Multivariate Multilevel Modelling of Business Process Optimisation in Entrepreneurships

By

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Thesis submitted in fulfillment of the requirement for the degree

Doctor of Philosophy

in the

Department of Statistics and Operations Research

Sefako Makgatho Health Science University

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2016
DECLARATION

I declare that “Multivariate Multilevel Modelling of Business Processes Optimisation in Entrepreneurships” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

..........................................................

MT MaseTshaba
DEDICATION

To all the women who are entrepreneurs in their own right:
Koko Makhupe le Makgolokhukhu Seng
Mma Meladi le Koko Choolo
Mommy NgwanaMothiba le Mme Tselane
I thank Jadah Matentji-Masuku and the National Research Foundation (NRF) for providing generous funding for this research and all my travels.

I owe my deepest gratitude to my promoter, Professor Solly Matshonisa Seeletse, whose invaluable knowledge, vast experience, encouragement, indispensable suggestions and, above all, patience is incomparable and much appreciated.

To the giants whose shadows I stood under: Dr JK Molefe, Prof Bheki Twala, Prof Hlengani Siweya, Prof Mamokgethi Phakeng and Prof Percy Sepeng. Thank you for allowing me to stand tall on your shoulders.

To my Statistics and Operations Research Team mates, Lebogang Sesale, Tshepo Matsose and Gezani Miyambu, thank you for the encouragement.

My huge family of friends, sisters, brothers, fathers and mothers, including di -Noko (Thobejane), di-Tau (Masemola), ba ga Mothapo, na va ka Tshabalala, for choosing me to be part of your family. Mama Ditshego Thobejane, for leading the way. To my sister, Dr MNL Thobejane, I had to do this before you did, only because I am older, but you are smarter.

My princess, Keamogetswe Malope, for Gracing me with all the love.

My prince, Sabata Tshepiso Duma, you are full of life.

The Queen Mother, Mmakoma Agnes, thank you for the brains and sacrifices.

Last and the most special, to the Queen of My Heart, Musa Rhangani, thank you for encouraging me to complete my first degree leading to an academic life, and for all the love we share.
ABSTRACT

The study investigated ways in which South African entrepreneurs can optimise their business processes considering their dynamics. Typical entrepreneurs’ ventures consist of many variables, and various levels that control or affect their business progress.

Mathematical formations are used to model and optimise their business processes. The study interviewed entrepreneurs from 30 successful enterprises at micro-business, survivalist, SME and large business ranks. The model developed showed that pragmatic optimisation of business processes requires knowledge and experiences in modern methods of business, with a vast application of technology. Also, the use of value engineering methods in business showed to be beneficial in profiting and growing the enterprises. These requirements are sterner for larger enterprises than the smaller ones.

The study established that three levels of business process operations are required to reach optimality, and that each level should be optimised separately from the other levels. Also, the variables/factors at each level should be optimised separately in order for business process optimisation (BPO) to materialise.

The large businesses require incorporation of all the factors and optimisation of most factors applicable to business, supported by technology. Lower ranks businesses, on the other hand, can do well even when some factors are excluded in the business processes. However, the remaining factors should be optimised for BPO to materialise. The three levels still apply to smaller enterprises. Also, integrating modern techniques offers an edge to smaller businesses over their rivals.

The generic model developed is adaptable to the size of the business. Smaller businesses can grow to become larger ones, and even to become multinational enterprises, by including new business methods such as total quality management, lean six-sigma, inward-out and other methods to add quality and save costs to earn more profits.

KEY TERMS:

Business processes, entrepreneurship, multilevel modelling, multivariate, optimisation
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CHAPTER 1: OVERTURE

1.1 INTRODUCTION

Businesses are interested in understanding the effect of changes in their processes. More particularly, businesses are mostly interested in the controllable variables, which they can influence to obtain the results they want to achieve. Many of them want to determine the best possible allocation of resources under complex and dynamic conditions in order to achieve certain but enriched performance and quality goals. Therefore, businesses attempt to optimise results by manipulating the controllable variables to react in a manner that will balance the business results to be ‘maximised’ under the circumstances that prevail. Optimisation is a form of goal seeking simulation to achieve best performance, which occurs when trade-offs have been fully incorporated in a business operation. The allocation of resources to tasks considerably affects the performance of the business processes. Since some aspects have to be withdrawn or reduced while others are increased or included, the act of optimisation is when the best combinations that can work together for improved results are incorporated. Documentation of blockages and gaps in a business process and proper allocation of resources to critical tasks help businesses to achieve business goals while delivering services and products at a desired value. Continuously improved business processes are a central success factor for companies.

Business process optimisation (BPO) is considered as the problem of constructing feasible business process designs with optimum attribute values such as duration and cost (Tiwari, Vergidis & Turner, 2010). It also includes resources, and its planned results should be both measurable and achievable. Furthermore, the lucidity of the results is essential to enable deviations on understanding. This basically implies that the stated outcomes of business actions should be simple. Due to the requirements of time-base (or duration) and cost, BPO can therefore be classified as a scheduling problem. The general problem of scheduling can be described to be a problem of assigning resources to tasks over time subject to a set of side constraints with the goal of optimising one or more objectives. The constraints and variables in the process of business operations make the process of optimisation more challenging and meaningful (or worthwhile).

Studies on measuring BPO are generally lacking. However, recently, business consultants, mathematicians, philosophers and statisticians from various countries collaborated through
research in designing practical scientific methods to measure BPO, and had resounding successes with publishable results. One was MaseTshaba and Seeletse (2014) who developed BPO measures for univariate settings. This research also suggested a need to expand these measurements to multivariate settings. Another one was Miyambu and Seeletse (2015) who developed measures on unilevel settings using regression approach. This publication also recommended advancement of results to possibilities where many levels are applicable. Both articles used fundamental mathematical principles. As a result, the two studies produced comparable results in univariate unilevel business settings. The complexity when these studies were applied on simple bivariate bi-level settings multiplied four-fold (Malebye, Seeletse & Rivera, 2015). The emerging dynamism and complexity as well as the appeals to extend the results to multivariate settings generated interest in this study. Efforts in this study extend the application of BPO to multivariate and multilevel realities, and also use mathematical models to advance operations research theory.

1.1.1 Business Processes Optimisation

BPO initiatives depend on competitive environments that an organisation faces within an industry. As a result BPO is considered a ticket to competitive advantage (Lee, 2005). BPO involves (re)designing the business processes for the underlying service composition to fit a specific given constraint, i.e. taking into account some constraints and conflicting objectives for a specific service infrastructure (Leymann & Roller, 2000). Business processes consist of providing worth to a customer through value-added activities, moving across functional area boundaries, controlling process standards and measuring process execution. BPO involves optimising all business process flows, crossing any worthy application, company boundary and connects process design and process maintenance (Papazoglou & Ribbers, 2006). It entails adapting the business process to improve the process execution to reach a higher quality of service level for a specific service composition.

1.1.2 Multivariate Multilevel Modelling

A multivariate multilevel model is a model with multiple outcome random variables observed at many levels that may or may not be hierarchical (Kolaczyk, Ju & Gopal, 2005). Easier problems to solve are those with hierarchies, but which lack correlations among the variables at different levels. These are the kinds that lack dynamism and severe complexity. This study embraces complexity and dynamism. The outcome variables may or may not be longitudinal
measurements of the same variable or characteristic. The first thing to note about multivariate models is that a two-level multivariate model in reality has three levels. In general, multilevel models are used for studying the structure in hierarchically organised data, where units of observation at one level are nested in units of observation at a higher level. Multilevel optimisation methods utilise the hierarchical nature of complex systems to distribute the optimisation process into smaller but less complex optimisation problems located at the individual elements of the hierarchy (De Wit & van Keulen, 2011). At each hierarchy, there may be several types of variables such as global, structural and contextual variables (Lazarsfeld & Menzel, 1961; 1969).

1.2 RESEARCH PROBLEM

BPO has received some visibly growing but little attention from academia, particular in real life problems requiring multivariate methods. There are no studies on BPO that relate to business process settings consisting of levels of different hierarchies. As a result, many approaches to enforce BPO produce suboptimal results. In some instances, BPO cannot be adequately measured, and are therefore adjudged to be lacking optimality. Many businesses fail because their business processes are not understood in all its dynamic and complex settings, and are therefore mainly under-represented. Multivariate multilevel modelling is a scientific approach to explain dynamism. In this study the multivariate multilevel modelling approach is used to optimise business processes using a mathematical approach.

1.3 PURPOSE OF THE STUDY

1.3.1 Aim of the Study

The aim of the study is to develop an operational research approach to optimise business process in multivariate environment that are described within multilevel settings.

1.3.2 Objectives of the Study

The study objectives are:

- To design a dynamic multilevel model for business processes;
- To develop optimisation measures for the levels of the multilevel models;
To apply probability properties within the various conditions of multilevel models, such as the individual, organisational and environmental elements of an entrepreneurial organisation; and

To develop optimisation measures for various forms of multilevel business processes.

1.3.3 Research Question

The research question is:

- How can multivariate methods be applied in optimising business processes in multilevel entrepreneurial environments?

1.4 RELIABILITY AND VALIDITY OF THE STUDY

A model based on mathematical principles needs to be verified using mathematical methods and statistical tests where possible. In this study, these proofs and tests evidence reliability. Fundamentally, the model validity depends on statistical tests performed on the developed model and the adaptations made. The models developed were proved to be parsimonious. Furthermore, the theorems derived from the emergent theory were proved.

The research instrument was a research questionnaire, validated and piloted by the researcher and supervisor as statisticians. The topics were geared at determining the objectives of the study. In research, the use of suitable instruments and relevant data is of fundamental importance in achieving the optimal outcome. Reliability of a research instrument refers to the consistency of the measurement of some phenomenon over relatively short periods of time (Giacobbi, 2002).

