, assisting with visibility of the entrepreneurs in the incubator is a well-established brand, and lastly, working within a community of peers.

2.6.1.6 Schumpeter's theory of economic development

Schumpeter (1934)'s theory of economic development posits that innovation is the stimulus for economic growth. The theory defines innovation as a new product, application, process, method of production or a new market or a new form of commercial business. According to Schumpeter, the innovation process is able to continually revolutionise the economic structure from within whilst continually destroying the old structure and creating a new one. This process is termed Creative Destruction and is the cornerstone of capitalism. According to Schumpeter, the innovation should be financed by credit from commercial banks that enable economic development within a capitalist economy.

Schumpeter (1934) describes the entrepreneur as a man of vision, willing to take risks based on his intuition and to strike out on courses that oppose the established patterns of the circular flow. The entrepreneurs should have the ability to found a private kingdom as a captain of industry and have the desire to create new things even at the expense of destroying established patterns. Schumpeter concludes that such people are rare in any society.

Alcouffe and Kuhn (2004) describe that Schumpeter (1912) was inspired by the work of Karl Marx in developing his theory of economic growth. The authors quote Schumpeter as stating that he wanted to develop a theory of economic change, which did not rely on external factors shifting the economic system from one direction to another. The main

difference between Karl Marx and Schumpeter is that Marx stressed the importance of the class struggle, whilst Schumpeter stressed the important of the entrepreneur. The entrepreneur in Schumpeter's theory of economic growth releases the force of creative destruction through his willingness to take risks and try new ventures in the hope for profit. Carree and Thurik (2004) refer to the Schumpeter Mark I regime, which is characterised by the innovating entrepreneur that produces new technologies, new firms and new products that make current products obsolete. This theory is considered as the starting point of technological change and evolutionary economics. The Schumpeter Mark II regime is a result of work by Joseph Schumpeter in 1950, and highlights the process of creative accumulation. In this latter regime, the focus is on how large firms perform better than small firms in innovation through a strong feedback loop from innovation to R&D activities (Carree & Thurik 2004).

According to Schumpeter (1934), entrepreneurial innovation is the central cause of economic development and capital accumulation is the result. Entrepreneurship is therefore regarded as the mechanism of change for economic development in a capitalist society.

2.6.2 The results chain and framework

According to Crawford and Bryce (2003, p. 364) the logical framework was first developed by "Practical Concepts Incorporates in 1969 for the United States Agency for International Development (USAID)" for project design and assessment. The fundamental structure of the logical framework is made up of a vertical axis and a horizontal axis presented as a 5X4 matrix as seen in Figure 9.

Goal/Impact	**Impact Indicators**	**Data Source/** Means of verification	**Assumptions/ Necessary conditions/ Risks**
Outcomes	**Effective indicators**		
Outputs	**Output indicators**		
Activities	**Activity Indicators**		
Inputs	**Input indicators**		

Figure 9: Logical Framework (adapted from Crawford & Bryce, 2003)

The vertical axis presents a hierarchy of objectives and assumptions. These objectives and assumptions are based on cause and effect logic. This concept is known as the vertical logic of the project. The horizontal matrix defines how the project will progress at each level in the vertical logic and is known as the horizontal logic of the project. The matrix can be used to describe a project by breaking down the causality chain using the IF-AND-THEN relationships. The second column highlights the objectively verifiable indicators (OVI) for each level in the logic to facilitate the assessment of progress. The third column identifies the means of verification (MOV), i.e. the source of indicator data for each OVI.

Logframes are widely used as a monitoring and evaluation tool by international development agencies and as a project planning and appraisal tool (Crawford & Bryce, 2003; Bamberger et al., 2006). The logical framework identifies the conditional assumptions on which the inputs, the implementation process and the expected linkages between programme cycle stages are based (Bamberger et al., 2006). The Logframe Handbook (n.d) explains that during planning it is important to identify the appropriate level for the programme being designed. This is termed point of view and it is relative with regards to results.

Dale (2003) differentiates between the logical framework and the logical framework approach (LFA), terms that are often used interchangeably. The logical framework is the 5X4 matrix as defined above and it assists to summarise useful information for stakeholders. The logical framework approach is a methodology used for development project planning, largely used by donor agencies. The approach is a largely standardised approach that incorporates a number of planning concepts (Dale, 2003; The World Bank Logframe Handbook, n.d).

According to NORAD (1996), LFA is advantageous because it ensures that fundamental questions are asked during project planning, it leads to the planning of designed projects and it provides a basis for monitoring and evaluation information. The tool facilitates better communication and a common understanding of projects. Bamberger et al. (2006) believe that logical framework analysis translates the programme theory into a series of indicators that can be monitored. This is done to assess progress of programme performance and to assess factors that lead to the achievement or non-achievement of outputs and impacts.

Crawford and Bryce (2003) have identified a number of limitations with the LFA especially when it comes to designing Monitoring and Evaluation Information system (MEIS) based on the logframe information. According to Crawford and Bryce (2003), the LFA serves as a good design tool for projects but is usually abandoned after project financing. The tool is ineffective for monitoring purposes, as it does not have a time dimension. In determining the objectively verifiable indicators, OVIs, the LFA does not allow one to track the difference

between planned and actually achieved progress. Crawford and Bryce (2003) also criticise that the logframe presents the MOVs as a simple matter of defining the method of verification but falls short on the details of how the data will be analysed and collected and in what form. The LFA is also a static tool as it only presents a snapshot of the project during the planning phase (Crawford & Bryce, 2003). NORAD (1996) also notes the rigidity of the LFA but advises that this can be avoided by regular project reviews. Norad (1996) also highlight that the LFA is one of several tools used for planning and should be used complementarily with other tools as it does not replace target-group analysis, cost-benefit analysis and other tools.

2.6.3 The 12 components of a functional M&E toolkit

The 12 components of a functional M&E toolkit, 12 components framework, in short, is another explanatory framework used in the study. This framework is an organising framework and offers components of what a strong M&E system should have in place. The framework is the work of Görgens and Kusek (2009) and serves as a toolkit to develop an M&E system. The toolkit offers practical steps on how to address each component on the framework in order to develop an M&E system within any organisation or institution.

The framework is divided into three interrelated rings namely, 1) people, patnerships and planning, 2) data collection, capture and verification and 3) using data for-decision-making.as can be seen in Figure 10 (Görgens and Kusek, 2009).

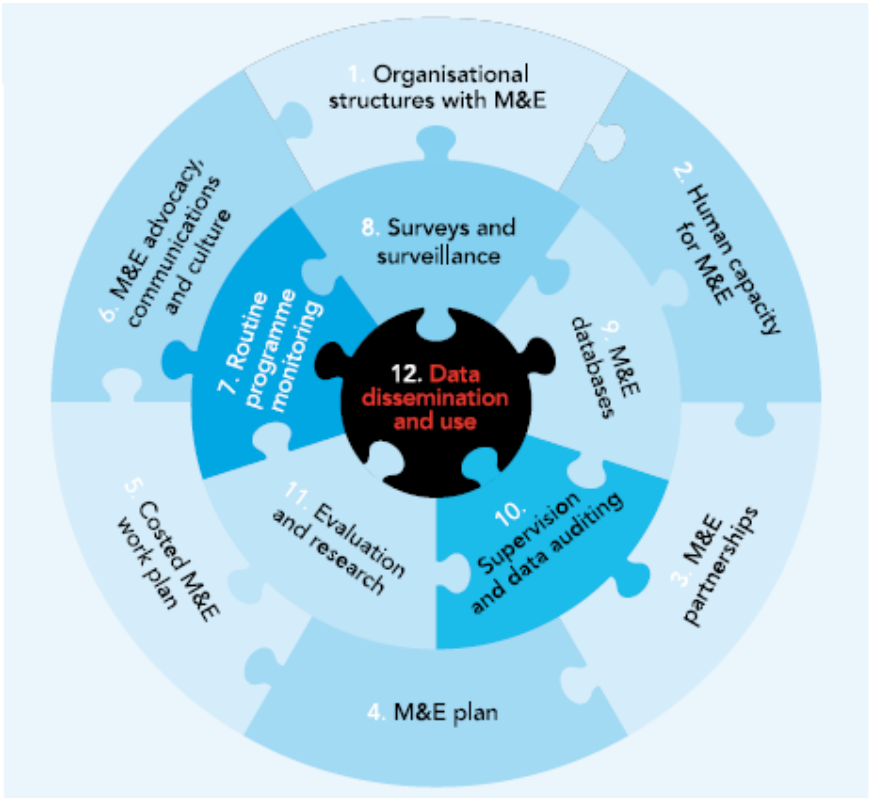

Figure 10: 12 Components of a functional M&E framework (Görgens & Kusek, 2009)

The 12 components work towards obtaining an optimum status for M&E system such that evaluation information can be credible and utilised for decision-making. The framework complements evaluability assessment work as the focus is on optimising use of evaluation information.

2.7 Evaluability assessment of the Gauteng science park, a conceptual framework

In this section, we introduce a conceptual framework that details how the research will proceed. The conceptual framework is derived from Section 2.1 through to Section 2.6 covered above. In Section 2, we discovered that past studies have not used the theory of change and results chain framework to evaluate the performance of science parks incubation programmes. We also found out that the evaluability assessment technique is a valuable technique for formative evaluations and for preparing a programme for an evaluation that can be utilised by stakeholders. Figure 11 is a diagrammatic representation of the conceptual framework for the study.

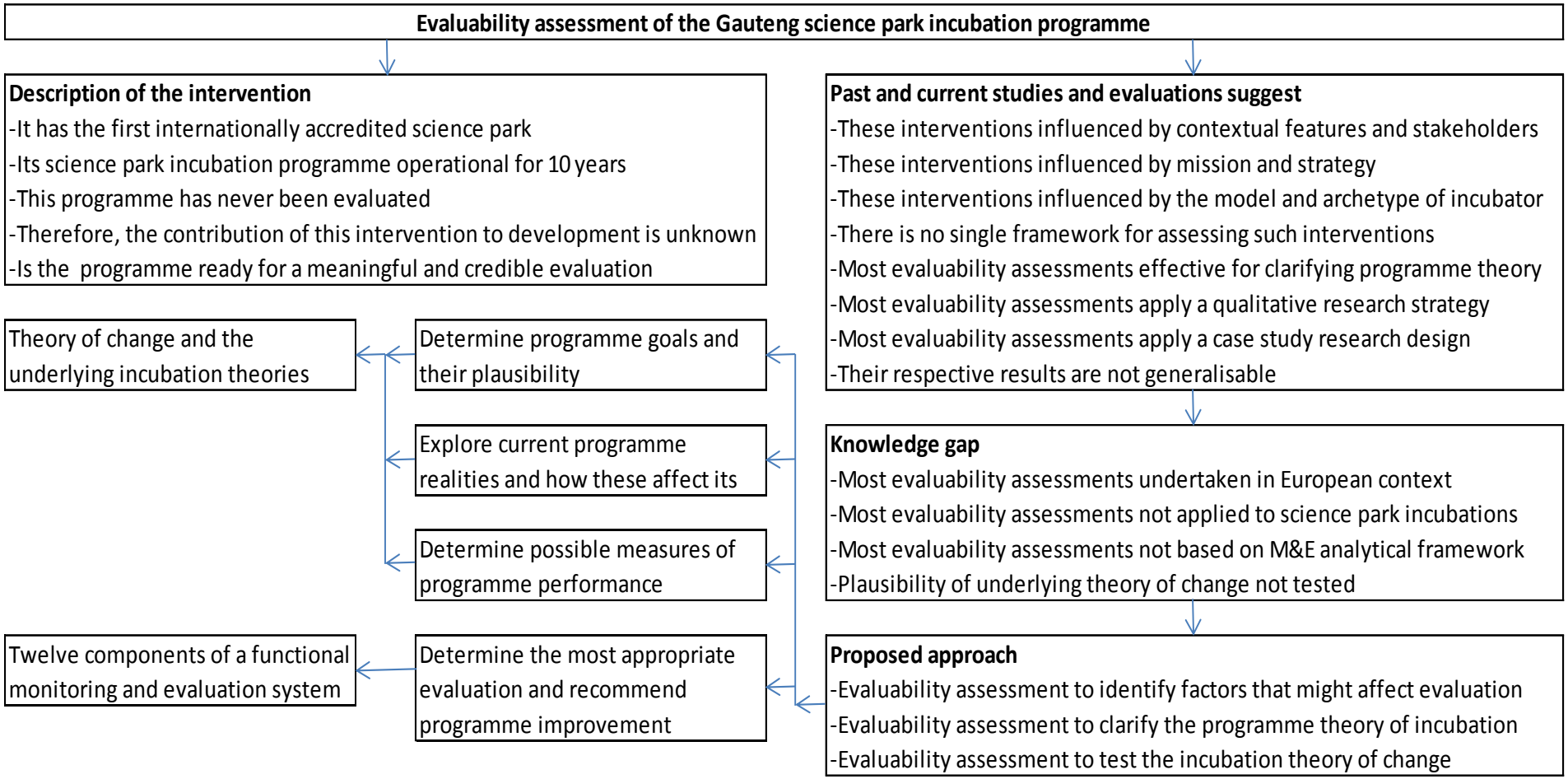

Figure 11: Conceptual Framework of the evaluability assessment for the Gauteng science park incubation programme

The evaluability technique was used in conducting this research study. Wholey (1987), in Rossi, et al. (2004), explains that an evaluability assessment can be used for the purposes of describing and assessing programme theory. In this study, the aim is to understand and assess the programme logic and understand the current programme logic employed in the study context. In this regard, the key attributes that the research focuses on included goals of the intervention, inputs of the intervention, activities (the incubation programme operations including recruitment of entrepreneurs, training, service offerings), outputs and the outcomes. Indicators also form part of the key variables the study need to determine if there is some form of performance measurement and how it is used for evaluation purposes.

The research follows the steps proposed by Wholey, et al. (2010) and draws on past evaluability assessments conducted by Basile et al. (2005), Bibeau et al., (2011). Mckinney, (2010), Ostie-racine and Dagenais (2013), and Youtie, Bozeman, and Shapira (1999), also based on Wholey's (1994) framework. It is therefore important that all questions be responded to before a recommendation for a particular type of evaluation is made.

Results based-management frameworks including the theory of change and the results chain and framework is used to interpret the empirical findings. The theory of change helps to explain why the intervention does what it does and provides a rationale for expecting the desired results (Rossi, et al., 2004). Using this framework, we explain how the interventions' inputs have led to the activities that have created the outputs. The theory of change is also used to determine the stage of the intervention. According to Thurston and Potvin (2013), programme logic developed during an evaluability assessment also helps to determine the stage of the intervention. The plausibility of the logic model is first tested scientifically using theories uncovered during the literature review (Brouselle 2011). The results chain and framework is used to determine the performance data needs of the intervention and to assess the current data available in the programme.