Moreover, the questionnaire was designed and used to ensure that all research respondents have the same opportunity to respond to the same questions. Differences in response were attributed to personal experiences of the respondents as opposed to different questions. The degree to which the questionnaire can be repeated implies repeatability of research and to a certain extent, generalisability, thereby addressing the question of reliability and validity. Furthermore, the extent to which questionnaire items are answered or individual’s scores remain the same can be determined throughout the use of test-retest method (Golafshani, 2003).
1.5 ETHICAL CONSIDERATIONS

This is a mathematical research where models are developed. The study uses a structured questionnaire to collect data. Each respondent was requested to sign an informed consent form for participation in the study. This study used secondary data for initial model development. Then, the primary data were used to authenticate or adapt the models developed. Experimenting with market data is mainly because it is available from different interested sources. The study approval was sought through the University’s School Research Committee (SReC) from the Sefako Makgatho University Research Ethics Committee (SMUREC). SMUREC certificate number SMUREC/P/296/2016 (Appendix B) was issued.

1.6 BIAS

Standard parametric statistical tests depend heavily on the observations on the assumption of distribution and parameter values (Hox, 2002). Initial analyses of data were used to then apply statistical tests to check if the assumptions are satisfied. Initial data analysis provided hypotheses for distributions to be assumed. If the assumptions are true, the methods will be applied forthrightly. If on the other hand the assumptions are violated, dynamic modelling will be applied to take care of correlations. Also, nonparametric tests will be applied for robustness in estimates. In the general approach, the study intends to develop a model that will use mathematical principles and statistical properties. Bias in this case can be the improper use of the mathematics rules. However, this possible or likely bias will be minimised or offset by the process followed in the development.

Most of the selected businesses had proved sustainability over time, and had surpassed tests of pressure from politics, legislation, unionism, recession, and any antagonist variables that could offset profitability, the survival and growth of business. The purposefully selected enterprises must be owned by working-age adults in the population. The enterprises must be at least 42 months old. This measurement is consistent with the expanded definition of entrepreneurs to include Schumpeterian entrepreneurs (see section 3.4.1 in Chapter 3) as well as managerial business owners. This measurement recognises the creation of new businesses as arising from the choice optimisation decision of individuals (Schmitz, 1989). The business must therefore not be insolvent, and its directorship members must be in good standing with the Companies and Intellectual Property Commission (CIPC) and the South African Revenue
Services. Datasets for this inclusion/exclusion are available at CIPC, and the information was also verified by the same institution.

1.7 LAYOUT OF CHAPTERS

Chapter 1 presents the introduction to the study, aim and objectives and the significance of the study. The theoretical aspects of multilevel multivariate modelling of business process optimisation will be deliberated in Chapter 2. Chapter 3 speaks to literature review on entrepreneurial multilevel environments. Chapter 4 consists of statistical model developments. Chapter 5 provides the applications, tests and adaptation of the built models. Lastly, Chapter 6 generally outlines the conclusion and recommendations of the study and presents the final developed model in mathematical and schematic forms.
CHAPTER 2: BPO AS A MULTIVARIATE MULTILEVEL SYSTEM

2.1 INTRODUCTION

The previous chapter provided the context of this study. It introduced the concerns that led to the study, and the background that stimulated a wider coverage that this study is exploring. It also highlighted the importance of investigating multilevel applications in dynamic systems that multivariate settings provide to the concept of BPO. This chapter presents the theory of the concepts making this study. They include the concept of BPO and its sub-components.

2.1.1 Optimisation Subject

Optimisation methods for large scale systems are fundamental tools for solving real world problems. Applications as diverse as weather forecasting, aircraft design, education, business management, scheduling, medical imaging, and mobile network communications can all be formulated as optimisation problems. The methods from mathematics for optimisation will be used to address dynamic problems. In this study, optimisation methods are used to address problems in various entrepreneurships in general.

2.1.2 Optimisation on Variables

Longitudinal data can be considered to have a hierarchical structure, where occasions of measurement are nested within subjects. There may also be individual differences when the variables are measured at the individual level and not varying over time (Robitaille, Muniz, Piccinin, Johansson & Hofer, 2012). The lowest-level measurements are said to be at the micro-level and all higher-level measurements are at the macro level. Macro-level measures are often referred to as groups, or even more officially as contexts. Hence, the name contextual models refer to models analysing data obtained at the micro- as well as the macro-levels (Kreft & de Leeuw, 1997).

Multilevel optimisation consists of a process of solving a set of sub-problems to give partial solutions to the main problem, followed by combining the partial solutions to obtain a global solution. The term ‘multilevel’ refers to the distinct levels or units of analysis, which usually, but not always, consists of, individuals (at lower level) who are nested within contextual or aggregate units (at higher level). Multilevel methods consist of statistical procedures that are pertinent when (i) the observations that are being analysed are correlated or clustered, or (ii)
the causal processes is thought to operate simultaneously at more than one level, and/or (iii) there is an intrinsic interest in describing the variability and heterogeneity in the phenomenon, over and above the focus on the average (Diez, 2002; Subramanian, 2004a; 2004b). The levels may be hierarchical, but this is not always the case as some case show levels at the same level. The global, structural and contextual variable types are described according to several authors (Kozlowski & Klein, 2000; Lazarsfeld & Menzel, 1961) below:

- **Global variables** are factors that refer only to the level at which they are defined, without reference to other units or levels. This basically implies that a global variable is measured at the level at which that variable actually exists.

- **Structural variables** are operationalised by referring to the sub-units at a lower level. They are constructed from variables at a lower level. Using the mean of lower level variables as an explanatory variable at a higher level is a common procedure in multilevel analysis.

- **Contextual variables** refer to the super-units. All units at the lower level receive the value of a variable for the super-unit to which they belong at the higher level. This is called disaggregation. Data on higher-level units are disaggregated into data on a larger number of lower-level units. The resulting variable is called a contextual variable as it refers to the higher-level context of the units under investigation.

Analysis models that contain variables measured at different levels of the hierarchy are known as multilevel models. In multilevel models there is the notion that separate (first-level) linear models for each context should be fitted. Usually each group has the same explanatory variables and the same outcome, but with different regression coefficients. The models are linked together by a second-level model. In this one the regression coefficients of the first-level models are regressed on the second-level model explanatory variables (Kreft & de Leeuw, 1997).

The number of business processes identified at the various levels within company hierarchies varies considerably across organisations. Davenport (1993) provides the following reasons for this variation:

- Processes within organisations are almost infinitely divisible.
- The identification of processes can be exploratory and iterative.
An organisation seeking to carry out incremental changes is highly likely to focus on improvements in sub-divisions of processes whereas for radical changes an organisation should attempt to define processes as broadly as possible.

2.2 Business Process Optimisation

To be more profitable, an organisation should react quicker than competitors and offer high quality products and services, with fewer human resources and at lower costs, businesses require effective knowledge creation and management. Many organisations view business processes as reactive rather than proactive. Reactive processes fail to continuously review and improve businesses to achieve benefits such as effectiveness, profit maximisation, cost savings and customer service. It is therefore necessary to be proactive in managing and mainly improving the desirable items while instantaneously preventing the undesirable ones. Improving the management of business processes has become a top priority for many organisations because many processes do not meet the expectations (Babulall, 2012).

2.2.1 Business Process Optimisation Dynamics

A business process consists of a set of activities that are performed in coordination with an organisational environment (Weske, 2012). It is formally defined as a sequence of tasks which are carried out in line with the organisation’s vision. The executing resources can be humans, software applications, or web services. The best (optimum) is expected to happen despite most modern data being noisy and dynamic. However, the allocation of resources to different tasks can be done in either a static or dynamic manner. Use of static approaches to dynamic problems often leads to underperformance. In order to meet performance level when dealing with dynamic problems, dynamic methods should be applied. Therefore, in order to understand the problem context, scientists should depend more on data sets to characterise phenomena as opposed to mathematical theories.

The critical objective of BPO is to select the accurate process policies and then apply the supreme properly fitting optimisation procedures. In order to attain this end goal, Trifu and Ivan (2016) counsel that BPO efforts should preferably include data integration, data analysis, discovery of gaps, and implementation of enhancements. BPO has also been brought into the assortment of enormous data constituents to determine the ideal methods of handling massive data produced by technological spaces.
Business process modelling and simulation play a principal role in the perception and understanding of business processes (van der Aalst et al., 2003). In some cases, a business process is as expressive and as communicative as the technique that has been used to model it. Therefore, the elements and the capabilities of a business process model play a significant role in describing and understanding a business process. Simulation modelling can effectively contribute to the understanding and analysis of business process. However, it does not provide the capability of finding the optimum values of decision variables and optimising a business process.

### 2.2.2 Performance Indicators in BPO

Babulall (2012) identified and substantiated the twelve (12) variables involved in optimising businesses processes in a bank setting. The study by Babulall, however, did not show ways to measure BPO. Then, MaseTshaba and Seeletse (2014) developed suitable measures for simple univariate cases. The indicators for BPO performance were shown to occur at the level of each variable involved, and a measure in percentage was also developed. The current study focuses on a general problem in which variables can take any form in any business setting. These BPO measures are important in any business for competitive strength, growth as well as profitability. These measures help to gauge the levels of competition, and generate performances. Then, when tracked on a time series format, the measures can also show the trends of improvement or deterioration in a business and its processes.