3 RESEARCH TECHNIQUES, PROCEDURE AND METHODS

In this section, we discuss the methodology that was used to conduct the research. Section 3.1 details the research strategy that was employed when collecting the information. Section 3.2 identifies the research design, which explains how we went about collecting the information for the study. Section 3.3. highlights important aspects that have to be considered for the research methodology. Section 3.3.1 up to section 3.3.6, looks at important aspects of collecting data, from identifying the instrument that was used, how we plan to target the research participants, ethical considerations that have to be considered when collecting data, data collection, storage process and analysis and lastly we describe the respondents in the study.

3.1 Research strategy

Bryman (2012) defines a research strategy as the course that will be employed in conducting social research. There are three research strategies in social research, qualitative, quantitative and mixed methods. Each of the strategies differs in the "role played by theory, epistemological issues and ontological concerns" (Bryman, 2012, p. 37). Each of them equally employs a different set of skills and procedures (Babbie, 2014). Bryman (2012) argues that even though there can be differences between qualitative and quantitative research strategies, a study does not necessarily have to have strict characteristics of one research strategy over the other and one may find broad characteristics of one research strategy within a study employing a different research strategy (Bryman, 2012).

The study under review employed a qualitative research strategy. Qualitative research aims to "understand the processes and the social and cultural contexts which shape various behavioural patterns" (Wagner et al, 2012, p. 126). Generally, qualitative research explains phenomena using words as opposed to numbers. There is an inductive relationship between theory and research in a qualitative study (Bryman, 2012). Bryman (2012) supports this view when he describes qualitative research by its epistemological position as being interpretivist. This means that a qualitative study aims to understand and interpret a phenomenon from the viewpoint of the participants in the research. This evaluability assessment aims to achieve these exact goals i.e. to understand the science park incubation programme intervention and its results from the viewpoint of the stakeholders. From an ontological position, qualitative research is described as constructionist. This is the belief that reality is socially constructed

and is a result of interactions between individuals (Bryman, 2012). A qualitative research strategy was therefore a fitting approach for this research topic.

Basile, Lang, Bartenfeld, and Clinton-Sherrod (2005) presented the background, process and findings of an evaluability assessment of the "Rape Prevention and Education (RPE) Programme" using a qualitative methodology. The data from the web-based interviews were analysed using SAS and descriptive analyses. The data from interviews and focus groups were analysed using NVivo, a qualitative programme (Basile, et al., 2005).

3.2 Research design

Wagner, et al. (2012) define research design as the blueprint that details how the research will be carried out. This details the appropriate methodology, the data collection method and the data analysis techniques (Wagner, et al., 2012). It is important that parts that make up the research are coherent to ensure that the "topic, research question, methodology and methods used in the study all fit within the same research paradigm" (Wagner, et al., 2012, p. 27). Babbie (2013) argues that the best research design applies more than one research method as, in this way, one is able to take advantage of the different strengths of the different designs. There are five generic designs, experimental design; cross sectional or survey design, case study design, longitudinal design and comparative design. This evaluability assessment employed case study research design, as it is specific to one organisation, a single case.

Within a case study, emphasis is on the examination of the context, using a variety of data sources (Baxter & Jack, 2008). Case studies are not generalisable in nature as they are context specific. The unit of analysis is a key feature in a case study. Baxter and Jack (2008) describe two approaches to case studies as defined by Robert Stake (1995) and Robert Yin (2003, 2006). Both approaches aim to explore the topic of interest thoroughly but employ different methods. Both approaches are based on a constructivist paradigm with social construction of reality as a foundation. The science park incubation programme was the unit of analysis for the study. This study employed an explanatory case study as described by Yin (2003) in Baxter & Jack (2008). An explanatory case study aims to explore the causal links in interventions. Although the reviewed EA's do not mention it, however, all of them are a case study of a particular context and are not generalisable.

In an evaluability assessment conducted by Bibeau, et al., (2011) of an immunisation improvement strategy in Burkina Faso, qualitative interviews were conducted with programme participants and stakeholders. The unit of analysis was the immunisation strategy within that

particular context and the results are specific for the questions posed then and can only be used in that context

3.3 Research procedure and methods

3.3.1 Data collection instrument

A data collection instrument is a tool used to gather information from target participants for the purposes of research. Literature often refers to the data collection instruments as data collection methods. Wagner, Kawulich and Garner (2012) advise that the type of data collection instrument chosen by a researcher is directly dependent on the type of information he or she is trying to collect. It is therefore important for a researcher to consider the research context prior to designing a data collection instrument, as the target audience need to be able to provide the required information (Wagner, et al., 2012). There are two key types of data collection instruments, namely observation schedule and interview schedule. The study intended to use both interview and observation schedules for data collection. However, the incubation programme has a number of processes that occur at specified intervals and because the study occurred over the Christmas period, there was not much activity in the programme.

In conducting evaluability assessments, interviews are mainly used to gather stakeholder perspectives on goals and observation schedules are important when determining programme reality. Bryman (2012) mentions that interviews are the most commonly used method in qualitative research, probably due to the nature of their flexibility. Another reason is that interviews allow the researcher to collect rich descriptive data from participants in qualitative research (Wagner et al., 2012). "An interview is a two-way conversation and a purposive interaction in which the interviewer asks the participants questions in order to collect data about the ideas, experiences, beliefs, views, opinions and behaviours of the participant" (Wagner et al., 2012, p. 133).

Bryman (2012) and Wagner et al. (2012) agree that focus groups and group interviews are variations of interviews. Focus groups encourage debate amongst the group being interviewed, whereas in a group interview, participants are asked a set or structured or semi-structured questions without encouraging debate (Wagner, et al., 2012). Data collection for the evaluability assessment was done using individual interviews and one group interview was arranged. Focus groups could not be arranged as planned due to poor availability of identified participants.

Interviews are distinguished according to their structure. A structure determines how an interview is administered. Bryman (2012) alludes that structure is a type of interview. Semi-structured and unstructured interviews are regarded as the prominent interview structures in qualitative research. In quantitative research, a fully structured interview is the alternative method of collecting survey data and is another type of interview structure (Babbie, 2013). Babbie (2013), Bryman (2012), and Wagner et al. (2012) agree that there are generally three types of interview structures, namely, 1) unstructured interviews, 2) fully structured interviews or questionnaires, and 3) semi-structured interviews.

A semi-structured interview schedule was used in this study (see Appendix 3 for interview guide). Semi-structured interviews allow the flexibility for participants to raise additional issues not thought of by the researcher (Bryman, 2012). In a semi-structured interview, the researcher has a list of specific topics, termed the interview guide, to which the interviewee can respond in a number of ways. Wagner, et al. (2012) define the interview guide as a list of questions that determines the line of questioning in an interview. It is important for the researcher to be attentive during the interview to identify and explore new emerging lines of inquiry from the participants' responses.

This research used semi-structured interviews as the researcher had a clear focus and information that she required to achieve from the interviews (Bryman, 2012). Document analysis was also employed to validate information from the interviews. The questions for the interview were sourced from the literature review, section 2.2 and from reviewing past research on a similar research topic, section 2.3. Wholey's (2010) framework was used which provided a guideline with key questions to cover during an evaluability assessment.

Literature confirms that interview schedules are a common data collection instrument used in evaluability assessments. Bibeau, et al. (2011), in an immunisation improvement strategy in Burkina Faso, also used a number of data collection activities including individual interviews and focus group interviews. Bibeau, et al. (2011) employed the services of an external interviewer to conduct individual interviews using a semi-structured interview guide. The individual interviews assessed the goals, objectives, as well as key components of the intervention. Focus group discussions were also conducted with various stakeholders and these covered the same subjects discussed during the individual interviews (Bibeau, et al., 2011).

3.3.2 Target population and sampling

Bryman (2012) describes a target population as the universe from where a sample is selected. Babbie (2013) refers to a population as the group about which the researcher aims to

draw conclusions. The researcher aims to generalise questions and findings to a certain population when conducting research (Wagner, et al., 2012). The target population for this research included the funders, policymakers, decision makers, and the incubator, made up of incubated companies and management team, tenants and TIHMCs management team within the Science Park Community.

From the population identified, a sample was drawn to use as participants of the research. Wagner, et al., (2012) explain that sampling is done because it can be time-consuming and sometime impractical to reach the entire population for the purposes of research. Bryman (2012) further expands that sampling is guided by research questions as these give an indication of what units to sample. There are two types of sampling methods that can be employed, probability and non-probability sampling. Neuman (2014) states that the type of sampling method used depends on the study, either qualitative or quantitative. This research used non-probability sampling.

The sampling technique that was employed in this research was purposive sampling with some element of random sampling. Bryman, (2012) explains that the aim of this type of sampling is for the researcher to sample participants in a strategic manner and select those that are relevant to the research. Wagner, et al., (2012) explain that with purposive sampling, often called judgement sampling, the researcher relies on his knowledge to find participants who could be representative for the population and uses specific criteria to identify the most suitable participants. Purposive sampling was used to select participants from stakeholders within the funding agency and the department. The selection of participants was based on the criteria shared in Table 4. The management team of the science park incubation programme is relatively small and it was possible to interview the majority of them, also based on criteria. Due to time constraints, it was not possible to be selective with regards to the participants, therefore, a random approach was taken where a number of participants were identified and interviewed as they appeared in the hot desk facility provided by Maxum. There were three groups of stakeholders selected based on the criteria proposed in Table 4. Each of the stakeholder groups had a different interview schedule.

Table 4: Criteria for selection of respondents

Stakeholder Group	Criteria
Funder, policymakers	Length of service with funding organisation Role in organisation
Programme Participants	Random as they were available in the Maxum hot desk facility
TIHMC Management	Duration in Programme Understanding of programme operations

In a paper written by Russ-eft (1986) on an evaluability assessment conducted on the Adult Education Programme (AEP) in the United States Department of Education, there is evidence of using criteria to determine a sample to target. The study does not explicitly detail that purposive sampling was used. However, there is mention that interviewees were selected from "congressional staff, office of management and budget staff, National Advisory Council on Adult Education staff, United States Department of Education (ED) and AEP constituents" (Russ-eft, 1986, p. 40). Amongst the selection criteria of participants from ED were that the participants selected needed to have interacted with AEP staff on a routine basis. A criterion for the EAP staff was that the participants were those concerned with programme operations and were interested when the programme regulations and priorities were announced (Russ-eft, 1986).

3.3.3 Ethical considerations when collecting data

Ethical principles in social research revolve around four main areas; 1) "harm to participants; 2) lack of informed consent; 3) invasion of privacy, and 4) whether deception is involved" (Bryman, 2012, p. 135). To ensure that this research adhered to ethical principles, an introduction letter was sent to the executive management within TIHMC informing them of the proposed study. The letter is attached in Appendix 4. A short biography of the researcher is attached in Appendix 5 to disclose the interests of the researcher in the study.

The selected participants for the study were all required to sign interview consent forms, providing their permission to participate in the study (see Appendix 6). All the interview consent forms were signed. To ensure there is no breach of confidentiality, the findings are presented in a manner that does not allow the participants to be easily identifiable in Section

4. The records from all the interviews are treated with confidentiality and codes only understood by the researcher are used to disguise their identities.

3.3.4 Data collection and storage

Given (2008) describes the term data in qualitative research as words. Most qualitative researchers consider words to be of utmost importance and generally look into the choice of words used, metaphors and the slang used. In most qualitative research, taking notes only during interviews is not sufficient and researchers usually audio-record or video record their participants. Recording interviews not only allows for in-depth analysis of participants statements, but also ensures integrity of the data. The interviews undertaken during the study were all recorded with a dictaphone with permission from the participants.

Data collected from interviews were transcribed and stored as electronic and manual files. According to Given (2008), documentation is crucial for informed use of data. In this regard, the author advises that each interview should have its own file. The contents of the file should be documented to include information about the participants in the interview, when the interview was held and where the interview was held and other important information.

This research used the five basic procedures that encompass data management namely, 1) "data storage, 2) format conversion, 3) backup copies, 4) authenticity and version control and 5) control of access and security" (Given, 2008, p. 194). Data were stored on archival media and in secure computers. A secure external drive has a copy of the data collected from the interviewed. The audio-recorded data is stored on a disc, as well as on a computer.

The backup files are important to reduce the risk of damage to data and reduce the risk of losing data. In line with best practice guidelines by Given (2008), the master file of the data collected is kept and copies are labelled as such, to maintain the authenticity of the data collected. Changes to the master files have been recorded, in instances where words were omitted to protect the identity of the respondents. Copies and different formats are version controlled. The master file is uniquely labelled as such and different versions of copies are labelled with version control applied. Lastly, access to the data is only for the researcher. This is to prevent losing anonymity of participants.

All other non-digital data that is part of the research including signed consent forms and field notes were digitised and stored electronically and manually. Schwandt (2007) highlights the importance of designing a system for organising, cataloguing and indexing material collected during fieldwork in the data log. The system allows for ease of retrieval of data and allows for ease of duplication of data to be used for different tasks. The system

designed for organising data in turn affects the conceptualisation of the data analysis process (Schwandt, 2007).

3.3.5 Data processing and analysis

Data processing is the subsequent step to data collection. The first step in processing the data collected was to transcribe the data so that it could create a write up that would be used for commenting, coding and analysis (Miles, Huberman, & Saldana, 2014, p. 71). There are different levels of transcription and they vary in the level of detail included from the "uhs, ers, pauses " to recording the straightforward summary of the main ideas. In this study, all interviews were transcribed verbatim (see Appendix 7 for an example), however, the level of transcription was not detailed enough to capture the pauses, and sighs of the interviewer. According to Forman and Damschroder (2008), it is important to have rules for each transcription, especially in instances with a number of interviewers. A few standard rules were observed in this study, even though there was one researcher. The header of each transcript has the recording number, participant ID, interview date and interviewer's name. The footer of each transcript contains a page number for ease of reference. It was easier to confirm the accuracy of the recordings in this study as the interviewer and the researcher was the same person. The last step in transcriptions was to remove all information from the text that could expose the identity of the participant (Forman & Damschroder, 2008).

The next step was the analysis of the data. Grbich (2013) describes the key stages in the process of qualitative data analysis. First, the process is an iterative process and requires the researcher to read and re-read the data and compare across it. Second, the researcher reviews and analyses the transcribed data highlighting key segments that are aligned to the research questions, theoretical frameworks from literature. Third, the data are fragmented and segments are matched with other like segments across the data and grouped. Fourth is the attachment of overarching labels and identification of sub-groups. Fifth and lastly, the groupings are conceptualised and linked with literature and theory.

This study employed qualitative content analysis to analyse the data. Schreier (2012) explains that qualitative content analysis describes the meaning of material. The analysis uses the research questions to specify the angle from which you examine data. This subsequently allows one to change the coding frame should important aspects arise during content analysis. The main difference with qualitative content analysis and other qualitative data analysis methods is that it focuses on certain aspects of the material. In this manner, the analysis also helps one to reduce data. Shannon and Hsieh (2005) explain that there are three approaches used in content analysis. First, the authors describe conventional content analysis, which is

useful when theories on a phenomenon are limited. In this type of analysis, researchers do not use pre-determined themes, but rather develop themes from the data. Elo and Kyngas (2007) refer to this type of analysis as inductive content analysis. In most cases, the results of conventional content analysis is concept development or model building, (Shannon & Hsieh, 2005).

According to Shannon and Hsieh (2005), directed content analysis is the second type of content analysis. This type of analysis is also referred to as deductive content analysis, (Elo & Kyngas, 2007). Directed content analysis is used in contexts where the researcher aims to test existing theories or theoretical frameworks in a new context. This evaluability assessment employed this technique during the data analysis stage, and used some themes from the data. An extract from the codebook used is attached in Appendix 8. Shannon and Hsieh (2005) explain that in directed content analysis, the initial step is the identification of coding categories from key concepts on existing theories or prior research. The definitions for each coding category are based on theory. The advantage of directed content theory can be used to support and extend existing theory.

The third type is summative content analysis. Shannon and Hsieh (2005) describe that this approach begins by identifying and quantifying usage of certain words in the text with the purpose of understanding their context. In this approach, the interpretation of the context is based on the number of times a word or phrase is used.

3.3.6 Description of the respondents

The following charts describe the demographics of the respondents that participated in the data collection phase. The respondents included representatives from the Department of Economic Development, the Gauteng Growth and Development Agency, The Innovation Hub Management Company, Maxum incubation companies, as well as participants from the Maxum incubation programme. The study had sixteen respondents. The demographics are grouped per category to protect the anonymity of the respondents.

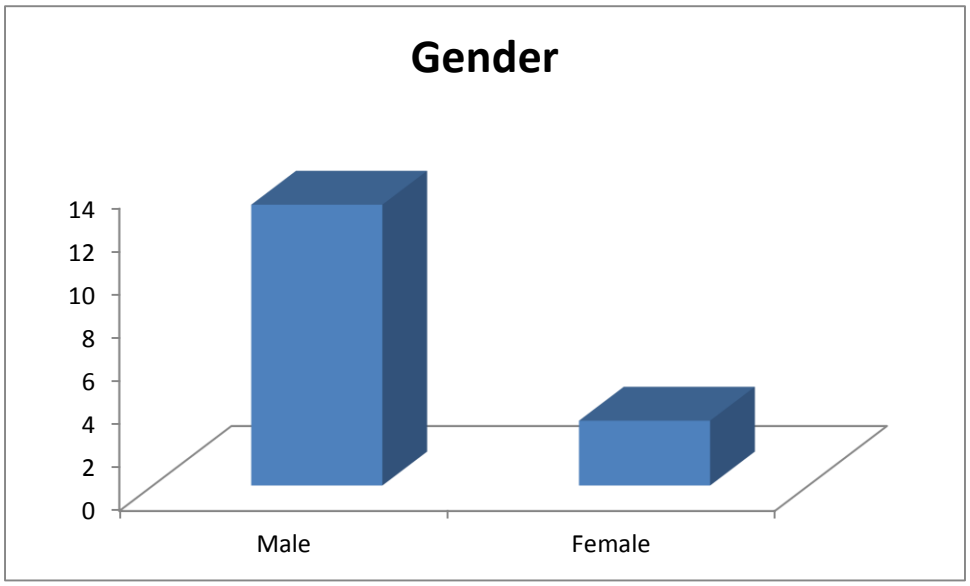

Figure 12: Gender split of respondents

As can be seen in Figure 12, over 70 per cent of respondents were males. The age profile of the respondents ranged from youth to participants over the age of 60 as depicted in Figure 13 below.

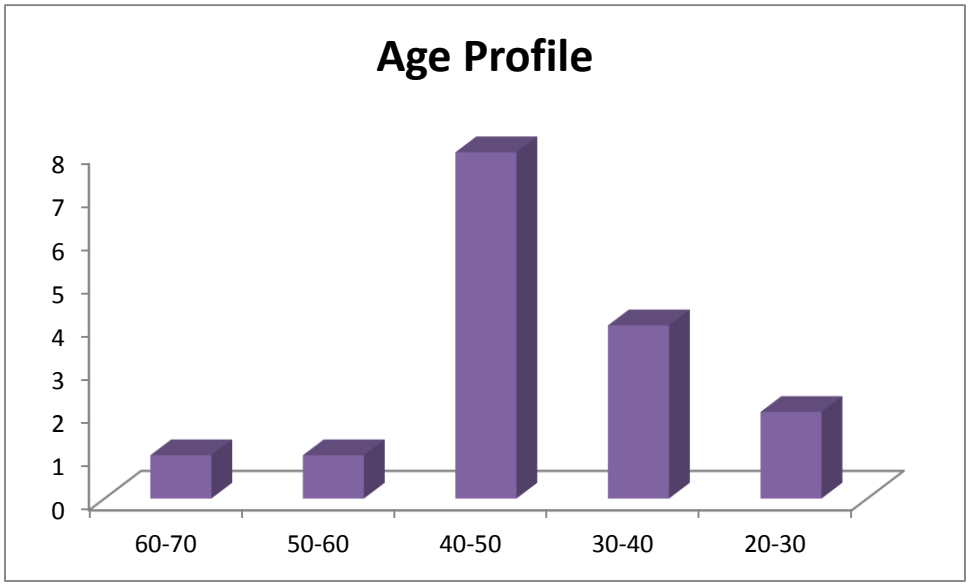

Figure 13: Age profile of respondents

The education levels of the respondents ranged from the undergraduate level to some of the respondents having qualified at a doctoral level as can be seen in Figure 14.

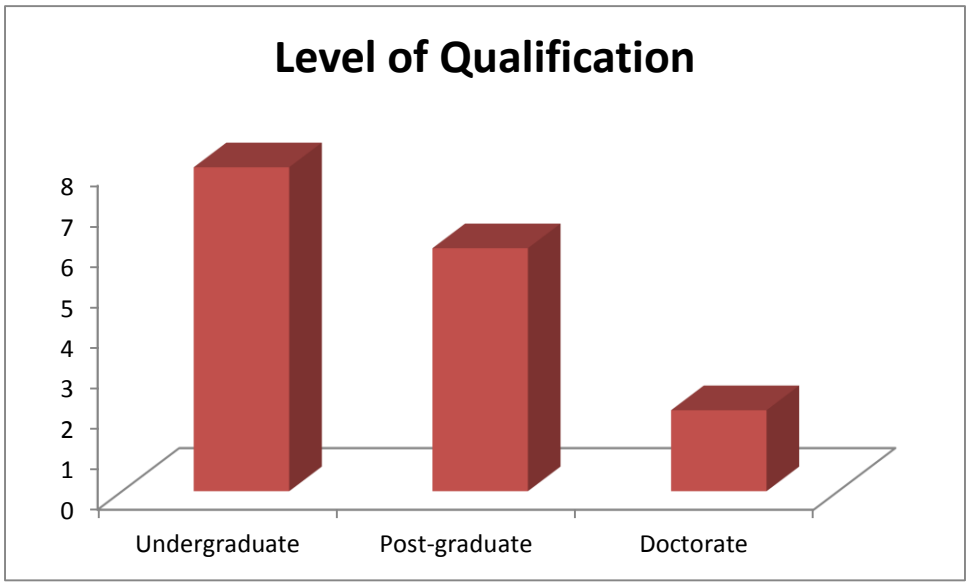

Figure 14: Education levels of respondents

All the respondents interviewed were in management positions within their respective organisations as can be seen in Figure 15.

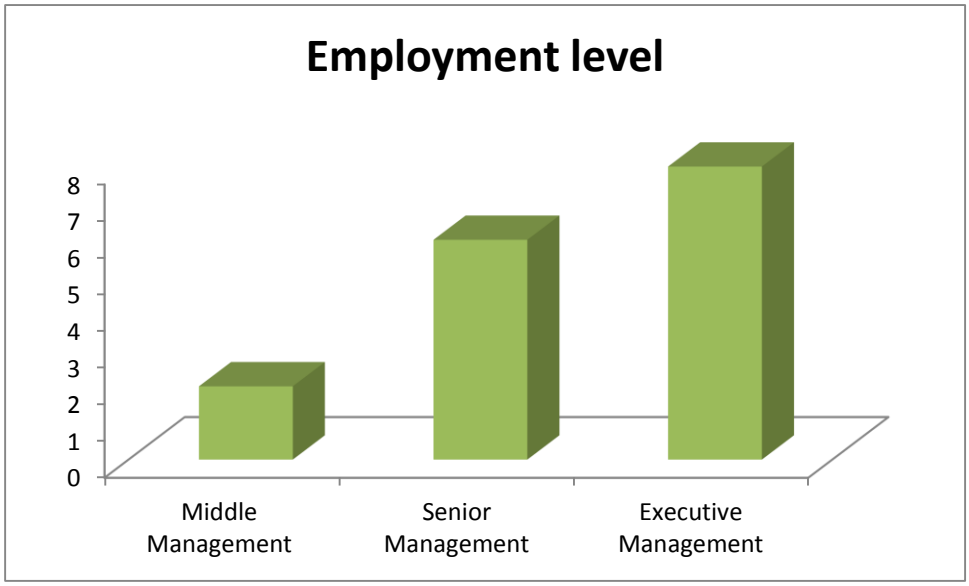

Figure 15: Employment levels of respondents

3.4 Research reliability and validity measures

Neuman (2012) describes reliability as dependability or consistency. Validity is defined as usefulness. Reliability and validity are mostly terms used in quantitative research that are concerned with accurate measurement and different terminology is used to refer to these terms in qualitative research (Bryman, 2012; Neuman, 2012; Wagner, et al., 2012), Guba and Lincoln (1994), in Bryman (2012), proposed another criterion to assess the quality of social research. They used the terms trustworthiness and authenticity as alternative terms to reliability and validity. Bryman (2012) describes trustworthiness as made up of four criteria, credibility, transferability, dependability and confirmability. Credibility of findings entails ensuring that research is carried out according to good research practice and that participants in the study are presented with the findings for confirmation. Wagner, et al., (2012) describe this technique as member checking to verify understanding with what was observed. Another technique used to increase the credibility of qualitative data is triangulation. Wagner, et al. (2012) explain that triangulation is possible only when using different data gathering techniques and instruments and different sources of information are used to measure the same thing. Guba and Lincoln (1985), in Bryman (2012), encourage researchers to use rich descriptions of the contexts in order to maximise chances of transferability of the findings to other environments.

Dependability is the application of the audit approach in research and requires all records of the research process to be kept safe. Confirmability is ensuring the researcher has acted in good faith and not allowed personal values to interfere with the research process, (Bryman, 2012). Neuman (2012, p. 214) summarises that authenticity means offering a "fair, honest and balanced account of social life from the view point of the participants in the study". This study employed a combination of these techniques to increase the trustworthiness of the findings. The interviews and document analysis were used to increase the credibility of data collected. According to Schreier (2012), having an additional resource to code during the data analysis phase also increases the trustworthiness of the findings. The coders are able to analyse the data and compare codes that are picked up in the data. A colleague was used to verify the codes identified in the study.

In the evaluability assessment by Ostie-racine and Dagenais (2013), the interviews of the 20 evaluation partners were all recorded and transcribed for analysis. Documents relevant to the evaluation were collected and reviewed as well to complement the information from the interviews to triangulate data sources, and maintain validity of the study. The evaluability assessment by Bibeau, et al., (2011) of an immunization improvement strategy in rural Burkina Faso also used triangulation of data sources to increase the trustworthiness of their findings.

A combination of document reviews, individual interviews, focus group discussions and observations during site visits was used. Although it is not explicitly mentioned in the article by Bibeau, et al., (2011), but the methods used were to increase the credibility of findings by using many sources to confirm findings.

3.5 Research limitations

This study was not generalisable to other science park incubation programmes due to a number of techniques and methodological choices made. The use of purposive sampling in selecting the participants limits the generalisability of the study as the views of the selected participants cannot be regarded as those of the entire population. As detailed in Section 3.2, case studies by nature are context specific. Consequently, the results and findings from this study may not be generalised to other science park incubation programmes even though there may be similarities that will be observed from prior studies detailed in Section 2.3.1. It is also important to note that the research occurred at a particular point in time and there may be new developments that may render some empirical findings irrelevant subsequent to the study within the Gauteng science park incubation programme.

4 PRESENTATION OF FINDINGS

In this section, we present the findings from the analysis phase. Our findings respond to the initial questions posed in Chapter 1 of the study. To recap, there were five questions posed that would assist the study to determine whether the Gauteng science park incubation programme meets the conditions to have a meaningful and credible evaluation. First, what is the Gauteng science park incubation programme intended to do? This question is answered with a logic model of the programme. Second, how is the programme currently operating? The findings represent any common areas and highlight differences compared to the logic model responding to the first question. Third, are the Gauteng science park incubation programme objectives plausible, given the way that it is operating? A response to this question is given, based on the assessment of the factors that affect plausibility. Fourth, what are the possible measures of programme performance? Lastly, is the programme ready for an evaluation and which evaluation options are appropriate for the programme? The last question is appropriately answered in Section 5, discussion, section, once all the key considerations of evaluations and evaluability have been taken into account. For the purpose of Section 4, we present the findings to the second part of the last question and present evaluation types proposed by participants.

4.1 Clarified aims and objectives of the science park incubation programme

Stakeholders from the Department of Economic Development and the Gauteng Growth and Development were interviewed to clarify the goals and objectives and the incubation programme. Document analysis of policies and strategic documents of the department were reviewed to triangulate data sources. Directed content analysis was applied using the following themes from theory; intended change, intended behaviours, outputs, activities. This informed the development of a theory of change for the programme as follows:

The Gauteng government provides resources in terms of funding and the science park facility to the incubation programme so that it can deliver business assistance and infrastructural support to entrepreneurs within the knowledge-based sectors. The business assistance provided is in the form of access to markets, research collaborations, access to experts, mentoring and coaching, access to networking platforms, access to funding, training on financial management and intellectual property management as well as access to legal and

contract specialists. These services enable the entrepreneurs to produce commercially viable new ventures that grow and create decent job opportunities in Gauteng.

Innovations from knowledge based sectors within Gauteng will lead to the establishment of new businesses thus creating employment opportunities and contributing to economic growth within the region.

Maxum incubation programme provides infrastructure and business support to innovators and inventors that establish new ventures to commercialise new technologies within targeted sectors. The incubation programme provides business infrastructure support in the form of access to office space equipped with access to office facilities (telephone, printer and internet) are provided with business support in the form of access to funding, access to markets, coaching and mentorship, legal and IP support as well as networking opportunities, the entrepreneurs are able to develop new products and start commercially viable entities that will lead to new industries and new jobs created within Gauteng.

The theory makes assumption that the businesses incubated in Maxum will create increase demand for jobs as they are established. The businesses established from the programme will be high growth firms that are able to create jobs. The new established companies within the science park will be able to cluster and create new economies that will improve the economic performance of the province.