The position that a company occupies in its industry in terms of product, process and supply chain, among other attributes, is vital. The attributes may not all be achieved at the same time. Hence, some compromises may be necessary. However, the trade-offs among the attributes and the business dimensions can be quite complex, as they are in most instances, interdependent. According to Simon (2002) complex systems consist of large numbers of interrelated sub-systems, each of the latter (i.e. sub-systems) being structured hierarchically until the lowest level of elementary sub-system is reached. A business process is an important business item in understanding the nature and interrelation among activities within complex organisations (Modarres, 2006). Assessing business process performance is essential because it provides the capability to identify performance bottlenecks and taking corrective action before the problems escalate (Kueng, 2000). Nevertheless, achieving the full performance measurement approaches requires managing issues regarding business process performance improvement and receiving support to the associated decision-making processes.
In addition, the complexity of business processes tends to increase as a result of causal connections within hierarchical processes and variability within sub-processes at different levels in the system. Moreover, open system, real-world business processes have not only internal relationships, but also external relationships with their environment in order to adapt and survive (Earl & Khan, 1994).

A business product can be conceptualised as a bundle of attribute-values according to industry standards. Attributes such as customisation may possess multiple values. Therefore, there should be creation of a large number of bundles possible. A vector of attributes such as speed, price, reliability and capacity is an effective way of describing the product (Krishnan & Ulrich, 2001). The choice of this vector is driven by customer preferences as well as manufacturing and supply chain concerns, as shown in Figure 2.1 below.

**Figure 2.1 Product structuring**

Source: Chakravarty (2014)

A profound analysis of all relevant business data in a company is necessary for optimising business processes effectively. According to Radeschutz, Marko and Bernhard (2013), current analyses typically run either on business process execution data or on operational business data. Consequently, correlations among the separate business data sets have to be found manually under immense effort. However, in order to achieve a more informative
analysis, and to fully optimise a company’s business, an efficient consolidation of all major data sources is indispensable.

2.2.3 Business Process Model

According to Babulall (2012), a business process model is a concept of a business that demonstrates the way business constituents integrate with one another, and the way they operate. The business process model illustrates the organisation's recent state in order to determine its vision for the future. Modelling a complex business requires the application of multiple perspectives and views. Each viewpoint is a simplified description of a business from a certain vantage point. Several authors (Groznik & Maslaric, 2010; Kovacic, 2007; Marrelli, 2005) insinuate that business process modelling has the following objectives:

- It assists in obtaining a holistic view of the business process of focus
- It identifies areas for improvement
- It visualises the impacts and implications of new processes
- It describes the rules that underlie the business processes
- It assists in sketching methods of operations

2.2.4 Process Optimisation Strategies

2.2.4.1 Total quality management

According to Heizer and Render (2008), total quality management (TQM) is a Japanese designed philosophy to enhance quality that requires an incessant process of continuous improvement which includes people, equipment, suppliers, materials and procedures to achieve high quality and increases operational effectiveness. The TQM philosophy is based on the ideal that every aspect of the organisation can be improved. In the 21st century, quality has become a competitive necessity (Appraisal Smart Ltd, 2011).

Quality has become a key factor in determining an organisational success or failure in the global marketplace. Advanced, highly reliable business methods make it possible to achieve high quality standards (Talha, 2004). As a result, many business organisations are making process quality a keystone of their competitive strategy. The successes of many major companies are strictly based in the commitment to improve quality. Globally, current competitive market is characterised by accelerating changes, innovation and massive amounts
of new information. Changing customer needs fuels rapid evolution in the markets. In the observation by Talha (2004), most organisations that are successful in their quality improvement effort have adopted the approach of TQM. The TQM philosophy consists of four basic beliefs, namely:

- Absolute customer focus
- Employee empowerment, involvement and ownership
- Continuous improvement
- Use of systematic management approaches

2.2.4.2 Lean

Lean is a process philosophy aims to eliminate wasted time, effort and material, to provide customers with products and to reduce costs while improving quality (George, 2002). The method compresses wasted time out of production processes by reducing the time spent waiting. It relies on a metric called ‘process cycle efficiency’. This metric is the ratio of ‘value added time’ to ‘total lead time’. Value added time is the time spent on a product that actually increases the perceived value of the customer. Total lead time refers to the overall production time. More non value-adding time in the production process leads to a lower lean ratio. As a result there is more room for shortening the variable days.

2.2.4.3 Lean six-sigma

In the lean six-sigma process, quality and efficiency are complementary values and not mutually exclusive. While six-sigma focuses more on quality than on speed, lean six-sigma improves process flow and accelerates production speed, seeking to combine excellent quality with rapid turnaround times. According to George, Rowlands and Kastle (2003) lean six-sigma improves processes by eliminating inconsistencies in quality or turnaround time and by streamlining the process flow, with documentation, examination, training, and waste elimination. These items are described as follows:

- **Documentation**: Documentation refers to describing in writing how work gets done in detail, thus documenting it. It means to record the details of the work done.
- **Examination**: Examination means to thoroughly scrutinize the details of the method and the results, thus carefully observing the work flow to find bottlenecks.
• **Training**: Training is about teaching or empowering workers to know the best practices they should follow.

• **Eliminating waste**: This is to ensure that the method does not have any space for parts that waste time but having no value. Much of what takes place in workplaces involves waste, which uses time, effort and resources that could be better spent elsewhere.

Fundamentally, lean six-sigma process improves both the quality and speed in processes and in doing things better. When it is used effectively, it can enhance innovations in products, services, markets and even a company’s underlying business model, as well as to improve operations of the company (Bryne, Lubowe & Blitz, 2007). Towers (2010) asserts that while six-sigma in lean six-sigma emphasises the voice of the customer and understanding customer wants, it misses the crucial point in the information age, which is delivering what the customers need.

Nevertheless, the success of six-sigma, lean or lean six-sigma, has shown that it can be suitably applied to optimise processes in both the manufacturing and service oriented organisations. Moreover, the economic meltdown in recent years has shown a re-prioritisation of company budgets in the search for short-term benefits. Burton (2011) emphasises that proper strategic improvement is not on the radar for organisations. This approach can jeopardise organisations in the long-run as hidden waste continues to pile up on a global scale.

### 2.2.4.4 Business process management

Business process management (BPM) relates to the managing of business processes with the use of information technology. However, Doebeli, Fisher, Gap and Sanzogni (2011) intimate that BPM is:

• a broader approach to manage and improve processes that focus on the process lifecycle;
• a solution for a business using technology to automate and manage processes; and
• an approach to manage an organisation taking the process view.

According to Venkatraman (1994), standard information technology (IT) application, when accompanied by corresponding changes in internal business processes, can enhance significant advantages. The functionality IT, however, should not be simply superimposed on
the existing processes. Rather, it should be made a basis for designing the new organisation and associated business processes.

IT has modernised business conduct of the 21st century. Business process technologies, mobile phones and the internet speed have changed the business scenery. Use of IT in the organisation has given rise to enterprise systems, which are integrated enterprise-wide information systems that coordinate key internal processes of the firm (Laudon & Laudon, 2007). Enterprise systems have numerous benefits such as the reduction of business process cycle times, cost reduction, quality and productivity improvement and customer service improvement (Shang & Seddon, 2002). The IT insurgency has brought several benefits to BPM, such as business profitability, improvements to workflow systems, intelligent work routing and improve business processes, among others (Fingar, 2011; Schurter, 2011).

2.2.4.5 Outward-in

The ‘outward-in’ method is a modern business framework and system for creating and sustaining successful organisations thinking (Towers, 2010). The method is relevant in the modern days, as the business pace is accelerating and the drive for innovation is becoming more evident. Then, as a result, businesses worldwide are transforming (Lasalle, 2007). Ancient business models do not apply anymore. The key for organisational success is based on the philosophy of successful customer outcomes (SCO) because the complexities of interconnections between people and systems in the workplace compel organisations to continuously re-invent projects to improve the ways of working, which lead to more complexities. The outward-in method requires a process that involves a customer, which can be person to person, person to system, system to person, system to system and person to product. Therefore, any interaction with a customer is essentially an opportunity for optimality and quality enhancement.

2.3 MULTIVARIATE SYSTEMS

Many researchers investigate situations assumed to be based on a single random variable, which in actual statistical practice is virtually improbable (Tsay, 2002). Generally, and according to several authors (Cohen, Cohen, West & Aiken, 2002; Fryzlewicz, Van Bellegem & von Sachs, 2003; Mark & Goldberg, 2001), most experiments collect a multitude of data sets in their trial exercises. Countless statistical techniques exist for the modelling and
interpretation of vector-valued multivariate data systems, including multiple time series. For example, a basic quantity is the cross-correlation. The prime strength of cross-correlation is that it is used to measure the association between different components of a vector time series at different lags.

2.3.1 Multivariate Statistics

Multivariate statistics is an extension of univariate statistics to express the several statistical random variables that occur together (Malakooti, 2013). There are many types of analyses for multivariate data. The instance of multivariate statistics is more real than univariate statistics because always, each variable occurs within constraints of other variables or influences. The theory of statistics is limited to the condition where the various variables in a multivariate setting should be distributed in similar ways, even when rarely they may be allowed to differ in parameters. That is, multivariate statistics has not extended to the various variables being completely incommensurate. In reality, this is highly possible. However, there has not been much research along these lines and there should be a move towards this development. Many different models exist, each separate model having its own type of analysis (Johnson & Wichern, 2007). They are explained briefly below:

- Multivariate analysis of variance extends the analysis of variance.
- Multivariate regression describes the way elements in a vector of variables respond simultaneously to changes in others.
- Principal components analysis (PCA) creates a new set of orthogonal variables that contain the same information as the original set.
- Factor analysis is similar to PCA but allows the user to extract a specified number of synthetic variables, fewer than the original set, leaving the unexplained variation as error.
- Canonical correlation analysis finds linear relationships among two sets of variables.
- Reduction analysis derives a specified number of synthetic variables from one set of (independent) variables that explain as much variance as possible in another set.
- Correspondence analysis finds a set of synthetic variables that summarise the original set.
- Canonical correspondence analysis summarises the joint variation in two sets of variables.
- Multidimensional scaling determines a set of synthetic variables that best represent the pairwise distances between records.
• Discriminant analysis establishes whether a set of variables can be used to distinguish between two or more groups of cases.
• Linear discriminant analysis to compute a linear predictor from two sets of normally distributed data to allow for classification of new observations.
• Clustering systems groups objects.
• Recursive partitioning creates decision trees to correctly classify members of the population based on a dichotomous dependent variable.
• Artificial neural networks address any form of problem in non-linear multivariate models.
• Statistical graphics explore multivariate data.
• Simultaneous equations; and various autoregression involves simultaneous regressions of various time series variables on their own and each other's lagged values to assist in scientific problem solving.