The understanding of the programme from the stakeholders' perspective was at a strategic level as opposed to an understanding of the daily operations of the programme. In a number of cases, the officials at the stakeholder level confessed to having limited understanding of the details of the Maxum programme, however, there was general consensus on the desired impacts that the science park incubation programme should have in Gauteng. The respondents all wanted to see commercialised entities that are participating in the economy, creating innovations that benefit Gauteng. A key word used by almost every respondent was that the companies that come out of the programme should be "sustainable". However, it did not come across clearly on who the targeted beneficiary is for the programme. The majority of the respondents believed that the current Maxum application criteria were appropriate as long as these afforded all innovators the opportunity to participate. The response from the other participants was similar to those raised by R3 as follows:

> "I don't think there is that distinction that needs to be made, I think the starting point the be it all for Maxum and TIH, is largely that it's innovators, irrespective of whether they are rural, they are urban whether they are youth

> or older people the importance of the common denominator should be that these are innovators or people that are in the smart industries. So it does not matter their location, gender provided they satisfy that criteria and are able to innovate and invent and be in the smart industry"

One participant was of a different view and believes that the beneficiaries of the programme should be those that have prior work experience, skills and exposure to the work environment, so that they can be practical in their approach of entrepreneurship. R1 highlighted the issue of current age group of beneficiaries.

> "I think what we need to be looking at should be entrepreneurs that are possibly in their 40s that sort of era. Because it is people who have come out of university, gone into the corporate environment, saw opportunities and they come with an understanding of how business works. What we do is we take university graduates they come up with bright ideas, there is nothing wrong with that but then where is the practicality?

The type of innovations or technological ideas that are incubated in the programme also provided for various opinions from the participants. The respondents believe that the innovations incubated at Maxum should be community focused or geared towards improving the lives of the population of Gauteng and should create job opportunities. Amongst other, R2 and R5 emphasised this point as follows:

> "Innovation does not have to be complicated, in my view, in fact, the more it responds to the needs of society the better and the needs of society are not sophisticated. It's about what society eats, it's about what society drinks, it's about what the sick in society take its about what people in society move from one place to another all of those things, how they keep clean. [The] more responsive to community needs then you are assured of your relevance".

> "It does not help to innovate something that is not going to resolve some challenge in the market space. And when we say market it could be government, private sector, commercial sector".

4.2 Implementation of the Gauteng science park incubation programme

The themes that were used to come up with the programme logic from the management's perspective were the same, including, goals, outcomes, outputs, inputs and activities. Document review of internal programme strategies was used as a method of data triangulation. Figure 16 depicts the programme logic of Maxum incubation.

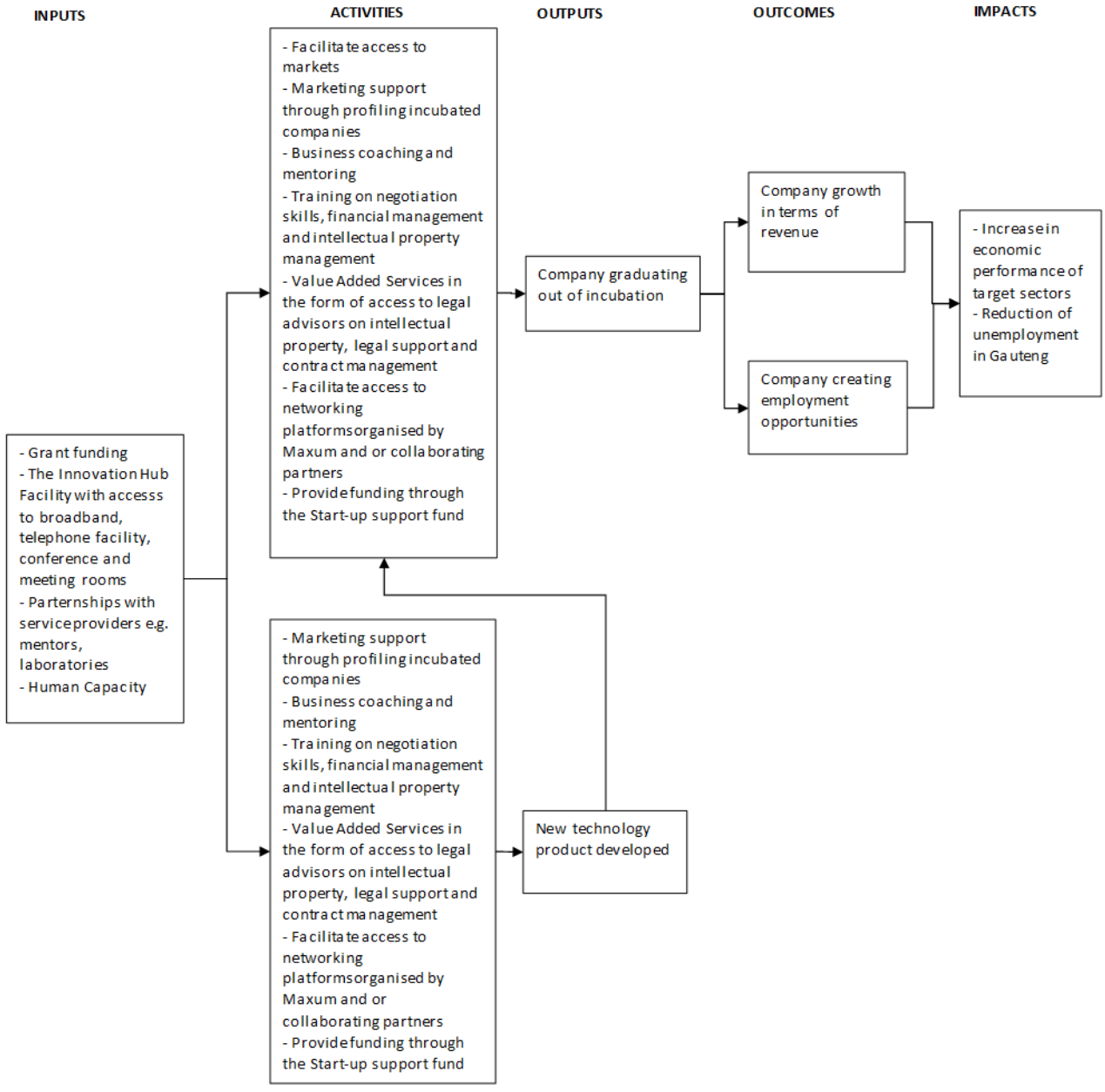

Figure 16: Maxum Programme Logic

The logic model illustrates that the understanding is consistent from external stakeholders and well as internal management. The stakeholders and the management team

agree on the goals for the programme and on its design. The goal of the programme is the creation of new commercial entities that will grow and contribute to the economy in one way or another. The incubation programme is mandated to deliver new commercial ventures to market that have to be sustainable. The GGDA and the Department have made this investment into the programme as they believe it will yield job opportunities.

The desired impact of the Maxum incubation programme, from internal managements' perspective, is to create companies that are sustainable in the market. The incubator aims to achieve this goal through providing support in terms of mentoring, financing opportunities and access to market opportunities to companies incubated in the programme. The inputs of the programme are consistent with those detailed by the stakeholders and with those identified in Chapter 2. The budget allocation and the facility are key inputs into the programme. It is assumed that if these inputs are in place, the incubator is able to provide the companies in incubation with the support services. As can be seen in the logic model, there are two stages at which outputs are produced. The outputs of the Maxum pre-incubation stage, a developed product that has initiated one sale or commercialisation is also the input of the Maxum core incubation phase that can take as long as three years. The services received during the period are similar to those in the pre-incubation programme even though the focus is on customer development. According to management, the incubatees graduates out of the programme when they have demonstrated sales and cash flow for a period of six months. The new company is expected to grow in terms of revenue and be competitive in the market. The implementation of the programme is therefore aligned to the programmes theory.

4.3 Plausibility of the Gauteng science park incubation programme in meeting its aims and objectives

From the data analysis phase, we identify factors from the themes that affect plausibility. These include; adequacy of resources to enable the programme to achieve its results, current results achieved as well as efficiency of programme implementation and processes.

4.3.1 Adequacy of resources to enable programme

Stakeholders and management agree that the resources for the programme are not adequate. All respondents agreed that financial resources for the programme are inadequate as government has limited funds as well. Forty per cent of the respondents believed that the adequacy of resources is linked to the results programme and cannot be determined in isolation. R3 explained his view on the matter as follows:

> . "let's take a rear view mirror and look at what [has] been our success to date. [There] is still a big question mark in relation [our successes] and I could be wrong, but the success that we are having in so far as commercialisation vis a viz where we [are] at, could be a factor that determines if we are spending enough or not".

Resources in terms of capacity were also highlighted as another limiting factor in running the programme. For a long time, the programme only offered administrative skills to its incubatees and the management expertise required to commercialise programmes were not available. The programme relies on mentors for these lacking skills. It was highlighted in Chapter 2 that a key criteria of science park incubation programmes is the strong vast management skills of the incubator staff (Durão, et al., 2005), and this has been a missing component in the programme. Over the past five years, Maxum, has had up to two resources in the programme responsible for both the administration of the programme and strategic oversight and maintaining relationships within the programme.

4.3.2 Results achieved to date

Stakeholders and management had differing views in terms of the results achieved to date by the programme. Both management and the stakeholders were unable to be specific about the results achieved to date and reference was made by both groups to one company

that is currently operating and has received great media coverage in the past year. This finding is unexpected, as in Chapter 2 the results of the programme were illustrated in Table 3. The respondents provided mixed reactions in explaining the programmes' results to date. Some of the positive results as mentioned by R9 and R10 were captured as follows:

> "I mean we have not seen much [success rate] but as programme has just been revamped in the past two or three years maybe it's too early to also expect that much. [However] in terms of the success rate [of] sustainable companies that has come out of the programme at least we are starting to see a lot of products getting to the market, whether they will survive [and become sustainable] is what we still have to see. [We have not seen much in terms of sustainability]
>
> It's difficult to say because I don't think we've ever looked at it in a very comprehensive way since inception. You know there [was] very little concrete evidence of things still operating in the market place. [There was] one company that had a breakout of 600 jobs or something but you know that is an anomaly in the wake of all the other activities.

Some of the respondents acknowledge that the programme has achieved results over the years. However, the concern was whether the results meet the desired expectations from the programme and whether the results are adequate in relation to the performance of the programme. R1 and R3 responded as follows:

> Like I say, it's not much unless people are hiding it from me. But I think it would be unfair to say there has not been results. In my view, I don't think [the results] have been impactful. So there has been [results] but in terms of commercialisation, job creation and manufacturing and all of that the impact has not been there.
>
> I think we are battling to say this has been the success rate, you take number of companies that have been through our incubation programme including Maxum and say this has been the rate of success, I don't know what percentage you'd put it at

Performance measures for the Maxum programme are presented in Table 3 in Chapter 2. The performance of the programme is measured on four indicators including, 1) number of incubatees in pre-incubation, 2) number of incubatees in Maxum core, 3) number of innovations commercialised, 4) number of jobs created from the entities. The programme uses incubation contracts signed between the programme and entrepreneur for the first two indicators, an invoice on the sale made by an entrepreneur is used as evidence for the third indicator and the jobs created are confirmed by a letter from the company providing employee details. There is no mechanism in place to verify that the innovations commercialised and the jobs created are a direct result of the incubation programme. The company has not been measuring its output of graduating companies out into the market, nor does it monitor the performance of companies that have graduated out of it.

4.3.3 Sufficiency of activities

The participants, both at a management level and at the stakeholder level, believe that the activities within the Maxum programme are sufficient and in line with science park best practice. This is indeed the case as understood from the literature review. The Maxum incubation programme provides shared services, financing, access to telephone and internet, resources and support to new firms as identified by Lindelöf and Löfsten (2002). The beneficiaries are also generally comfortable with the services offered in the programme and believe The Innovation Hub brand gives credibility to their businesses. R14 expressed his view as follows:

> "At this stage this area [referring to the Innovation Factory hot desk facility] makes a bigger difference than most would think and I wouldn't say services but just the name of The Innovation Hub it holds leverage for business owner".

The Maxum programme offers business mentorship provided by external experts. This offering is one of the indicators that show that an incubator has good networks. The TIHMC mentorship contract mentions that mentors are required to provide three hours of mentoring to an entrepreneur over a three months' period. The beneficiaries also raised a few concerns on the blanket approach to training provided within Maxum and the referral system used to access experts. Another concern was the issue of intellectual property theft by the experts that are meant to assist the entrepreneurs. The programme affords both entrepreneurs in the pre-incubation programme and core incubation programme the same training. R15 raised the following challenge with regards the training provided:

> It is valuable but there is a different level to the training so you can't just throw guys who are in pre- incubation together with guys that are in [Maxum] core and provide them with the same training. [The entrepreneurs] won't [process the information in the same way and level]
> …the programme just needs to be restructured in terms of looking at, prior to getting into the programme, a proper needs assessment for the business owners so that they can give us different services separating the core guys from the pre core guys, [and separate by individual needs]

4.3.4 Efficient programme implementation

The Maxum programme, as discussed in Chapter 2, has two phases to it, the Innovation factory and Maxum core phase. The programme only has a Maxum strategy document in place to guide the implementation of the programme. The programme does not have policies in place that clarify the criterion for candidates suitable for the innovation factory and those suitable for the core. The INBIA incubator assessment tool presented in Chapter 2 highlights the need for policies with regard to selection, graduation and exit from an incubation programme. According to the participants, the programme does not advertise to recruit and is flooded with applications. Once an application is received, the potential entrepreneur is invited to pitch their business concept to a panel. The panel then decides on who is accepted into the programme based on the criteria presented in Chapter 2. All entrepreneurs go through an induction session upon acceptance in the programme. R9 raised concerns on the calibre of some entrepreneurs that are participating in the programme as follows:

> Coming from the fact that we are a developing country with a whole lot of unemployed people and a whole lot of people from previously disadvantaged communities, there is fair number within the incubated companies that you may say are not entrepreneurs. They just get into entrepreneurship because they are surviving [because] they cannot get a job [and] are unemployed so they eventually [they] just try anything that comes as an opportunity. So [it] becomes difficult whatever you put in place to really change them to become business minded persons. Unless they themselves change their attitudes. But there is a fair number of that and also resources are limited and most of these companies some of them they barely have [anything] and [whilst you] also want them to succeed in their business, you also don't want them to depend on the grants

> because they are not going to be sustainable. [Therefore] to strike the balance between supporting them at the same time that they are also surviving [is] tricky [and] one has to assess each case individually.

The programme collects data on a monthly and ad hoc basis for internal purposes and also for organisational monitoring purposes. The programme collects and keeps records of the incubated companies' revenue through the collection of financial statements. The incubated companies are also contractually bound to receive training on a portal that the programme uses for data collection, however, it is not certain whether the portal is regularly updated or useful. A recently introduced financial management system is in place to capture details of company financial details. The financial system is not effective yet, since entrepreneurs are reluctant to provide this information for various reasons. The incubator also has a database of the number of candidates in the programme and the profiles of candidates.