2.3.2 Matrix Methods

Vectors and matrices are convenient ways to express random variables and their parameters in multivariate statistics. A convenient approach to express multivariate random variables is through the use of a random vector, which is stacking random variables together. Suppose that there are \( k \) random variables under investigation denoted by \( Y_1, Y_2, \ldots, Y_k \). Then the random vector is a form:

\[
Y = \begin{bmatrix}
Y_1 \\
Y_2 \\
\vdots \\
Y_k
\end{bmatrix}.
\]  

(2.6)

The form above denotes a random vector. The corresponding mean vector is a vector formed from the corresponding means. Suppose that each \( Y_i \) has mean \( \mu_i \) for all values of \( i \). Then the random vector has mean vector denoted by:
\[ \mathbf{\mu} = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_k \end{bmatrix}. \]

(2.7)

Similar vectors can be provided for the other measures of central tendencies. As was said earlier that the vocabulary and developments in multivariate statistics are still lagging behind, the median vectors and mode vectors do not appear in statistical literature. But they can also be defined. Suppose that the \( Y_i \) have median \( \pi_i \) and mode \( \gamma_i \). Then the median vector and mode vector are respectively denoted by:

\[ \mathbf{\pi} = \begin{bmatrix} \pi_1 \\ \pi_2 \\ \vdots \\ \pi_k \end{bmatrix}. \]

(2.8)

and

\[ \mathbf{\gamma} = \begin{bmatrix} \gamma_1 \\ \gamma_2 \\ \vdots \\ \gamma_k \end{bmatrix}. \]

(2.9)

The standard deviation plays a significant role in data analysis. Its definition goes from the variance. The formulation of standard deviation does not exist in multivariate form. Due to the mathematical formulation that has desirable forms and properties; the covariance matrix is instead defined. Suppose that each \( Y_i \) has variance \( \sigma^2_i = \sigma_i^2 \) for all values of \( i \), and each pair \((Y_i, Y_j)\) has covariance \( \sigma_{ij} \), the covariance matrix of the random vector \( \mathbf{Y} \) is given by:
This formation expresses the variances of each random variable in equation (2.6) on the main diagonal. The off-diagonal elements express the covariances.

### 2.3.2.1 Multivariate time series modelling

Multivariate time series analysis was developed to analyse two or more time series that are observed simultaneously. Multiple time series analysis allows for:

(i) An understanding of the relationship the variables share with each other.

(ii) The establishment of causal relationships between series.

(iii) The determination of the interdependencies between series.

Multivariate time series models: Vector Autoregressive model of order \( p \) (VAR (\( p \))), the Vector Moving Average model of order (VMA ) and the Vector Autoregressive Moving Average model of order (VARMA ) for the stationary and nonstationary case. A key aspect of multivariate time series analysis is the choice of model used to represent the series. Differences in model specifications and parameter estimates can result in very different findings. It is important to select the appropriate model to avoid obtaining spurious results (Fackler & Krieger, 1986).

**2.3.2.2 Vector Autoregressive Model of Order \( p \)**

Vector Autoregressive Model of Order \( p \) (VAR (\( p \))),

The VAR model for can be written in the general form of the multivariate linear model

\[
Y = X + U = + \Sigma
\]

(i.e. the general form of the multivariate linear model).
2.3.3 Multivariate Random Variables

The matrix and vector formations in the previous section present the basic formation of a random vector. This is an extension of a random variable from the univariate setting. The covariance matrix presented as equation (2.10) provides variances and covariances. However, analyses of multivariate random variables require standard deviations of single random variables and the correlations matrices of the pairs of random variable. The respective standard deviations are $\sigma_i = \sigma_i^2$ and the correlations of variable pairs are:

$$\rho_{ij} = \frac{\sigma_{ij}}{\sqrt{\sigma_{ii}\sigma_{jj}}}$$  \hspace{1cm} (2.11)

In the multivariate form the correlation matrix is:

$$P = \begin{bmatrix}
\rho_{11} & \rho_{12} & \cdots & \rho_{1k} \\
\rho_{21} & \rho_{22} & \cdots & \rho_{2k} \\
\vdots & \vdots & \ddots & \vdots \\
\rho_{k1} & \rho_{k2} & \cdots & \rho_{kk}
\end{bmatrix}$$ \hspace{1cm} (2.12)

This formation expresses the standard deviations of each random variable in equation (2.6) on the main diagonal. The off-diagonal elements express the correlation coefficients between the pairs of the various random variables in the random vector setting.

2.4 MULTIVARIATE MULTILEVEL MODELLING

MLM is known by different names in various disciplines. In biometric research, it is referred to as mixed–effects models, or random–effects models. In economics, it is referred to as random-coefficient regression models; and in Statistics, it is often referred to as covariance components models. It is a statistical modelling strategy in which the parameters of a regression model are given a probability model and have their own parameters (Gelman & Hill, 2007).

MLM programs use empirical Bayes estimation to derive the randomly varying level-one coefficients ($\beta_{qj}$) (Raudenbush & Bryk, 2002). MLM is an extension of multiple linear
regression to incorporate a more residual structure, which allows the user to partition variance across the levels of our model.

2.4.1 Multilevel Modelling

Multilevel models are developed for analysing hierarchically structured problem contexts. A hierarchy consists of lower-level observations nested within higher levels (Kreft & de Leeuw, 1998). Hierarchical data structures may have any number of levels. There may also be variables measured on the units at any or all levels. Multilevel models (also called mixed methods, random co-efficient models or hierarchical linear models) provide framework for representing the structure of such data within and between levels. This therefore eliminates the need to aggregate data or to analyse different levels separately.

Multilevel methods are specifically geared towards the statistical analysis of data that have a nested structure. The nesting, typically, but not always, is hierarchical. The idea of multilevel (ML) structure can be recast, with great advantage, to address a range of circumstances where one may anticipate clustering. Outcomes as well as their causal mechanisms are rarely stable and invariant over time, producing data structures that involve repeated measures, which can be considered a special case of multilevel clustered data structures (Subramanian et al., 2010).

Multilevel modelling tests multilevel theories statistically, simultaneously modelling variables at different levels without necessary recourse to aggregation or disaggregation.

In their basic form, multilevel models are multivariate models. In general also, they explain the interclass correlation. Hence, the effective number of variables is different for different variables. In addition, in most multilevel problems there are clustering of individuals within groups, and there are variables measured at all available levels. The primary interest is in the relationship among all these variables. Combining variables from different levels in one statistical model is a different and more complicated problem than estimating and correcting for design effects. Multilevel models are designed to analyse variables from different levels simultaneously, using a statistical model that properly includes the various dependencies (Goldstein, 2003).
Whether the data of interest are longitudinal or cross-sectional, multilevel analyses are concerned with the study of variation (Lott & Antony, 2012). When conducting ML analyses, it is important to balance the need for complexity and the need for parsimony.

### 2.4.2 Multivariate Modelling

It is common to investigate situations assuming cases of a single random variable, which in actual statistical practice these cases are improbable (Tsay, 2002). Real-life occurrences generally take place within multivariate conditions. Also, there is an influence of the variables of the environment in which each occurrence is experienced. According to several authors (Mark & Goldberg, 2001; Cohen, Cohen, West & Aiken, 2002; Fryzlewicz, van Bellegem & von Sachs, 2003), most experiments generally collect a multitude of data sets in environments that are characterised by multivariate statistics. Sub-optimality tends to occur in modelling these experiments because the influences are undervalued. Hence, multivariate provides a more realistic approach to modelling than univariate.

To justify and qualify the research problem, one needs to acknowledge that multivariate linear mixed modelling (MLMM) generalises linear mixed modelling (LMM). Also, multiple analysis of variance (MANOVA) and covariance (MANCOVA) envelop general linear models (GLM). MLMM enables simultaneous analysis of multiple dependent variables defined at the first level in a multilevel model. Further characterisation of MLMM is its property of hierarchical nature as “hierarchical multivariate linear modelling” (HMLM).

Multivariate analysis refers to all statistical techniques that simultaneously analyse multiple measures on individuals or objects under investigation. A variate of $n$ weighted variables ($X_1$ to $X_n$) can be stated mathematically as:

$$\text{Variate value} = w_1X_1 + w_2X_2 + w_3X_3 + \cdots + w_nX_n$$  \hspace{1cm} (2.13)

where $X_n$ is the observed variable and $w_n$ is the weight determined by the multivariate technique. The result is a single value representing a combination of the entire set of variables that best achieves the objective of the specific multivariate analysis variation.

Variation must be measured to be identified.
2.4.3 Multivariate Multilevel Models

A common example of these models is the case of students nested within classes nested within schools. In studies involving multiple variables changing over time, one could consider the study of change on each response variable separately. When observing data for a single subject on any single response variable, one would observe variation among individuals with respect to the pattern of change over time or inter-individual variation (Robitaille et al., 2012).