Monitoring reports in terms of mentoring engagement and hours kept and used for billing purposes. The mentor reports are important and used to determine whether an entrepreneur should continue receiving support in the programme, as well as whether the entrepreneur can proceed to the next stage of the programme. Growth wheel assessments form part of the monitoring tools used in the Maxum programme. The Growth wheel criteria are presented in Figure 17.

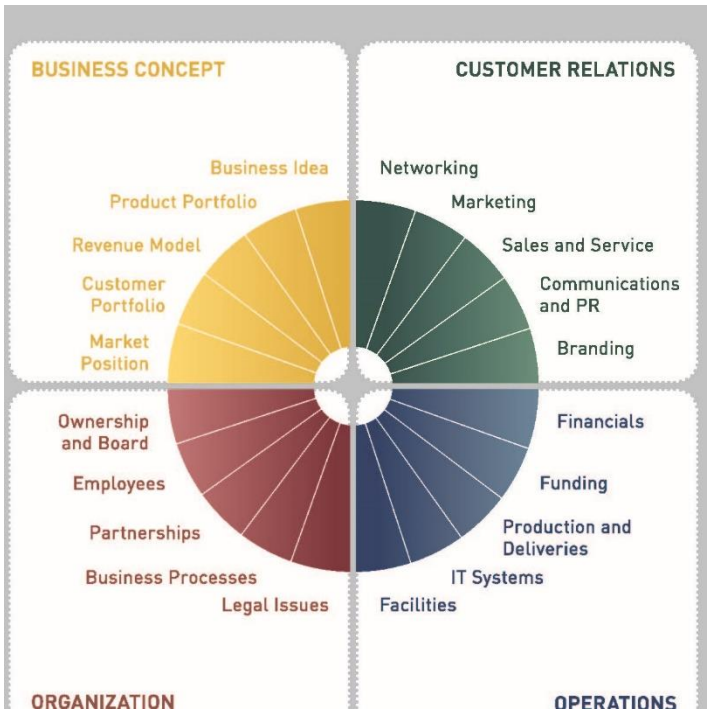

Figure 17: Growth Wheel Assessments components

The incubator also keeps records of all applicants to the programme. All the data collected in the programme is filed manually with no particular data management process.

4.4 Performance measures of the Gauteng science park incubation programme

In this sub-section, we address what we found about the respondents who were interested in measuring and the current measures of performance of the programme. Maxum currently reports on four performance indicators that can be found on the Annual Performance Plan (APP) of The Innovation Hub Management Company, the APP of the Gauteng Growth and Development Agency and the APP of the Department of Economic Development. The information required in the performance scorecard is 1) the number or companies incubated in Maxum core, 2) number of companies incubated in Maxum pre-incubation, 3) number of innovations commercialised, 4) number of jobs created. Another indicator that was measured in the past, was the number of companies graduating from the programme.

The respondents are comfortable with the indicators as these are approved by the Board of the entity and are agreed upon with the shareholder during the planning period of the organisation. Some of the respondents are not comfortable with the level of understanding for the programme these measurements provide. The understanding of these performance measures is different at the funders' level and the policymakers' level. Respondents from the funding organisation are comfortable with the information reported even though they believe it does not provide strategic information: R2 and R7 believe that the information being reported on is missing detail that would enable them to understand the programme better:

> "The [reports] won't tell me fifteen ideas that have been explored in the past month and two of them have been taken to the next level and perhaps therein sits a bit of a challenge for us and criticism objectively and [that is that the Department of Economic Development] should develop an even deeper interest than we are doing now.
>
> But the targets on the APP [annual performance plan], they do not cover the outcomes. You know the targets that are on the APP at the moment they are at the output level, so we would want to see the outcome, the product at the outcome level and at the impact level. We have not yet realised that".

Dissemination of performance information across the group is also not effective. Some participants have some understanding of the programme and there are extreme cases like R8, at a stakeholder level, that are not provided within accessible information regarding the performance of the programme:

> "I get nothing … so I am really out unless if I was to read the APP report I don't know a lot, but I've visited the programme I know the platforms they have been demonstrated to me but on the outcome side I do not know".

4.5 Is the programme ready for an evaluation? What evaluation options are appropriate for the programme?

According to Wholey, et al. (2010) any programme or intervention can be evaluated at any time and this applies to the science park incubation programme as well. However, it is important, although not compulsory, for an evaluability assessment like this one to be conducted as pre-evaluation research to inform future evaluations. This assists programme managers to identify gaps that can inhibit a credible evaluation. The evaluability assessment also serves as a good base to understand the programme and enable stakeholders to determine appropriate evaluation questions.

The stakeholder participants were asked to share possible evaluation questions for the programme. The answers to these questions would then determine what type of evaluation the stakeholders felt was needed for the programme. Table 5 illustrates the types of questions posed and the complementary evaluation type that would address it:

Table 5: Evaluation Questions from stakeholders

Evaluation questions	Evaluation Types
- What would be the situation without Maxum? What was the policy objective for establishing Maxum? Who is the right target audience for Maxum? Is the programme addressing the key objectives and mandate of the Innovation Hub as an institution?	Diagnostic
What are the processes in Maxum? Is there a point where the programme can self-finance? Over the past 10 years was the programme able to achieve what it set to achieve and at what scope? Does the programme have outcomes in terms of how it aims to change peoples' lives?	Process evaluation
What has come out of Maxum? What has it done and who has benefitted from it? Where are the companies that have come out of Maxum? Do they still exist?	Outcomes evaluation
To what extent has Maxum, as it stands, contributed to our challenges of economic growth, jobs, unemployment and poverty. Is Maxum helping in any way with those three? What impact did Maxum have in terms of creating jobs?	Impact evaluation
Did the Department of Economic Development realise the value of the resources that were spent in the programme?	Cost Benefit analysis

4.6 Conclusion

Management and stakeholders are in agreement of the logic of the programme even and the programme is implemented according to design. The theory of change of the programme has not been able to yield the desired results. The respondents believe that the programme has the correct activities in place however, the resources are not adequate to support the implementation of the programme. The implementation of the programme is also difficult to assess without programme policies in place. Stakeholders are also unclear about how the programme is implemented but are aware of some activities from the programme.

The programme results produced to date are not to the expectation of both management and stakeholders. The programme has a performance monitoring framework in place, however, stakeholders believe that the measurements and information being measured is not is not sufficient and does not communicate the progress of the programme towards the desired goals. Furthermore, management believes that the indicators on the framework are not measuring relevant information to be able to track the progress of the programme towards achieving its goals.

Programme stakeholders and management want a future evaluation of Maxum to explain the relevance of the programme. The design and implementation of the programme are also areas that need an evaluation so that areas of improvements can be identified and also to increase understanding of the programme by stakeholders. As the programme has been in existence for over 10 years and has been funded by government all this time, both stakeholders and management are interested in evaluating the outcomes and impact the programme has achieved over the years. The shareholders are particularly interested in understanding whether there has been any economic value derived from investing in the programme.

5 DISCUSSION OF RESEARCH FINDINGS

This section interprets and discusses the empirical findings presented in Chapter 4. This section engages theory detailed in Section 2.6 to interpret the empirical findings. To recap, the study is an evaluability assessment and thus aims to clarify the programme goals of the Gauteng science park incubation programme, determine whether they are plausible as well as to confirm the availability of data to support future evaluations. The discussion commences with a determination of whether the interventions goals are plausible in Section 5.1. The theory of change is used as the theoretical framework for the discussions, supported by relevant theories at each stage of the programme logic. Section 5.2 discusses the empirical findings of the programme in relation to implementation theory. In Section 5.3, we discuss the findings related to the performance measures of the Gauteng science park incubation programme using the theory of change and logical framework approach as an analytical framework. The discussion concludes with a review of the possible evaluation questions for the Gauteng science park incubation programme in Section 5.4.

5.1 Plausibility of the Gauteng science park in meeting its goals and objectives

The logic model of the Gauteng science park incubation programme that captures its theory of change is depicted in Section 4.2. Empirical findings show that both parties are in agreement of what the goals of the incubation programme are, however, the logic models depict the goals from the point of views of both at different project level. A theory of change statement for the programme can therefore be defined as follows: The Gauteng government provides resources in terms of funding and the science park facility to the incubation programme so that it can deliver business assistance and infrastructural support to entrepreneurs within the knowledge-based sectors. The business assistance provided is in the form of access to markets, research collaborations, access to experts, mentoring and coaching, access to networking platforms, access to funding, training on financial management and intellectual property management as well as access to legal and contract specialists. These services enable the entrepreneurs to produce commercially viable new ventures that grow and create decent job opportunities in Gauteng.

As detailed in Section 2.6.1, the theory of change is a hypothesis that explains why a programme does what it does and how it aims to achieve the desired results. MacKenzie and Blamey (2005) posit that theory of change development is a collaborative process that should occur at the planning phase of the programme to acknowledge gaps in the programme and

manage expectations and clarity of the desired results. A good theory of change is one that is plausible, do-able and testable. At this stage, the evaluability assessment performs a key role of a design evaluation which is to understand whether the programme has a strong theory of change. Campbell (1996) in Weiss (1998) advances that the viability of a programme theory is tested through pattern matching. In this process, the expectations generated by theory are compared with those from the empirical data to determine how well they fit. Going forward, the study assesses how well the theory of change stipulated in the previous paragraph fits with relevant theories to determine whether the logic chain is plausible. In the absence of a single incubation theory, the study will use a number of theories to test assumptions made on the different levels of the programme logic.

5.1.1 Inputs to activities level

The discussion commences at the input level of the programme logic. The research themes identified at this level during the analysis phase is adequacy of inputs and quality of inputs. The themes can be translated into the assumptions made in the linkages. The inputs for the science park incubation programme include the facility, funding from provincial government as well as partnerships that facilitate access to resources for the entrepreneurs, as could be observed in Section 4.2. The management team of the programme is considered a key input of the programme as should be the case with science park incubation programmes. The empirical findings also revealed that the funding resources as well as human capacity are inadequate. Innovators are also inputs into the programme and they are recruited through public calls in the media and most through walk-ins and referrals. The empirical findings suggest that the quality of entrepreneurs recruited into the programme is poor.

The knowledge spill-over theory of entrepreneurship developed by Audretsch, et al., (2009) posits that new product innovations come from incumbent firms in the form of large corporations with R&D facilities or research institutions. According to this theory, entrepreneurial opportunities are realised when incumbent firms develop new knowledge but do not commercialise it. Entrepreneurship, therefore, becomes the channel through which new knowledge from incumbent firms spills over to start-up firms. Organisations like science parks need to have strong operational linkages to such incumbent firms in order to access new knowledge (Durão, et al., 2005). According to the knowledge spill-over theory, it is important to account for the source of knowledge opportunities as an input into entrepreneurship and within a knowledge-based environment, this source needs to be incumbent firms. The real options driven theory of business incubation proposed by Hackett and Dilts (2004) supports the knowledge spill-over theory and posits that incubation performance is positively related to

an abundance of resources in terms of access to a selection pool of good quality innovations, experienced entrepreneurs, impeccable networks, as well as funding.

Consequently, the plausibility of the theory of change for the Gauteng science park incubation programme at the input level is weak because there is no evidence to suggest that recruitment of new knowledge is a structured pro-active effort targeted at obtaining candidates with good quality innovations from the source. If entrepreneurial opportunities are realised when incumbent firms generate new knowledge but do not commercialise it, then this creates an opportunity for the incubator to have access to good quality innovations that have good potential for success. The limited funding resources also weaken the plausibility of the programmes' theory at the input level. The inadequate resources have three key implications for the incubator; 1) the entrepreneurial opportunities incubated at the science park are of substandard quality and have minimal chances of making it to commercial markets, 2) the inadequate resources may negatively affect the intensity of activities offered to the entrepreneurs leading to poor results, and 3) if the programme is to manage with the current inputs then only a select few entrepreneurs in Gauteng can be afforded incubation services within the programme.

5.1.2 Activities to Output level

The research themes at the activities level included adequacy of activities as well as appropriateness of the activities. The themes at this level also represent some of the assumptions made at the linkages. Empirical findings illustrate that the Gauteng science park incubation programme offers business assistance in the form of access to funding, access to networks, access to markets, as well as access to mentors and coaches. Access to funding is provided through a small fund within the programme. The organisation, as a whole, has a number of networking events to expose the entrepreneurs to funders as well as potential markets. Mentorship is a standardised offering in the programme, with the entrepreneur required to meet with a mentor external to the programme for at least 3 hours in a month. The mentor monitors the performance of the entrepreneur and offers business advice to the entrepreneur. Recommendations made by the mentor influence the relationship of the incubation programme management and the entrepreneur. Internal programme management focuses on managing administration for the programme as well as building networks for the programme.

Durão, et al. (2005) emphasise that strong management skills and competencies of the internal incubator team are the most important asset to an incubation programme. The presence of an internal management team differentiates a science park from other office or

industrial parks. The co-production theory is used by Rice (2002) to explain the incubation manager-entrepreneur company dyad within an incubation programme. The theory of co-production applied in business incubation posits that the incubation manager and the entrepreneur engage in co-production to make up for the firms' knowledge gaps, resource gaps and competencies. According to the theory, the incubation manager that invests more time in co-production and uses various modalities of co-production has a greater impact and realises positive results. Furthermore, the theory suggests that entrepreneurs that exhibit greater readiness to engage in co-production benefit positively from the co-production activities as opposed to those that are unmotivated. The theory highlights the need for an incubation programme to structure its internal human resources in a manner that allows maximum time allocation to be on co-production activities. Hackett and Dilts (2004) real-options theory, supports the co-production theory and also posits that monitoring and business assistance in terms of time intensity of support provided, as well as the comprehensiveness and quality of the support provided to entrepreneurs is positively related to the incubator outcomes.

The plausibility of the programme at the activities level is weak, as the programme does not offer an appropriate activity that transforms the inputs into the desired outcomes. Capacity planning and an understanding of competencies and roles required for the programme is lacking. Consequently, the Gauteng science parks' incubation programme is a referral programme where external service providers offer most of the key services. This may negatively affect future evaluations as it will be a challenge to directly attribute the role of the incubation programme to the results achieved by the entrepreneur. This may also explain why the entrepreneurs in the programme view the facility as the most valuable offering of the programme and have little regard the other services of the programme. The inverse proposition of the real options theory that low intensity of time realised in monitoring and business assistance leads to poor incubator outcomes is observed within the Gauteng science park incubation programme. The empirical findings indeed confirm that the intended outputs, in the form of new commercial ventures established have not been forthcoming, thus supporting the co-production theory. This overall means that human resource planning for the programme is generally weak and the incubation managers and staff do not provide skills that the entrepreneurs can directly benefit from.

The lack of co-production activities within the programme has a number of implications, 1) a one-size fits all approach is used in the provision of business assistance and the needs of the entrepreneurs are not adequately planned for, 2) an increase in intensity of

monitoring and business assistance required by the entrepreneur has an additional financial implication whereas if a strong competent team was present internally, there would not be additional financial implications when this need arises, 3) the internal management team adds no direct value to the development of the entrepreneur. This would create a challenge with future evaluations at the results level as it would be difficult to directly attribute entrepreneur performance to the programme.