2.5 HIERARCHICAL OPTIMISATION PROBLEMS

Hierarchies are the natural bases for levels. They also apply in issues of prioritisation. In many optimisation problems there may exist multiple ways in which a particular hierarchical optimisation problem can be modelled. In addition, the diversity of hierarchical optimisation problems requires different types of multilevel relations between sub-problems. Hierarchical optimisation problems can be viewed as a particular combination and ordering of other optimisation problems. There, the solution of the initial problem can be rebuilt by combining solutions of its sub-problems. Generally, such sub-decisions have to be taken in a particular sequence (order) due to the fact that the solution of the upper level will define the level of optimality of its following levels. The multilevel optimisation facilitates the modelling of problems in which different disciplines interact. Hierarchical optimisation allows designers to incorporate all relevant disciplines simultaneously.

The hierarchical linear multilevel approach improves estimation of individual- and cross level effects in studies that use hierarchically structured, multilevel data by concurrently modelling within- and between-group effects (Raudenbush and Bryk 2002). Lack of data independence is present in multilevel data when the sampling unit displays intra-class correlation.

In the healthcare context, a greedy heuristic procedure is developed by Nicholson et al. (2004) for managing the cost of inventory in a healthcare setting. Specifically, the authors compare the service levels and inventory costs of an in-house three-echelon distribution network against an outsourced two-echelon distribution network. A constraint programming optimisation model is developed by Little and Coughlan (2008) determining the inventory needs in hospitals constrained by various product and service levels. Their model is capable of determining optimal stock levels of products restricted by the space, delivery and
criticality of the items. In Haijema et al. (2007), simulation is combined with Markov dynamic programming for production and inventory management of platelets at a blood bank, and Kopach et al. (2008) investigated multitier control policies for management of both urgent and non-urgent red blood cell supplies. A simulation-optimisation approach is developed in Ryttilä and Spens (2006) for managing blood inventory in a blood supply chain. They were able to determine the optimal inventory control of blood stock that minimise outdating and backorder costs while maintaining maximising the blood availability level. Discrete event simulation is used in Katsaliaki and Brailsford (2007) for inventory management in a blood supply chain. The model is used to determine ordering policies with the objective to minimise cost and supply shortages and wastage, and to increase service levels and safety procedures. As more hospitals added to the blood supply chain, the authors extended their work in Mustafee et al. (2009) by using distributed simulation to reduce the time needed to executing the model.

2.5.1 Conditions for cost minimum

A firm’s objective is to minimise $\sum_i p_i q_i$ subject to the production constraint by varying the $q_i$’s. The Lagrangian function

$$L(q, \rho) = \sum_1^n p_i q_i - \rho h(q, z)$$

(2.14)

when differentiated with respect to $\log q_i$ yields

$$\frac{\partial L}{\partial \log q_i} = p_i q_i - \rho \frac{\partial h}{\partial \log q_i}$$

(2.15)

By equating this to zero,

$$p_i q_i - \rho \frac{\partial h}{\partial \log q_i} = 0, \quad i = 1, \ldots, n$$

(2.16)

we obtain $n$ equations which, together with $h(q, z) = 0$, are assumed to yield unique positive values of the $q_i$’s and $\rho$ (Laitinen, 1980).

For the second-order condition we differentiate the Lagrangian function $L(q, \rho)$ with respect to $\log q_i$ and $\log q_j$ to obtain:
\[ \frac{\partial^2 L}{\partial \log q_i \partial \log q_j} = \delta_{ij} p_i q_i - \rho \frac{\partial^2 h}{\partial \log q_i \partial \log q_j} \]  

(2.17)

where \( \delta_{ij} \) is the Kronecker delta, equal to one for \( i = j \) and zero otherwise. To obtain a cost minimum, it is sufficient that the \( n \times n \) matrix with equation (2.17) as its \( (i,j) \)th element is symmetric positive definite.

The optimum values of the inputs can then be written as functions of the quantities taken as given by the firm, which are input prices and output quantities:

\[ q_i = q_i(z, p), \quad i = 1, \ldots, n. \]  

(2.18)

Minimum cost can therefore be written as a function of input prices and output levels:

\[ C = \sum_i^n p_i q_i(z, p) = C(z, p) \]  

(2.19)

2.5.2 Conditions for profit maximum

Another objective of a firm is to maximise profit for given input and output prices. Since \( y = (y_1, \ldots, y_m)^T \) is the vector of output prices, the firm’s revenue is

\[ R = \sum_r y_r z_r = y^T z. \]  

(2.20)

The objective is to maximise profit, \( R - C \), by varying \( q \) and \( z \) subject to the production constraint \( h(q, z) = 0 \) for given \( p \) and \( y \). Suppose that we know the solution for \( z \), so that \( R = y^T z \) is also known. Maximising \( R - C \) is then equivalent to minimising \( C = p^T q \) by varying \( q \) subject to the production constraint with \( z \) specified as the known solution.

Consider profit as a function of \( z \), which means that the first-order condition is

\[ \frac{\partial (R - C)}{\partial z} = 0 \]  

(2.21)

yielding

\[ \frac{\partial C}{\partial z_r} = y_r, \quad r = 1, \ldots, m, \]  

(2.22)
because $\frac{\partial R}{\partial z_r} = y_r$ follows from the assumption that $y$ is given. The second order condition requires $\frac{\partial^2 (R-C)}{\partial z \partial z'}$ to be negative definite, for which it is sufficient that

$$\frac{\partial^2 C}{\partial z \partial z'}$$

is symmetric positive definite,

$$\frac{\partial^2 R}{\partial z \partial z'}=0$$

because $\frac{\partial^2 R}{\partial z \partial z'}=0$ follows from the assumption that $y$ is given.

### 2.6 Conclusion

The chapter presented discussed BPO and factors of importance to business such as business process model and process optimisation strategies. The latter explained TQM, lean and lean six-sigma approaches, business process management (particularly emphasising technology use), and outward-in methods. The chapter also presented mathematical methods useful in expressing relationships of variables in linear forms. It also presented mathematical methods of measuring and effecting some important business variables, such as cost minimisation and profit maximisation. The chapter proceeded to explain multilevel modelling and describing the multivariate multilevel model and its suitability in this study. The convenient notation for these models was shown to be vector and matrices.

The use of numbers and availability of actual/numeric data is not possible due to value trends being unavailable. Also, some businesses do not provide correct financial statistics for many reasons. Therefore, descriptive methods should be able to cover aspects where numbers are not obtainable. The next chapter provides some facts about entrepreneurs. It is also used to provide the qualitative version in order to assist when mathematical methods lack reliable formulae for executing the calculus and matrix methods described.
CHAPTER 3: ENTREPRENEURIAL ORGANISATIONS

3.1 INTRODUCTION

The preceding chapter presented mathematical methods of optimisation. Some cases such as the ones in this study lack systematic approaches that could be modelled in mathematical forms. They also lack data useful for analysing their activities and progresses. However, their actions and activities can still be optimised as they express business processes. Qualitative approaches to the problem of optimisation of entrepreneurship activities may be practical as the quantitative aspects are lacking or are inadequate. This chapter explains the qualitative items applicable in optimising business processes in entrepreneuring.

3.2 ENTREPRENEURSHIP

Entrepreneurship is the innovative process of establishing a business, a startup enterprise or other organisation by an industrialist known as the entrepreneur (Hisrich, 2011). In enhancing the success of the business and its operations, the entrepreneur develops a business plan for the enterprise, hires suitable human resources, secures required business equipment and resources, and is fully responsible for the success or failure of the enterprise. The essential qualities for the entrepreneurs are team-building, leadership, and management ability.

The origin of entrepreneurship was intended to be for profit making. However, recently, according to Halloran (2014), ‘entrepreneurship’ has been made comprehensive from that origin of being for-profit businesses to embrace social entrepreneurship and the concept of the political entrepreneur. Deakins and Freel (2012) describe entrepreneurs as leaders prepared to take risk and exercise initiative, who exploit market opportunities by planning, organising, and engaging resources. Some entrepreneurs practice by purely innovating new products, while others improve existing ones. More recently, the term entrepreneurship has been extended to include a specific mindset which results in entrepreneurial initiatives. In addition to social entrepreneurship and the concept of the political entrepreneur, the entrepreneurial initiatives of the modern mindset include knowledge entrepreneurship. According to Reynolds (2007), in developed economies, participating in a new business creation is a common activity among workers over the course of their careers. Due to this trend, in recent years, entrepreneurship has been claimed as a major driver of economic growth in the United States, Western Europe, China and India, among others.
3.2.1 Leadership

Leadership is a skill that encompasses the ability of an individual or organisation to guide other individuals, teams, or whole organisations (Trevisani, 2016). It is basically a process of social influence in which a person can solicit the encouragement and assistance of others to achieve of a common undertaking. In this study, leadership refers to a range of macro-level, micro-level and project leadership (Scouller, 2011). Macro-level refers to higher abilities in managing the overall picture, micro-leadership refers to higher abilities in specialised tasks, and project leadership refers to higher ability in managing the execution of a task.

3.2.2 Management ability

Management refers to the administration of an organisation (Gomez-Mejia, Balkin & Cardy, 2008). The term may also be used to refer to the group of people managing an organisation. It includes the activities of setting the strategy of an organisation and coordinating the efforts of its employees or volunteers to accomplish its objectives through the application of available resources, such as financial, natural, technological, and human resources. According to Holmes (2012), in large organisations, there are generally three levels of managers, namely; senior management, middle management and lower management. These levels are typically structured in a hierarchical, pyramid structure. Senior managers set the strategic goals of the organization and make decisions on how the overall organization will operate. They provide direction to the middle managers who report to them. Middle managers provide direction to front-line managers. These managers communicate the strategic goals of senior management to the front-line managers. Lower managers oversee the work of regular employees and provide direction on their work. Aguinis and Edwards (2014) enlighten that in small organisations, managers’ roles have much wider spaces. A manager can perform several roles or even all of the roles commonly observed in a large organization.

3.2.3 Risk taking

Risk is the likelihood or probability of acquiring or losing something of value (Antunes & Gonzalez, 2015). Valuable items, tangible or intangible, can be gained or lost when taking risk because of a given action or inaction, foreknown or unanticipated. According to Cline (2015), risk can also be defined as the intentional interaction with uncertainty. Uncertainty is
a prospective, random, and overwhelming outcome. Risk is a result of action taken regardless of ambiguity.

### 3.2.4 Team building

Team building is a shared term for various types of activities used to enhance social relations and define roles within teams, often involving collaborative tasks (Ravio, Monna, Weigand, Eskolar & Lintunen, 2010). It is a widely used group-development activity in organisations. It is may coincide with team training, which is designed to improve the efficiency, rather than interpersonal relations. Team-building exercises aim to expose and address interpersonal problems within the group. Over time, team building activities are envisioned to improve performance in a team-based environment. Team-building is a base of organisational development that is applicable to teams. The gains of team building are visible in teamwork, which is discussed later in section 3.4.3.

### 3.3 SOME LOCAL PRACTICAL BARRIERS TO ENTREPRENEURSHIP

#### 3.3.1 Competition and other threats of locally owned SMEs

Competition is a business aspect globally (Porter, 2008). Entrepreneurs, and mainly the locally-owned small and medium enterprises (SMEs), face a threat of competition from foreign-owned SMEs, large MNEs and other mass merchandisers. Other threats originate from the fluctuating demographics of consumers, and the unstable consumer purchasing patterns. These coerce locally-owned SMEs to review their business operations. These SMEs are urged to modify their business strategies and models. Modern consumers use shopping malls, because they want shopping value, choices, convenient shopping locations, extended business hours, the convenience of one-stop shopping, a problem free shopping environment, and a friendly personal touch in a clean, fun place to shop (Seeletse, 2015a). These trading variations have increased the options accessible to the typical consumer at the expense of the entrepreneurs.

Strategic options in entrepreneurship are needed in the modern shopping phenomenon due to the entrance of ruthless competitors. Maesela, Hungwe and Seeletse (2016) showed that competition has strongly challenged entrepreneurship at the local level in South Africa. In many cases, incoming competitors displace local SMEs from their markets.
3.3.2 Large and multinational enterprises

The overall impact of multinational enterprises (MNEs), large franchise retailers and foreign-owned small and medium enterprises (SMEs), among other business competitors, on locally-owned SMEs has been identified as a major barrier to entrepreneurship and small business development. The literature on the MNEs and franchises phenomenon focuses sizeably on the negative impacts of mass merchandisers and discounters on local retailers and the local economy (Haig, 2011; Whitley, 2002). Secondly, there is substantial consideration from research and the media (Tomiura, 2007). The presence of newcomers such as large discounters and foreign-owned SMEs disturbs entrepreneurship at a local level, especially of the SMEs (Freel, 2006). This emerging competition of large retailers intensifies the overall competitiveness of the local retail marketplace, and also displays a pull-factor by attracting consumers from surrounding communities (Peterson & McGee, 2000).

The new competition has forged the development of discounters into local markets. Through a mixture of forceful pricing and innovative inventory-control systems, franchises and MNEs have displaced competition to their favour. They have succeeded as giant buyers by negotiating the best wholesale prices, while offering customers the lowest prices and making up the differences in volume (Tsao, 2002; 2003). On the other hand, entrepreneurs, basically the emerging, SMEs struggle to compete at large levels of economies of scale and scope. Consequently, according to Peterson and McGee (2000), many independent SMEs, are faced with the entry of ruthless competitors, and are thus under the danger of bankruptcy.

3.4 SKILL SET IN ENTREPRENEURSHIP

The entrepreneur is universally viewed as an innovator and a source of new ideas and business processes (Rostam-Afschar, 2014). Among the set of skills to effect a successful entrepreneurship, Prive (2012) enlightens that management skill and strong team building abilities are crucial leadership attributes for successful entrepreneurs. These accumulate to essential qualities identified earlier as essential qualities of an entrepreneur, which are leadership, management ability, and team-building.
3.4.1 Joseph Schumpeter

According to Schumpeter (1976), an entrepreneur is willing and able to convert a new idea or invention into a successful innovation. This approach also embraces ‘the gale of creative destruction’, which replaces inferior offerings across markets and industries, simultaneously creating new products and new business models. Therefore, creative destruction leads to long-term economic growth. Schumpeter (1934) demonstrated that changing the environment continuously provides new information about the optimum allocation of resources to enhance profitability. Some individuals acquire the new information before others, and recombine the resources to gain an entrepreneurial profit.

3.4.2 Risk-taking

Knight (2009) explains that the entrepreneur is willing to risk her or his career and financial security because of an idea, spending time as well as capital on an uncertain venture. The uncertainty could be due to risk, which is measurable statistically; ambiguity, which is hard to measure statistically; or true uncertainty, which is impossible to estimate or predict statistically. Entrepreneurship is often associated with true uncertainty, particularly when it involves something truly novel, such as a market that did not previously exist. Entrepreneurs can only become successful when they start by risking into business ventures.

3.4.3 Teamwork

Penrose (1959) highlights the collective nature of entrepreneurship. The effort implies that the entrepreneurs should be an institutional entrepreneur. Also, this approach embraces teamwork among members of an organisation. Penrose comments on teamwork that in modern organisations, human resources need to be combined in order to better capture and create business opportunities. In addition, DiMaggio (1988) confirms that entrepreneurship is more pronounced through teamwork, because new institutions arise when organised role players with sufficient resources identify opportunities to appreciate interests that they value highly.

Teamwork is a vital component for business. It is essential for groups of colleagues to work together in order to achieve a goal (Cattani et al., 2013). Team members should cooperate with complementary backgrounds using individual skills and providing constructive feedback
despite any personal conflicts between individuals. According to West (2012), three categories of teamwork exist. These are transition process (TP), action process (AP) and interpersonal process (IP). Each category has several processes within it which together result in 10 processes. TP consists of mission analysis, goal description and strategy development. AP entails monitoring progress towards goals, systems monitoring, team monitoring and background behaviour as well as coordination. IP entails conflict management, motivation and confidence building, as well as affective management. Teamwork is generally effective when team members have experience working together due to enhanced coordination and communication (DeChurch & Mesmer-Magnus, 2010). Some cases require team members to be trained to improve teamwork.

Hoegl and Gemuenden (2001) outline some few important teamwork benefits. One benefit is problem solving from contributions of collaborators who can provide alternative approaches to a solution. Another benefit is networking and developing relationships. Moreover, a team working together continually can develop high level of bonding to help avoidance of unnecessary conflicts. Unique qualities of each individual enable unique knowledge and abilities contributing to improved team members.

Caution is that teamwork is not necessarily easy to administer. It is also not a guarantee for success. Members in a team should all be worthy for the tasks at hand. Teamwork can have adverse effects if not perfectly administered (Lattimore & Von Glinow, 2010). It may have an unforeseen upshot of inciting hostility toward the managerial goal of making the teams fully self-managing. Also, teamwork initiatives may have a potential of individuals doing less work in a team than what they would normally do working individually (known as social loafing). Several measures are available for offsetting social loafing (Prtić, Taeihagh & Melton, 2015). Management can minimize social loafing by introducing incentives and rewards. They have to make individual performance to be visible while in a team setting. They can form smaller teams of specialization in specific tasks to certain individuals, and then measure individual performance. Social loafing can also be reduced by increasing employee motivation, by selecting motivated employees, and increasing job enrichment.

### 3.4.4 Synergy

Synergy refers to the use of several elements to generate a whole that is greater than the sum of the individual portions (Goffee & Jones, 2013). In teamwork and in crowdsourcing, the
synergistic relationship can be identified from the various crowd or team members (Gillwald, Moyo & Stork, 2012). The synergistic action gives different dimensions to competitiveness, strategy and network identity becoming an unconventional ‘weapon’ to compete in the market. It is used by those who exploit the economic systems’ potential in depth. Synergy constitutes a model of the factors which enable the practitioners to outline an active synergistic network. Furthermore, according to Hertzberg and MacDonell (2002), the synergistic network signifies an incorporated fragment of the system which controls, coordinates and optimizes functions.

3.4.5 Innovations

Innovation refers to development of new, original and more effective ideas and mechanisms that lead to better solutions which meet new requirements, unarticulated needs, or existing market needs (Heyne, Boettke & Prychitko, 2010). Durable thinkers reflect more effective products, processes, services, technologies and business models that improve work. In the work environment, innovation often leads to more productivity, improved performance, better results, and cost-effectiveness, among others. Innovation can be a catalyst to growth. Furthermore, it continually modernizes the organizational structure with better and more effective processes and products. Innovators continuously search for superior techniques to satisfy their work with improved quality, durability, service, and price with advanced technologies and organizational strategies.

According to Siltala (2010), innovation is the precise utility by which innovators either produce novel treasure generating capital, or provide current assets with enhanced prospects for generating prosperity. Innovation is about change (or improvement), which occurs because of an acknowledged necessity. It is carried out mainly by competent people with relevant technologies. Even though some of the innovations do not require finances, many sophisticated ones may require financial support.

Even though innovation can be accomplished in several ways, Frankelius (2009) points out that research and development is a formal direct approach to initiate innovation. Information technology also influences innovation. These approaches initiate radical and revolutionary innovations. However, innovations can also be established by informal on-the-job variations of practice, through discussion and blend of professional experience and by countless other methods. Changing business processes and management style can also lead to a work climate
that is conducive to innovation. Thus, deliberate and unintentional processes are capable of effecting innovation, but wisdom is a necessary attribute to acknowledge and recognize innovative opportunities. Crowdsourcing is a deliberate and intelligent way to innovate and to ensure attainment of quality work.