5.1.3 Output-Outcomes level

The research themes that were identified at this level included the sufficiency of outputs achieved and evidence to support the outputs achieved. Empirical findings illustrate that both stakeholders and management are not pleased with the results of the programme achieved to date. In all the interviews collected during the data collection phase, all respondents agreed that the desired output of the programme are new sustainable companies operating in the market. The respondents were also not convinced that there is any evidence to suggest that there are such companies that come from the science park incubation programme.

The theory of change posits that an intervention is likely to achieve desired results if there are strong linkages between the different levels of the programme's logic. As previously discussed in Section 5.1.1 and 5.1.2, the linkages at the input-activity and activity-output levels are weak and this has negatively affected the achievement of results at the output level.

The programme results measured at the output level is only the number of technologies commercialised and no other results are monitored. Training and mentorship are offerings within the incubation programme that have an effect on the individual, and the change and growth of the individual entrepreneur as a result of the programme is not monitored. It becomes evident that results-based planning is not a tool that was used for planning the programme as all possible outputs would have been determined upfront. Additionally, entrepreneurship theories emphasise that start-ups survive and grow because of the cognitive capabilities of the entrepreneur, and appropriate training can develop these. This has two implications for the programme, 1) the actual growth of cognitive ability of the entrepreneur should be a focus of development within the programme and be monitored as it may be a result of the incubation offering, 2) training provided in the programme must add value to the development of the entrepreneur intellectual capabilities, 3) the outputs of mentorship could be measured and monitored as they also develop the entrepreneur on a personal level. Direct results of the mentorship relationship include self-confidence, increased entrepreneurial self-efficacy and development of leadership skills, (St-Jean & Audet, 2012).

5.1.4 Outcomes-Goal level

The research theme at this level included behavioural changes, outcomes supported by evidence as well as adequacy of results. At the outcomes level, the empirical findings illustrated that the desired outcome for the Gauteng science park incubation programme is growing new sustainable ventures operating in the market. The growth of the companies is in relation to employment creation opportunities. Empirical findings are similar to those displayed at the output level and reveal that performance of the programme at this level is poor. The programme has also not been evaluated for outcomes, and it is not clear how data for outcome indicators would be collected and the frequency thereof. The programme has outcomes indicators and the methods for collecting data on these is not specified and the data is also not verified and tested for accuracy. These are all symptoms of a weak results-based management culture within the programme.

In Chapter 2, Gupta, et al., (2013) suggest that there are two schools of thought regarding the growth path of companies. The one school of thought posits that the growth path of enterprises is linear, invariant and can be determined. The growth stages in this path include existence, survival, take-off, maturity and re-intervention or death. The other school of thought posits that the sequence of stages within the growth path of small to medium enterprises in particular, is heterogeneous and influenced by unpredictable intervening factors. The factors may include uptake of technologies, founders' judgement and the competitive environment. This implies that monitoring only company growth is a narrow and unrealistic measure for the programme as SMEs go through various heterogeneous stages of development.

Hackett and Dilts (2004) describe three possible company-specific outcomes that can be achieved by a business incubator namely, 1) company is surviving and growing profitably, 2) company is surviving and growing but not yet profitable, 3) company is surviving but not growing and also marginally profitable. The current programme information only considers one possible outcome out of many and this oversight may arise when planning is not done according to the results-based management practises.

The programme performance measures only focus on the changes experienced by the company as an entity and not the individual developed through the process. To illustrate this point with an example, an entrepreneur may start a technology-based company that becomes a success with the assistance of the incubation programme and decide to sell the business once it is at a certain stage. The entrepreneur would still have benefitted from the incubation programme even in the absence of ownership of the incubated company.

The change in the circumstances of the entrepreneur also highlights another important aspect of the current theory of change that is overlooked in the planning for the programme and that is the understanding of who the targeted beneficiaries of the programme are.

It is not clear whether the programme wants to expand companies that already exist or if it wants to develop innovative individuals to become company owners. There are other results that the innovators can achieve from the programme including, change in wealth status and growth in business acumen and these can be monitored and measured as part of the programmes' results through assessments.

This limited understanding of the benefits that can be accrued by the entrepreneur from the programme does not negatively affect the plausibility of the programme theory, however, important programme results are not considered because of the narrow focus on company growth. This also proves that results-based planning is not used effectively within the programme because if this was the case, it would be clear who the ideal beneficiary is for the programme and what about the beneficiary needs to be improved.

5.1.5 Goal level

The research theme identified at this level is the desired change. Empirical findings have shown that both stakeholders and management agree that the goals of the programme are to create jobs and also to improve the growth of target sectors.

The goals of the Gauteng science park incubation programme find their basis in Schumpeter's (1934) theory of economic development. The theory posits that the innovating entrepreneur challenges the incumbent firm by introducing new technologies that make current technologies and products obsolete (Acs & Audretsch, 2008). This process is referred to as creative destruction and characterises what is referred to as Schumpeter Mark I. Entrepreneurs are able to produce new technologies that lead to the creation of new industries and the effect on the economy in terms of employment growth and sectorial performance improves. Braunerhjelm, Acs, Audretsch and Carlsson (2010) extend on Schumpeters' theory by positing that entrepreneurship is a mechanism by which new knowledge can be transferred into economic knowledge which positively influences economic growth. The programme is therefore set on a solid foundation by focusing on entrepreneurship to create new economic sectors, however, Schumpeter (1934) posits that the major result of entrepreneurial innovation is capital accumulation and this result is not monitored from the theory of change of the incubation programme. Job creation is also not directly linked to the formation of new sectors as the new sectors may make current products obsolete and therefore lead to job losses.

Gupta, et al., (2013) advances that job creation is not an intended consequence of entrepreneurship and employment opportunities are only created when there is a strong need to employ. Some start-up companies are also comfortable with being small and do not aim to grow their companies beyond a certain point, especially with owner managed enterprises. This has three implications for the programme, 1) in the planning phase, at the input level, the incubation programme should be able to recruit and support companies within sectors that have a high potential of absorbing labour, possibly through manufacturing of the products, 2) the goals should not only focus on job creation, and programme planning should be supported by baselines to understand the desired sectorial growth, 3) it is important to also consider measuring the accumulated capital of the entrepreneurs once they have graduated from the incubation programme within a specified period.

The plausibility analysis of the programme theory confirms that there are weak linkages in the theory that negatively affect the achievement of programme results. The current theory of change is not plausible at the input-activity level as the resources are inadequate. The theory of change is also not plausible at the activity-output level as activities are not appropriate and this weakens the chances of progressing to the results level of the programmes theory. An intervention theory of change needs to be plausible, do-able and testable in order to achieve the desired results and to enable summative evaluations. The empirical findings strongly suggest that results-based management employing the theory of change, as a planning approach is not utilised in the organisation specifically for programme planning. During the data collection phase, we also did not come across any evidence that suggests that there is a functional M&E system within the organisation as described by Gorgens and Kusek (2009) in Section 2.6.3. The next sections will determine whether the programmes theory of change can be implemented successfully, i.e. do-able.

5.2 Implementation of the Gauteng science park incubation programme

The research themes identified when reviewing the implementation aspect of the data included effectiveness of implementation as well as adequacy of implementation. The findings in this section help us determine if the theory of change of the programme is do-able. The programme provides services that are in line with global best practice. We did not come across any operational plans or implementation plans of the programme that detail how the services are delivered to the clients and the level of intensity of services provided. Key and important processes of the programme are not documented. The stakeholders of the programme also

confessed that they have limited understanding of how the science park incubation programme is implemented.

Weiss (1998) posits that the theory of change has two components to it, implementation theory and programme theory. The implementation theory takes into account what is required to translate the objectives of the programme into service delivery and programme operations. The theory assumes that if activities within the programme are conducted as planned, with adequate intensity, quality and commitment to the plan then the desired results should be achieved. The logic is that each activity assumes a required response from the participants, and these responses condition the next stage of the intervention. The programme is thus not likely to meet the desired goals unless the activities are implemented according to an articulated plan and the participants are willing and motivated to use the services of the programme. The implementation theory and the programme theory have to interact to produce the desired results. Bamberger, et al., (2012) refer to this phenomenon as an implementation strategy, which explains how the inputs are converted into the outputs.

We deduce that in the absence of an implementation plan and strategy in place, the theory of change of the programme is not do-able. As can be explained by the implementation theory, if the activities are implemented according to plan, then the probability of achieving the desired results is high. In this case, there is no plan and we can link the absence of planning at the implementation level to the poor results observed in the programme to date. Once more, this highlights that results-based management within the organisation is not utilised. The absence of a clear implementation plan for the programme inhibits the potential to improve on the programmes' implementation. As it stands, it is not clear which of the activities in the programme need to be intensified or improved in the absence of understanding what original plan was. The next section will determine if the programmes theory of change can be tested using currently available data.

5.3 Performance measures of the Gauteng science park incubation programme

The research themes identified to respond to what performance measures are appropriate for the intervention included verifiable measures as well as appropriateness of performance measures. The empirical findings presented in Section 4.4 reveal that the performance measures of the programme are not appropriate as they do not provide adequate information to determine the progress made towards the achievement of programme goals.

Empirical findings reveal that the indicators being tracked by the programme do not measure relevant information.

As mentioned in Chapter 2, a good theory of change should be testable and specified adequately to allow for verification of progress and measurement of the intended outcomes. The logical framework is able to translate programme theory into a series of indicators that allow for measuring of progress towards the programmes results. MacKenzie and Blamey (2005) found that programmes that do not have adequately defined outcomes can be a result of a poor evaluation culture within the organisation, a lack of evidence based approach within the organisation and/or lack of credible baseline data. The logical framework approach is a planning methodology that is used for project planning, employing the logic framework as a then planning tool (Dale, 2003; Crawford & Bryce, 2003). According to Bamberger, et al., (2006) the logical framework approach is considered to be advantageous as it ensures that the correct questions are asked during project planning. The logical framework matrix also facilitates better understanding and communication of projects.

From the empirical findings we can deduce planning for performance measures is not a collaborative effort as there is no uniform understanding of results. The findings also imply that the logical framework approach is not used in the development of performance measurements. Consequently, the current theory of change of the programme is not testable and is therefore weak.

5.4 Evaluation options for the Gauteng science park incubation programme

The empirical findings presented in Section 4.5 show that both management and stakeholders are interested in various evaluation designs regarding the programmes. The stakeholders posed questions that showed their need to understand the programme by presenting questions that related to the design and implementation of the programme as well as a cost-benefit analysis. Internal management was interested in evaluations that would confirm the results achieved at outcomes and impact level.

Weiss (1998) and Patton (2012) suggest that the theory of change can be used to focus evaluations. Patton (2012) advances that once a theory of change is described and agreed upon, then evaluation focus is easy to attain and agree upon. At the time of evaluation, not all linkages in the logic chain will be open to testing and different data-gathering techniques are required for different objectives. In summative evaluation, the focus is the attainment of outcomes and casual attribution. For formative evaluations, it is important to determine what information

would be useful at a point in time. The information gathered would then enable the programme to make an improvement in its decision-making. Having a conceptualised theory of change allows the evaluator to determine on which linkages to focus the evaluation. Summative evaluation will include follow up data on behaviour change and also aim to determine if that behaviour has been sustained over time.

The evaluation questions posed by both the stakeholders and management illustrate that both parties are at different levels of understanding of the programme. This further confirms that planning for the intervention was not a collaborative effort and results based planning approach is not utilised in programme planning to articulate the desired results at specified intervals. Theory of change articulation is required to assist both parties into a common understanding of the programme so that an evaluation focus can emanate from the same basis to enable decision-making for the programme at a particular point in time.

6 SUMMARY, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

In this section, we summarise the lessons we have learnt from the study. The study commences with a summary of the research background and highlights lessons learnt and accomplishments from Chapter 1-5. The conclusions from the reports as well as limitation of the study are presented. Lastly, the study makes recommendations for future research.

6.1 Summary

The study was undertaken to determine whether the Gauteng science park incubation programme meets the four conditions of evaluability in order to enable a meaningful and credible evaluation to occur. The research problem identified within the park was that we were not certain if the programme can be credibly evaluated as the intervention was conceptualised before the introduction of the South African Government Wide Monitoring and Evaluation System. A results-based management system, such as the one implemented in the country, requires that results in terms of outputs, outcomes and impacts are defined and in this case, we did not know if this was the case. Consequently, the research purpose aimed to assess the theory of change of the Gauteng science park incubation programme and determine if it was solid enough to enable a theory based evaluation, to close that knowledge gap. To achieve this goal, the research employed an evaluability assessment to respond to five key questions about the programme, namely, 1) what is the Gauteng science park incubation programme intended to do, 2) how is the programme currently operating, 3) are the programme goals, plausible given the way the programme is currently operating, 4) what are the possible measures of the programmes performance, and 5) is the programme ready for an evaluation and which evaluation options would be appropriate for the programme?

A literature review was conducted to provide the context and detailed understanding of science incubation programmes globally and within the current context. Additional, the literature review served to determine what was achieved from prior similar studies so that we could plan adequately for the study in consideration. The broad field of study of the research was identified as the field of evaluation studies with aspects of socio-economic development. The literature review concluded with a conceptual framework that outlined how the research would be carried out. The conceptual framework incorporated theoretical frameworks that would assist in determining whether the Gauteng science park incubation programme is ready for a meaningful evaluation.

The study employed a qualitative methodology using semi-structured interviews for data collection. The data were collected from three groups including the representatives from the Department of Economic Development, the Gauteng Growth and Development Agency and the management team within The Innovation Hub Management Company. The data were analysed using qualitative content analysis and empirical findings reported in Chapter 4. The theory of change for the programme was defined in Chapter 4, based on empirical findings. The discussion chapter served to assess the theory of change using theoretical frameworks to determine whether is it plausible, do-able and testable and supported by relevant performance measures.

The evaluability assessment illustrated that there is room for improvement in the design of the science park incubation programme. The programme's stakeholder and management agree on the impact level results desired for the interventions. However, the results have shown that there has not been concerted planning that critically engages whether the goals would be achieved. The linkages in the theory of change of the intervention are weak at the input-activity level as well as the activity-output level.

The design or programme planning of the intervention is weak and not plausible and reduced the evaluability of the programme from a design perspective.

The lack of a results-based management planning inhibits the availability of decent data for evaluation planning. The programme does not have appropriate performance measures or rather does not have a programme theory upon which the appropriate performance measures can be drawn. The evaluability of the programme with regard to the availability of data aspect is therefore very weak. The Gauteng science park incubation programme should consider improving the design and the implementation of the programme before a programme evaluation can be considered.