Innovators produce innovations to ultimately substitute older mechanisms. Distribution of innovation from an innovating party to other parties occurs to assist and help networking groups (Tuomi, 2002). Other parties may advance the innovation by additional or elevated innovation. Effectiveness of innovation should be gauged. Ideally, innovation should produce positive impact. The innovation measures at the organizational level relay to individuals, team-level assessments, and private companies from the smallest to the largest company. They can be conducted through surveys, workshops, consultants, or internal benchmarking. According to Salge and Vera (2012), a balance scorecard is a common innovation gauging tool in organizations. There is today no established general way to measure organizational innovation. Often, each company or industry uses ad hoc measures for this purpose.

### 3.4.6 Conflict in Crowdsourcing

Conflict occurs when there is a serious disagreement or argument in which parties get into collision or disagreement in contradicting one another (Maccoby & Scudder, 2011). It exists in all organizations, and may sometimes designate a healthy exchange of ideas and creativity. Some positive criticism of management may be a form of conflict. However, counter-productive conflict can result in delays and/or disruptions of work. It is important to manage conflict. It is the role of executive directors and/or managers to gauge the level and possible impacts of conflict (Lang, 2009). Resolving conflict should ideally occur at the levels where it occurs. The problems may occur when conflict gets out of hand. There are many causes of conflict, and many forms, which mainly depend on the size and format of an organization or the industry. Fisher (2010) advises that conflict should not escalate to beyond manageable levels. At the time that conflict prospects appear, they should be thwarted. According to Ishak and Ballard (2012), even when conflict has already started to frustrate operations, the affected company should find ways to regroup and refocus. Counter-productive conflict is a source of weakness in an organisation. It can also be a threat in the company transforming to be reality. Hence, crowdsourcing approach should apply robust methods to curb negative influences of occurring conflict.
3.4.7 Task Optimisation

The presence of distractors in crowdsourcing cannot be completely ruled out, such as conflict and other threats. In order to obtain the best from crowdsourcing, methods and processes should be systematic and robust in order to enable optimal crowdsourcing activity. Optimization refers to an act, process, or methodology of making a system as effusively impeccable, functional, or effective as possible (Babulall, 2012). It also refers to allocation of resources in order to achieve certain performance and quality goals. Innovation initiatives are aimed at optimising the tasks and their outcomes. The use of a crowd is aimed at maximizing benefits and minimizing possible detriments. Unsuitable fragments are not included in the solution (Savulescu & Persson, 2012). Teamwork is also applied for ideas to eliminate fragile solution proposals and reinforce useful ones. These show that optimization can easily be accomplished through innovation that is driven by crowdsourcing and meaningful teamwork.

3.4.8 Individual/Opportunity Nexus

Some individuals exploit entrepreneurial opportunities by risking with their possessions while others do not. Also, there are active connections between individuals and opportunities of entrepreneurship. According to several authors (Blackburn, 2008; Shane, 2013; Shane & Nicolaou, 2013; Shane & Venkataraman, 2000; Zahra, 2009), entrepreneurship covers both ‘enterprising individuals’ and ‘entrepreneurial opportunities’. Hence, researchers should study the nature of the individuals who respond to these opportunities when others do not. Also, there should be investigations to understand the opportunities themselves, as well as the relationship between individuals and opportunities.

3.5 Psychological Make-Up

In a USA case, Lazear (2005) established that variety in education and work experience was the most important trait that distinguished entrepreneurs from non-entrepreneurs. In Switzerland and Germany, Uschi and Moog (2013) found that a diverse social network was also important in distinguishing students who would go on to become entrepreneurs. Gender differences seem nonexistent in embracing entrepreneurship as males and females do neither shy differently nor embrace entrepreneurship dissimilarly. Age is not expected to be a factor, but experience has shown to be a beneficial trait. Experienced people from fulltime employ have been confirmed to be more effective in entrepreneurship creations and management.
Workplace peers and social composition are significant influences on the decision to become an entrepreneur (Nanda & Sørensen, 2010). There is a positive correlation between working with former entrepreneurs and how often these individuals become entrepreneurs themselves. On the other hand, compared to those who did not work with entrepreneurs, there is often no smooth sailing. Cattell's personality framework, both personality traits and attitudes are thoroughly investigated by psychologists. However, in case of entrepreneurship research, these notions are employed by academics too, but vaguely.

Another factor of decision-making in matters of entrepreneurship, personality is a system that is related to the environment (Swedberg, 1998). He further adds that traits and attitudes bring about change and growth in a person. Hence, the system seeks explanation to the complex transactions conducted by both. Personality which informs what an individual will do when faced with a given situation because a person's response is triggered by his/her personality and the situation faced.

### 3.5.1 Project Entrepreneurship

According to Ferriani, Cattani and Baden-Fuller (2009), a project entrepreneur is a person who is engaged in the repetitive assembly of temporary establishments. Some companies have limited lives planned to produce a singular objective or goal and get dispersed when the project ends. Industries where project-based enterprises are prevalent include music, movies, software, television, construction, and new media (Mampana, Seeletse & Sithole, 2016). Project-entrepreneurs are typical from a theoretical standpoint in that they have to modernise these temporary endeavours whenever new project opportunities arise. Consequently, they are exposed repetitively to problems and tasks characteristic of the entrepreneurial process.

The project-entrepreneurs face two critical challenges that customarily typify the creation of a new venture. The first one is pinpointing the right opportunity to launch the project venture, and the second one is to assemble the most fitting team to exploit that business opportunity meritoriously. In order to address the first challenge, project-entrepreneurs should access information necessary to snatch new investment opportunities. For addressing the second challenge, they should gather a cooperative team that fits well with the particular project challenges and has to function almost immediately to reduce the risk that performance might be adversely affected.
3.5.2 Innate Ability vs. Public Perception

Miller (2005) explains that project entrepreneurs can use ‘an innate ability’ or quasi-statistical sense to measure public opinion. According to Scheufele (2007), people assume they can sense and figure out what others are thinking. In general though, the mass media often assist in determining the dominant opinion. The mass media impact enormously on the way public opinion is depicted. It can then intensely impact an individual's perception about where public opinion lies, whether or not that portrayal is factual. This is the way fashion and trends are developed or formed.

The entrepreneurs’ ability to innovate relates to innate traits, including extroversion and a tendency for risk taking (Ramoglou, 2013). The competences to innovate, introduce new technologies, increase efficiency and productivity, or generate new products or services, are confirmed distinctive qualities of successful entrepreneurs.

3.5.3 Entrepreneurial Styles

Differences in entrepreneurial establishments often partially reflect their founders' diverse identities. Fauchart and Gruber (2011) have classified entrepreneurs into three main types: Darwinians, Communitarians and Missionaries. These types of entrepreneurs diverge in central ways in their self-views, social motivations, and patterns of new firm creation. They are explained below:

3.5.3.1 Darwinians

Darwinism is a philosophy that states that all classes of beings arise and develop through the natural selection of small, inherited variations that increase the individual's capability to compete, survive, and reproduce (Schmitt, 2009). It describes evolutionary concepts in general. The theory applies to business entrepreneurship when the entrepreneur has ambitions to grow the business.

3.5.3.2 Communitarians

Communitarianism is a philosophy that highlights the assembly between the individual and the community (Barzilai, 2003). Its prime philosophy is based upon the belief that a person's social identity and personality are largely shaped by community relationships, with a smaller
amount of development being placed on individualism. The community is a family unit. As a result, communitarianism is usually considered, in the wider, philosophical sense, as a pool of interactions, among a community of people in a given place/location, or among a community sharing an interest or a history. This philosophy enables entrepreneurs to share and combine ideas in a business or other venture to achieve a common goal.

3.5.3.3 Missionaries

The concept of ‘missionaries’ in entrepreneurship entails a philosophy where an entrepreneur aims to engage in business to advance a cause for people who are not necessarily known him or her (Hoang & Gimeno, 2010). The global intention is to contribute in making the world a better place. It is therefore society-at-large which acts as the primary frame of reference of the entrepreneur style of missionaries.

3.6 FINANCIAL MANAGEMENT AND FINANCING

3.6.1 Financial Management

Some companies generate enough revenue in the short- and medium-terms, but still fail to sustain the businesses due to the poor financial decisions they make. Financial management is an important and necessary quality for successful entrepreneurship. The financial decisions start from capital investment to profitability, and they also include budgeting and resource allocation (Van Horne & Wachowicz, 2009).

3.6.2 Bootstrapping

Every entrepreneur has to secure funds to operate. Entrepreneurs may attempt to ‘bootstrap’ a company rather than seeking external investors of financiers. Bootstrapping is simply a collection of methods applied to reduce the amount of outside debt and equity financing needed from banks and investors (Ebbena & Johnson, 2006). Often, entrepreneurs engage in bootstrapping to incur personal credit-card debt, but many other methods are available for bootstrapping. Bootstrapping entails increased risk for entrepreneurs. However, being the only stakeholder gives the entrepreneur more freedom to develop the company. Successful companies which started with bootstrapping include Dell Computers and Facebook. Types of bootstrapping, according to Narayanan & O'Connor (2010), include:
• owner financing
• sweat equity
• minimization of accounts payable
• joint utilization
• delaying payment
• minimizing inventory
• subsidy finance, and
• personal debt.

3.6.3 External Financing

Sometimes the startup business requires huge amounts of money. Generally, many businesses need more capital than can be provided by the owners themselves, and in this case, a range of options is available including:

• Angel investors
• Venture capital investors
• Crowdfunding
• Hedge funds, and
• Alternative asset management.