6.2 Conclusions

The evaluability assessment is an important evaluation for programme theory analysis and improvement. In this research study, the technique has highlighted areas of the Gauteng science park that need improvement before an evaluation can be commissioned. Key areas of improvement include, 1) initiating implementation planning for the programme based on the theory of change, 2) a review of the programmes human capacity and revising the roles of the incubation manager, 3) strengthening and operationalising linkages with research institutions to have a supply of new knowledge that requires commercialisation, 4) implement a results

based management system for the programme and make planning for programme results a collaborative effort that engages the funding organisation, as well as the department.

The evaluability assessment technique is valuable for planning and preparing for future evaluations whilst also being a type of formative evaluation in its own right. The technique can be as extensive as desired, depending on the research questions posed. Additionally, public entities could adapt the technique to determine programmes or interventions that should form part of the evaluation plans of public entities. The evaluability assessment technique provides understanding of key principles within theory-based evaluations and can be used to provide practical training for evaluation capacity building (Trevisan, 2006).

6.3 Limitations

An evaluability assessment aims to gain agreement on an interventions theory of change through a collaborative effort. The technique involves interviewing and re-interviewing respondents until a point where there is agreement on the goals of the programme, and therefore focus groups serve as a good tool for data collection. Due to time limitations and challenges in arranging the respondents to make time to participate in a focus group, the study resorted to collecting data using individual interviews and collating the responses individually.

The inability to have a focus group as well as tine constraints did not allow for engagement with the stakeholders to reach agreement and commitment on how information from future evaluations would be used. This is another important condition that has to be met within an evaluability assessment. Subsequent to programme goals being clarified and agreed upon, the stakeholders of the programme and management need to agree on how information from a future evaluation will be used. Aspects of use were not included in this research study.

A last limitation in the study was the use of simplified programme logic, which presented the theory of change of the incubation programme as though it is linear, whereas in reality this is not the case. This linear model was used to simplify interpretation of results.

6.4 Recommendations

The absence of a single theory for effective business incubation is a theoretical gap identified in Chapter 5 and paves the way for future research. Maital, Ravid, Seshadri and Dumanis (2008) suggest that a theory of effective business incubation should cover three principles namely, 1) guidance on the contradiction that currently exists within successful business incubators in that they imitate market conditions by selecting using a criteria similar to that of venture capitalists, and yet they are in the business of shielding their incubated companies from the same markets, 2) the theory should include principles that guide

identification of key constraints and direction on how to eliminate them, and 3) the theory should align with national and local culture, instead of imitating incubator processes that are not suitable for many cultures. The evaluability assessment has, however, shown that there are a number of theories that can be used to explain and improve the logic of incubation programmes.

The Gauteng science park incubation programme can use the findings of this study as a basis for future programme evaluations. Important steps of the evaluability assessment, which include the focus for a future evaluation, priority improvement areas and the utilisation of future evaluation, can be completed, based on the work initiated in this study. Government entities are required to complete annual evaluation plans for programmes that should be evaluated within a specified period and currently there is no guideline to define what programmes should be part of the evaluation plan. An evaluability assessment like this one can serve as a basis for recommending the science park incubation programme or any other programme that aims to have an impact assessment in future.

There are a number of recommendations from this study, that can be used to improve the incubation programme. From a results-based management point of view, the programme needs to be clear of who and/or what it aims to develop and identify key characteristics that the programme can realistically improve. The stakeholders and management can work collaboratively to plan and on design the incubation programme to be aligned with goals that can be achieved within the current context, in terms of resources. The programme could benefit immensely from the use of the results chain framework as a guide to develop indicators for the programme and to gather data for baselines as well as target setting. This framework, used appropriately, can also assist in determining the extent of the problem through baseline studies, and the amount of change that the programme can bring about. The programme may consider comparing with best performing incubators to better understand the required skills and roles of incubation staff within a science park, as currently this key role is undermined within the programme. A clearly defined theory of change with a results chain framework, will assist programme management to decide on how best to implement the programme and enable the creation of implementation plans and policies for the programme. Programme policies are also important for programme continuity as well. If the programmes will continue operating as a science park incubation programme, as opposed to a generic incubator, it is important to formalise its collaboration partnerships with private and public sector R&D firms as well as academic institutions to gain access to a wider range of good technology ideas. The funding requirements for the programme can be determined after the programme has been

adequately designed, and it can be determined whether is it feasible, from a financial perspective, to continue with the programme.

The monitoring and evaluation functions of the programme can be improved using the 12 steps framework by Görgens and Kusek (2009), as a guide. The 12 components framework improves monitoring and evaluation systems by holistically looking at 12 key interdependent components and serves as an organising framework for thinking about resources, staff and support required for the monitoring and evaluation system. Data integrity, dealt with in the middle ring of the 12 steps framework, is an important area which is not institutionalised within the programme and as a result, both stakeholders and management cannot confidently account for the results of the programme.

REFERENCES

Acs, Z.J., Braunerhjelm, P., Audretsch, D.B., Carlsson, B. (2009). The knowledge spillover theory of entrepreneurship. *Small Business Economics, 32* (1), 15-30

Acs, Z.J., Braunerhjelm, P., Audretsch, D.B., Carlsson, B. (2009). The missing link: knowledge diffusion and entrepreneruship in endogenous growth. *Small Business Economics, 34* (2), 105-125

Alcouffe, A., & Kuhn, T.(2004). Schumpeterian endogenous growth theory and evolutionary economics. *Journal of Evolutional Economics, 14*(2), 223-236

Bøllingtoft, A., & Ulhøi, J. (2005)The networked business incubator-leveraging entrepreneurial agency? *Journal of Business Venturing, 20* (2), 265-290

Babbie, E. (2013). *The Practise of Social Research*. (13th Edition). Belmont: Wadsworth Cengage Learning,

Bamberger, M., Rugh, J., & Mabry, L. (2006). *Real World Evaluation: Working Under Budget, Time, Data, and Political Constraints*. Thousand Oaks, CA: Sage Publications, Inc.

Bamberger, M., Rugh, J., & Mabry, L. (2012). *Real World Evaluation: Working Under Budget, Time, Data, and Political Constraints*,(2nd Edition). Thousand Oaks, CA: Sage Publications, Inc.

Baxter, P.,& Jack,S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report, 13* (4), 544-559

Basile, K. C., Lang, K. S., Bartenfeld, T., & Clinton-Sherrod, M. (2005). Report from the CDC: Evaluability assessment of the rape prevention and education program: summary of findings and recommendations. *Journal of Women's Health (2002)*, *14*(3), 201–207.

Bergek, A., & Norrman, C. (2008). Incubator best practice: A framework. *Technovation*, *28*(1-2), 20–28.

Bibeau, G., Nguyen, V., Sanou, A., & Kouyate, B. (2011). Evaluability Assessment of an immunization improvement strategy in rural Burkina Faso: Intervention theory versus reality , information need and evaluations, *Evaluation and Program Planning, 34* (3),303–315.

Bigliardi, B., Dormio, A. I., Nosella, A., & Petroni, G. (2006). Assessing science parks' performances: Directions from selected Italian case studies. *Technovation*, *26*(4), 489–505.

Brousselle, A. (2011). Program theory evaluation: Logic analysis, *Evaluation and Program Planning 34(1)*, 69–78.

Brown, J. L., & Kiernan, N. E. (2001). Assessing the subsequent effect of a formative evaluation on a program. *Evaluation and Program Planning*, *24*(2), 129–143.

Bryman, A. (2012). *Social Research Methods* (4th Edition). New York: Oxford University Press.

Carree, M. & Thurik, A.R (2010). The Impact of Entrepreneruship on Economic Growth. In Acs, Z.J & Audretsch (Eds) *Handbook of Entrepreneurship Research*. (p 557-593)

Casebeer, A., & Thurston, W. (1995). Evaluability Assessment in Health Care: An Example of the Patient Care and Outcomes Process. *The Canadian Journal of Program Evaluation*, *10*(1), 89–102.

Chan, K. F., & Lau, T. (2005). Assessing technology incubator programs in the science park: The good, the bad and the ugly. *Technovation*, *25*(10), 1215–1228.

Chan, K.A., Oerlemans, L.A., & Pretorius, M.W. (2010). Knowledge Exchange Behaviours od science park firms: the innovation hub case. *Technology Analysis & Strategic Management, 22(2)*, 207-228.

Clarke, A., & Dawson, R. (1999). *Evaluation Research: An introduction to Principles, Methods and Practice*. London, Thousand Oaks, CA: Sage Publications Ltd.

Crawford, P., & Bryce, P. (2003). Project monitoring and evaluation: A method for enhancing the efficiency and effectiveness of aid project implementation. *International Journal of Project Management*, *21*(5), 363–373.

Dale, R. (2003). The logical framework: An easy escape, a straitjacket, or a useful planning tool? *Development in Practice*, *13*(1), 57–70.

Dassah, M.O & Uken, E.A. (2007). Towards more effective utilisation of evaluations. *Journal of Public Administration, 42*(2), 119–136.

Davies, R., & Payne, L. (2015). Evaluability Assessments: Reflections on a review of the literature. *Evaluation*, *21*(2), 216–231.

Department of Performance Monitoring and Evaluation, (2014). *Guidelines on Diagnostics Evaluation (Guideline No 2.2.10).* Pretoria: The Department.

Department of Performance Monitoring and Evaluation, (2014). *Guidelines on Process Evaluation (Guideline No 2.2.13).* Pretoria: The Department.

Dumanis, A., Maital, S., Ravid, S., & Seshandri, D. (2008). Toward a Grounded Theory of Effective Business Incubation. *Vikalpa, 33(4), 1-13*

Durão, D., Sarmento, M., Varela, V., & Maltez, L. (2005). Virtual and real-estate science and technology parks: A case study of Taguspark. *Technovation*, *25*(3), 237–244.

Elo, S., & Kyngas, H. (2007). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115.

Etzkowitz, H. (2002). Incubation of incubators: innovation as a triple helix of university-industry-government networks. *Science and Public Policy, 29*(2), 115-128

Felsenstein, D. (1994). University-related science parks — "seedbeds" or "enclaves" of innovation? *Technovation*, *14*(2), 93–110.

Forman, J., & Damschroder, L. (2008). Qualitative Content Analysis. *Advances in Bioethics*, *11*, 39–62.

Ghazali, M., & Yunos, M. (2002). Building an innovation-based economy : The Malaysian technology business incubator experience . *Journal of Change Management*, *3*(2), 177–188.

Given, L. M. (Ed.). (2008). *The SAGE encyclopedia of qualitative research methods* (Volume 1). Thousand Oaks, CA: Sage Publications, Inc.

Görgens, M., & Kusek, J. Z. (2009). *Making Monitoring and Evaluation Systems Work*. Wahington, D.C: The World Bank.

Grbich, C. (2013). *Qualitative Data Analysis: An Introduction* (2nd Edition). Los Angeles, CA: Sage Publications, Inc.

Greiling, D., & Halachmi, A. (2013). Accountability and Organizational Learning in the Public Sector. *Public Performance & Management Review*, *36*(3), 380–406.

Greve, A.,& Salaff, J. (2003). Social Networks and Entrepreneurship. *Entrepreneurship Theory and Practice, 28*(1), 1-22

Grimaldi, R., & Grandi, A. (2005). Business incubators and new venture creation: An assessment of incubating models. *Technovation*, *25*(2), 111–121.

Guerra-López, I., & Toker, S. (2012). An application of the Impact Evaluation Process for designing a performance measurement and evaluation framework in K-12 environments.

Evaluation and Program Planning, *35*(2), 222–235.

Gupta, P. D., Guha, S., & Krishnaswami, S. S. (2013). Firm growth and its determinants. *Journal of Innovation and Entrepreneurship, 2*(1), 1–14.

Hackett, S. M., & Dilts, D. M. (2004). A Real Options-Driven Theory of Business Incubation, *Journal of Technology Transfer, 29*(1), 41–54.

Huibing, X., & Nengli, S. (2005). Exploration of Science Parks. *Chinese Journal of Population Resources and Environment*, *3*(1), 55–59.

Jasra, J. M., Khan, M. A., Hunjra, A. I., Rehman, R. A. U., & Azam, Rauf, I. (2011). Determinants of business success of small and medium enterprises.*International Journal of Business and Social Sciecne*, *2*(20), 274–280.

Katz, J., Wandersman, A., Goodman, R. M., Griffin, S., Wilson, D. K., & Schillaci, M. (2013). Updating the FORECAST formative evaluation approach and some implications for ameliorating theory failure, implementation failure, and evaluation failure. *Evaluation and Program Planning*, *39*, 42–50.

Kusek, J. Z., & Rist, R. C. (2004). *Ten Steps to a Results-Based Monitoring and Evaluation System*. Washington, D.C.: The World Bank.

Lindelöf, P., & Löfsten, H. (2002). Growth, management and financing of new technology-based firms-assessing value-added contributions of firms located on and off Science Parks. *Omega*, *30* (3), 143–154.

Lorentzen, J. (2008, September). *Provinces, city-regions, and innovation in South Africa*. Paper presented at the VI Globelics Conference, Mexico City

MacKenzie, M., & Blamey, A. (2005). The practice and the Theory: Lessons from the Application of a Theories of Change Approach. *Evaluation, 11*(2), 151-168

Mckinney, L. (2010). Evaluability Assessment: Laying the Foundation for Effective Evaluation of a Community College Retention Program, *Journal of Reseacrh and Practice, 34*(4) 37–41.

Miles, M., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis: A Method Sourcebook* (Edition 3). Los Angeles, CA: Sage Publications, Inc.

Ndabeni, L.(2008). The contribution of business incubators and technology stations to small enterprise development in South Africa. *Development Southern Africa, 25*(3), 259-268.

Neuman, L. W. (2014). *Social Reseacrh Methods: Qualitative and Quantitative Approaches* (7th Edition). London: Pearson.

Norwegian Agency for Development Cooperation. (1996). *The Logical Framework Approach* (LFA). (4th Edition). Oslo: Norad

Ostie-racine, D., & Dagenais, C. (2013). An evaluability assessment of a West Africa based Non-Governmental Organization's (NGO) progressive evaluation strategy, Evaluation and Program Planning, *36*(1), 71–79.

Patton, M. Q. (2005). Qualitative research. New York: John Wiley & Sons, Ltd.

Patton, M.Q. (2012). *The Essentials of Utilisation-Focused Evaluation.* Los Angelos, CA: Sage Publications Inc.

Peters, L., Rice, M., & Sundararajan, M. (2004), The role of Incubators in the Entrepreneurial Process. *Journal of Technology Transfer, 29* (1), 83-91

Posavac, E.J and Carey, R.G, 1985, Program Evaluation: Methods and Case Studies. Upper Saddle River, NJ:Prentice-Hall.

Rice, M. (2002). Co-production of business assistance in business incubators-An exploratory

Study. *Journal of Business Venturing, 17* (2), 163-187

Rogerson, C. M. (2001). Knowledge-Based or Smart Regions in South Africa. *South African Geographical Journal*, *83*(1), 34–47.

Rogerson, C. M. (2004). From Spatial Development Initiative to Blue IQ : Sub-National Economic Planning in Gauteng. *Urban Forum*, *15*(1), 74-101.

Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2004). *Evaluation: A Systematic Approach* (7th Edition). Thousand Oaks, CA: Sage Publications, Inc.

Russ-eft, D. (1986). Evaluability assessment of the adult education program (AEP): The Results and Their Use, *Evaluation and Program Planning , 9*(1), 39–47.

Sanderson, I. (2001). Performance Management, Evaluation and Learning in Modern Local Government.*Public Administration, 79*(2), 297-313.

Schreier, M. (2012). *Qualitative Content Analysis in Practice* (1st Edition). London, Thousand Oaks, CA: Sage Publications Ltd.

Schumpeter, J,A. (2010). The Theory of Economic Development. (Elliot, J Trans) Piscataway, NJ: Transaction Publishers (original work published 1934).

Schwandt, T. A. (2007). *The SAGE dictionary of qualitative inquiry* (3rd Edition). London: Sage Publications, Inc.

Shannon, S. E., & Hsieh, H.F. (2005). Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, *15*(9), 1277–1288.

St-jean, E., & Audet, J. (2012). The role of mentoring in the learning development of the novice entrepreneur, *International Entrepreneurship Management Journal, 8* (1), 119–140.

The Innovation Hub Management Company Annual Reports, (2001-2002), (2002-2003), (2004-2005), (2007-2008)

The Innovation Hub Management Company. Five-Year Strategic Plan 2014-2019

The Innovation Hub Management Company Annual Performance Plan, 2014-2015

The Innovation Hub Management Company. (2014). Enterpise and Skills Development Strategy

The World Bank. (n.d.). *The LogFrame Handbook - A Logical Framework Approach to Project Cycle Management*. Washington, D.C. The World Bank.

Thompson, J., & Downing, R. (2007). The entrepreur enabler: identifying and supporting those with potential. *Journal of Small Business and Enterprise Development*, *14*(3), 528–544.

Thurston, W. E., & Potvin, L. (2003). Evaluability Assessment: A Tool for Incorporating Evaluation in Social Change Programmes. *Evaluation*, *9*(4), 453–469.

Trevisan, M. S. (2007). Evaluability Assessment From 1986 to 2006. *American Journal of Evaluation*, *28*(3), 290–303.

Wagner, C., Kawulich, B., & Garner, M. (2012). *Doing Social Research: A global context*. Milton Keynes: McGraw-Hill Higher Education.

Weiss, C. H. (1998). *Evaluation* (2nd Edition). Upper Saddle River, NJ: Prentice Hall.

Wholey, J. S., Hatry, H. P., & Newcomer, K. E. (2010). *Handbook of Practical Program Evaluation*. (3rd Edition). San Francisco: Jossey-Bass.

Youtie, J., Bozeman, B., & Shapira, P. (1999). Using an evaluability assessment to select methods for evaluating state technology development programs: The case of the Georgia

Research Alliance. *Evaluation and Program Planning*, *22*(1), 55–64.

APPENDICES

Appendix 1: Overview of The Innovation Hub precinct

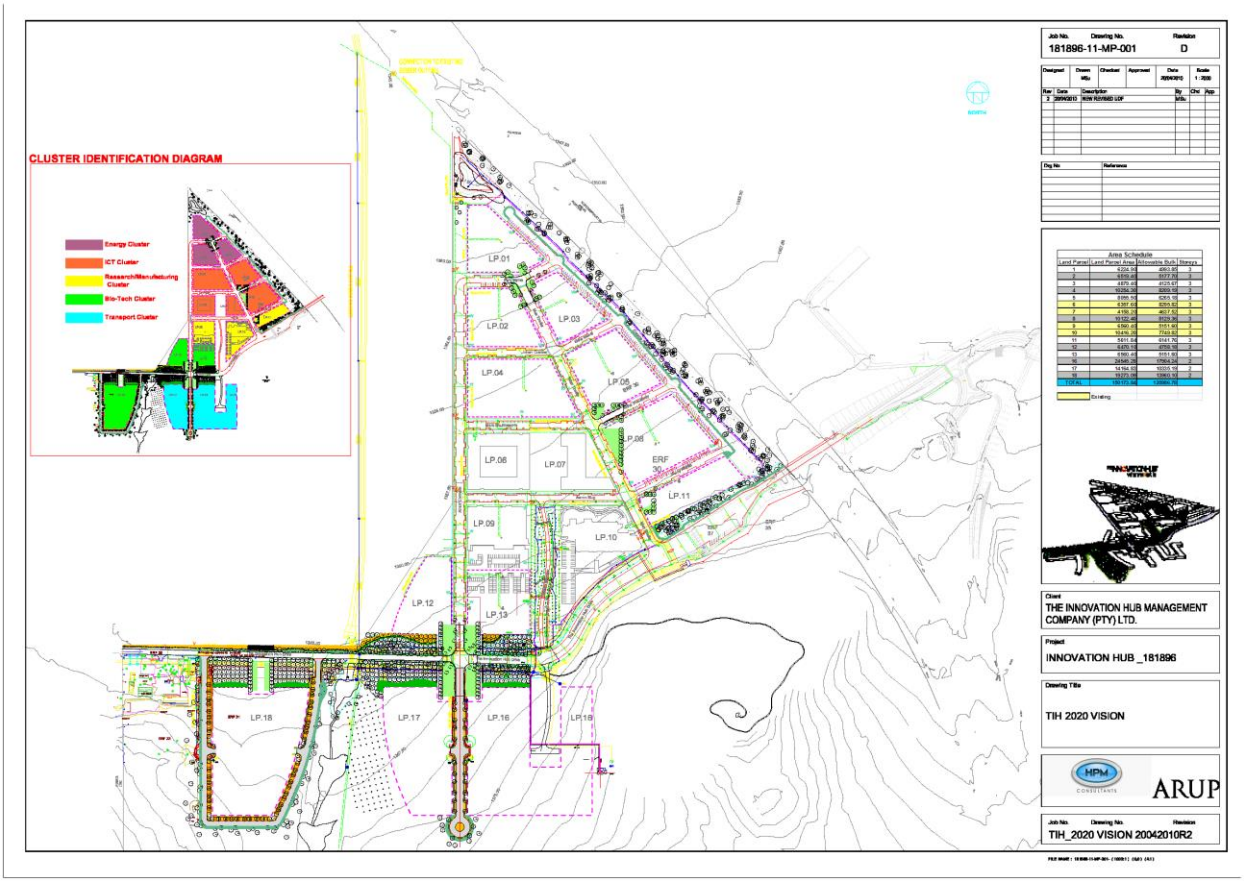

Figure 18: Overview of The Innovation Hub precinct

Appendix 2: TIHMC Grant funding

Table 6 : TIHMC Grant funding

Financial Year	Grant Allocation
2000-2001	3 192 268
2001-2002	12 264 000
2002-2003	1 389 090
2003-2004	113 662 888
2004-2005	123 425 183
2005-2006	257 174 123
2006-2007	294 581 775
2007-2008	4 842 000
2008-2009	29 498 000
2009-2010	23 500 000
2010-2011	27 063 000
2011-2012	33 077 000
2012-2013	50 727 000
2013-2014	64 002 000

Appendix 3: Interview Guidelines

FOR STAKEHOLDERS (GDED & GGDA)

1 From your perspective, what is this programme trying to achieve?
2 What resources does the programme have to meet number 1 above?
3 What would you like this programme to be known for in the long run?
4 How would you know when this level of achievement has been reached?
5 Who should be the ideal target beneficiaries for TIHMC services?
6 What services should TIHMC provide in order to achieve this goal?
Wwhat are your perseptions on the resources of the programme? Are they adequate?
7 What results has the programme produced to date?
8 What results would you like the programme to achieve in the next two years and why?
9 Are you aware of any problems that the programme is currently experiencing?
10 What kind of infomration do you get on the programmes performance and results
11 What effects does the programme have on its participants? How are they different as a result of being in the programme?
12 If the programme were to undergo an evaluation , do you have any questions that you would like answered

THE INNOVATION HUB MANAGEMENT

1 What are your goals for the programme?
2 What are the major programme activities?
3 Why will these activities achieve these goals?
4 What resources are available to the project ito staff and budgets?
5 What outputs are produced by the programme?
6 What evidence is necessary to determine whether goals of the programme are being met?
7 How is the programme related to local government priorities
8 What data or records does the programme maintain?
9 How often are these data collected?
10 How is this infomration used? Does anything change based on this data?
11 What major problems doe sthe programme experience and how would these be solved?
12 What results has the programme produced to date?
13 What results are likey in the next two years?
14 How does the programme identify, recruit and sustaiin intended beneficiaries
15 Are beneficiaries happy with the programe?

PROGRAMME PARTICPANTS

1 How did you get into the programme
2 What services do you get in the programme
3 How do you request for services
4 How process do you require when needing services?
5 Which of the services are most appropriate for you?
6 Which of the services are not appropriate for you?
7 What would you say are the benefits of being in the programme?
8 What are your concerns about the programme and what do you most like about the programme?

Adapted from Wholey, (2010), Smith, (1989), DPME Guidelines (2012)

Appendix 4: Letter requesting permission from TIHMC

THE INNOVATION HUB

MEMORANDUM

Private and Confidential

SUBJECT: REQUEST FOR PERMISSION TO COLLECT AND USE TIHMC DATA FOR ACADEMIC PURPOSES

1. Department Submitting Report

Monitoring and Evaluation

2. Purpose

To obtain approval to collect and use data from TIHMC to conduct research for academic purposes.

3. Background

I am currently registered for the Masters of Management in Public and Development Sector Monitoring and Evaluation and have selected to use the Innovation Hub as a case study for my research. The research aims to conduct an evaluation of TIHMC performance outcomes. As part of conducting the research, the researcher has to ensure that all ethical considerations have been adhered to. It is in this light, that I request permission to collect data from TIHMC staff and programme participants as part of the research process. I am ethically obligated to ensure that there is no harm to the participants in the research and the organization, and that the organization is not deceived in anyway. The research will also strive not to infringe on participants right to privacy and will guarantee anonymity to participants. To ensure that the organization and participants are protected, the research report in draft and final form will be shared with the participants for review.

4. Financial Implications

None

5. Attachments

None

6. Recommendations

It is recommended that the approval to collect data from TIHMC for academic purposed be granted.

Submitted by: Kutala Pangwa
Designation: Manager: Strategic Planning and Reporting
Date: 3 June 2015

Moving the Gauteng City Region Forward

GAUTENG

Recommended by: Tsietsi Maleho
Designation: GM: Skills Development, Partnerships, Monitoring and Evaluation
Date: 04/06/2015

Approved By: McLean Sibanda
Designation: CEO: TIHMC
Date: 7/7/2015 Received 6/7/2015

Appendix 5: Biography of the researcher

My name is Kutala Helen Pangwa. I completed my undergraduate studies at the University of Witwatersrand with majors in Chemistry and Microbiology in 2003. In 2004, I made a decision to pivot in my studies and focus on business administration studies. I completed a Postgraduate Diploma in Management with a focus on Business Administration in 2004. My career journey started at the Cape Biotech Trust, an entity that was funded by South African government to support entrepreneurs within Plant Biosciences field. I later became the founding member of the Centre for Proteomics and Genomics Research which still remains a success story of the Cape BioTech Trust Projects. I left the field of science to join a management consulting firm, House of Performance, and worked as a consultant. It is in this role that I learned and became interested in strategic management principles, process improvement and the important of performance measurement in within organisations. In 2009, I returned to public service within the science and technology sector, however, this time around, I was determined to create my niche in strategic management and performance management. I worked for the Technology Innovation Agency (TIA) within the Corporate Strategy unit and my focus was on developing new operational processes for the new entity and also to report on performance achievement. I received my Lean Six Sigma Green Belt in 2010. While working for TIA, I completed the Business Communication programme, Strategy Management programme and Advanced Strategy management through the University of South Africa. In 2011, I joined The Innovation Hub Management Company and I am still employed in the role of Manager: Strategic Planning and Reporting. My understanding and growth within Monitoring and Evaluation field has grown over the years

This research report is part of the academic programme to achieve a Master of Management qualification in Public and Development Sector Monitoring and Evaluation. This research report is conducted as part of the delivery on the programme and is solely for academic purposes. The evaluation research on this report is not sponsored by anyone and is therefore not influenced to take on a specific direction.

Appendix 6: Interview consent form

Thank you for agreeing to participate in the study. The purpose of the study is to determine the level at which the Gauteng Science Parks incubation programmes is ready for an effective evaluation. To achieve this, the researcher would like to elicit your views through an interview. The information that you will provide during the interview is solely for academic research purposes. The information provided will be treated with confidentiality and your identity will not be disclosed. The interviews will be audio recorded and the participants have the right to withdraw from the interview at any time.

I the undersigned, have read and understand the purpose of the study

I understand that the interviews will be recorded

I understand that my personal details will not be revealed

I understand that my word may be quoted in the final report, however, my identity will not be revealed

I understand that I can withdraw form the study at any time.

_____

Participant Signature Date:

_____

Researcher Signature: Date:

Appendix 8: CodeBook

CodeBook for the Evaluability Assessment of the Gauteng science park incubation programme		
Code	**Description**	**Example**
Programme goals Desired change - Expectation	Discussion of the goals for the programme	
	Information about the change that will be visible when the programme is succeful. Also include information about the current state that must be changed	*"Our main objective as this department is to create as much jobs as possible for the province of Gauteng so that you know if people are working the economy will grow". [R7]* *"Err to have improved the lives of our people. To have made business easier better in Gauteng. To position Gauteng as a centre of innovation and excellence in the country on the continent and in the world" [R2]* *"Achieving its mandate and ensuring that we become the province which Is very much innovative and then producing young talented, I don't know whether it is the correct word to day, Innovists or technological experts. Or it's able to tap into a dormant innovative ideas that are sitting in the townships that are not exposed to the innovative world and which will also contribute to research and development".[R6]*
Programme Resources	Discussion of the resources that are required in order for undertake the required activities. Also discuss resources that would enable the programme to function better Also discuss who provides the resources	*"I mean the Maxum, the budget is between R5 and R6 million because there could be other not really cash related amounts that or some small amounts that come from different places for sponsorships and everything. So and also taking into acount the future budget that is R6 million. I'm sure between R5 and R6". [R9]*
Adequacy of resources	Information about the quantity of resources of resources.	*"From a human capital perspective huh, I don't think we're actually ever been properly and adequately resourced with reference to commercialisation skills. So you know, managing the programme from management and admin is a customer service role. And the level of skills required for that, you don't need a high tech level".[R10]*
Allocation of resources	Discussion of factors to consider when resources are allocated	*"So if the innovation hub says it needs R20 million for whether its Biosciences park or whatever we then determine it as desirable we then transfer funds to the GGDA and GGDA transfers to TIH".[R2]* *"For me the resources will be tied to the number of creative ideas that we are able to produce. And (hesitant)…whilst on one hand we (thinking) could say that we can't talk to the resources away from the number of business ideas that are coming up".[R3]*