Financiers offer funds. However, some of them also deliver financial oversight, accountability for carrying out tasks and meeting milestones. In some cases they may also provide business contacts and experience. There are many sources of funding who in return on the additional services they give; may require a return for an equity stake.

3.6.4 Predictors of Entrepreneurial Success

Factors that may predict entrepreneurial success include methods, markets, industry, team, company, and status (Duening, Hisrich & Lechter, 2009). These are described as follows:

3.6.4.1 Methods

• Establishing strategies
• Maintaining the human personnel
• Ensuring the availability of required materials
• Utilizing the unique advantage of the business
• Ensuring good organization and co-ordination, and
• Congruency to the culture of the society.

3.6.4.2 Market

• Business-to-business model
• High growth market, and
• Targeting customers missed by others.

3.6.4.3 Industry

• Growing industry
• High technology impact on the industry
• Low capital intensity, and
• Small average incumbent firm size.

3.6.4.4 Team

• Large, diverse venture team
• Qualifications
• Management experience
• Work experience in the start-up industry
• Employed full-time prior to new venture
• Prior successful entrepreneurial experience
• Full-time involvement in the new venture
• Motivated by high profits, and
• Number and diversity of individual's social ties.

3.6.4.5 Company

• Written business plan
• Activity focused on a single product or service
• Competition based on a dimension other than price
• Early, frequent and intense marketing
• Tight financial controls
• Start-up capital, and
• Corporation.

3.6.4.6 Status

• Wealth
• Dominant Race, Ethnicity, or Gender in a Socially Stratified Culture.

3.7 ENTREPRENEURSHIP ROUTE

The methods explained in the discussion on entrepreneurship are proven global techniques to engage in business. They depend on the place of business. Entrepreneurs in developed nations used most of them, and could also add a few more others at customised levels. In the undeveloped countries, entrepreneurs often use less of the methods. However, in the towns and cities of developing ones, there could be demands and pressures to incorporate more of the modern business methods in order to survive. The next few paragraphs explain generic stages that are vital for growth and survival of entrepreneurialships.

The entrepreneur’s route commences with generating a business idea, consciously or unconsciously, and gain interest to making the idea real. The idea has to be viable in order for embarking on factual entrepreneurship. Then, planning for the business venture to transform the idea into business starts. When ready to embark on a business venture based on the idea generated, business finance becomes a necessity. The way start-up capital is obtained in any one way of the methods explained earlier. In the modern days, competition should be envisaged, whether current or future. In the case of South Africa, it is advisable to establish a formal business organisation in order to avoid running a micro-business or a survivalist, which are not registered businesses. Also, once registered, there are opportunities of finance and other benefits that may not be open for unregistered businesses.

Once opened, the formal business can start. The test of three to five years is vital, as there is evidence that SMEs have a high tendency to collapse before end of five years. The vital key to survival includes identifying a market, having a good product to offer to the market(s) in a way above competitors, being able to sustain your offer, being persistent and firm in position of competition, being profitable, and use finances wisely, among others.
The above key elements are also the prerequisite for business growth. However, the growth requires that in addition to the items stated in the last paragraph, there should be increases in the (product) offers and markets, revenues generated and profits, intensifying competition and increase space, among others. New ways of doing business, such as use of technologies and expanding to markets outside the original/local territories is another possible boost that entrepreneurs can adopt to improve business.

3.8 CONCLUSION

The chapter explained the essential qualities for entrepreneurship to be successful, which are leadership, management, risk control and team building. The barriers of entrepreneurs were also discussed. The skill set required in entrepreneurship was then presented and described. The chapter also presented the psychological aspects of importance to entrepreneurship. The topic of financial sources and financial management closed the discussions. The next chapter presents study methods used to accomplish this study.
CHAPTER 4: EXPERIMENTAL SETUP

4.1 INTRODUCTION

The previous chapter discussed entrepreneurships and the various topics related to the concept of business process optimisation. This chapter presents the research methods used in conducting the study.

4.2 STUDY DESIGN

Regression formations are addressed by empirical research. The principle of parsimony is also used to determine the levels in multilevel modelling of business process and variables of each level. Parsimony requires use of the least possible resources (Zhang, Xu & Callan, 2008).

The study applies operations research methods to mechanise the process and update it when necessary. To ensure accuracy, the study used actual practitioners for real data. According to Cohen et al. (2015), the approach should be summed as:

\[
\text{Data} \leftrightarrow \text{Model} \leftrightarrow \text{Optimisation}
\]

(4.1)

Thereafter it is expected to go: Back to Data for Monitoring and Control (see Figure 4.1).

The study design is basically a mathematical multilevel model building which depends on a mix of qualitative and quantitative scheme through quantifying and measuring the various variables for quantifying BPO.

Figure 4.1 BPO Design

Source: Author’s own design
Description of the above approach

Information obtained from the data, which is obtained from the analysis, informs the model development. Further information on enterprise successes informs optimisation. Then, the optimised form is expected to assist in improving data weaknesses where possible.

4.2.1 Target Population

Targeted respondents are some entrepreneur-owned private enterprises, which include financial institutions, manufacturing companies, food services institutions, IT companies, events management companies, private education providers, allied and medical healthcare organisations, transport or shuttle services and management consulting companies.

4.2.2 Population and Sample

The study population consists of successful entrepreneurs with working experiences of business processes as well as managing in the environments where processes are optimised. They are managers with experience in business processes, and employees at business process operations. Initial screening of the possible informants showed that it is rare to find these features in government and academic institutions where merit carried less weight in appointing people to top positions. Thus, sampling of the respondents will be purposive, to ensure that respondents who lack information for the study are excluded. The study sample consisted of 30 entrepreneur practitioners in Pretoria, Gauteng Province. Company names are not revealed for ethical reasons.

4.2.3 Data Collection Tool

A structured questionnaire was designed, piloted, validated and administered to officials for entrepreneurs with experience at operational, middle and top management levels regarding the processes in their organisations. The data collection tools are included under Appendix A.

4.2.4 Data Collection

Data collection techniques for modelling BPO tools are grouped as qualitative or quantitative methods. Qualitative measures use non-numerical data. Quantitative measures use numerical
assessments (Yang, Lin & Jin, 2015). This study used primary data sourced from successful entrepreneurs in Pretoria.

4.2.5 Data Analysis

Analysis was done by multiple regression models at the different levels of the multilevel model. Existing correlations are also explained. Then multicollinearity is also discussed and its implications interpreted. Actual data analysis, which consists of numeric and non-numeric answer, depended of SPSS and the GABEK software. An analysis of the numeric data was executed using SPSS. That of text material collected during the interviews was carried out with the GABEK software. GABEK is an acronym for Ganzheitliche Bewältigung von Komplexität, and means ‘Holistic Processing of Linguistic complexity’. It is a PC-supported method for the qualitative analysis of text.

4.3 QUALITATIVE DATA

Qualitative methods can be supportive in scientific research for model building, especially when details can be found to reinforce the model (Chaves et al., 2008). This is particularly factual expressly when research area is innovative and earlier work is inadequate for a conjectural approach. Then, explorative work is essential to specify and structure topics. In this approach, semi-structured interviews are beneficial for collecting data when respondents inform on concrete themes. Also, it is possible to respond to special topics specified by the respondent. Therefore, presumed subjects can be validated and newly emerging critical areas can be branded. This is the reason to fortify quantitative research with qualitative methods. This is because usually, in quantitative research, new discoveries cannot be discovered and therefore are unnoticed during the research.

The software used, GABEK, is a qualitative research method based on natural language processing of individual statements that allows for the transparent organization of knowledge (Zelger, 2008). The method helps to collect and systematise unordered, but theoretically noteworthy knowledge of members of interest groups, which in this study is entrepreneurship practices for concentrated accomplishment. The procedure assimilates and unites multifaceted contents and knowledge. The study results may consist of a holistic model of complex phenomena expressed in tabular form (Zelger, 2000). In some instances it aids to
illuminate topics and their connection by creating network graphs. Moreover, a qualitative assessment of key research terms can fill the ensuing impression of the data interpreted.

The explorative research procedure can help to sustain the investigation process. It can subsequently assist to formulate additional concrete research questions. These new developments could then be scrutinised using quantitative methods.

4.4 CONCLUSION

The chapter briefly explained the methods used in the study for data collection. It explains an information-driven model development effort through use of data collected and used to derive the information needed to formulate a mathematical formation or relationships and interaction in entrepreneurial activities for enterprise success. The next chapter presents the analyses of text and statistics, and then derive results from statistical tests.
CHAPTER 5: DATA PRESENTATION AND ANALYSIS

5.1 INTRODUCTION

The preceding chapter explained the research methods used in this study. This chapter presents the data collected from the interviews and questionnaires. The aim was to determine factors in the entrepreneurship that were fundamental to the success of several entrepreneurs in various sectors. Data were gathered from 30 respondents who took part in the research study. The study had to ensure that the businesses selected were neither franchises nor multinational enterprises (MNEs) that were created from reputable entities that were rich. It was required to ensure that they went through entrepreneurship paths. Purposive sampling of three process experts in each entrepreneurship, who were involved in business processes, was made. Questionnaires from 14 entrepreneurships were completed and returned. The final response rate was 30 responses out of 36, giving a response rate of 83.3%.

5.2 PROFILES OF ENTREPRENEURSHIPs

The table below shows the ‘description’ of the level at which the entrepreneurship efforts were initiated. The current status is captured on the right column, alongside the respective starting point of each enterprise.

<table>
<thead>
<tr>
<th>Start</th>
<th>Description</th>
<th>Frequency</th>
<th>Development stage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning</td>
<td>1 ind. clean, surv; 1 sme</td>
<td>2</td>
<td>50%</td>
<td>1 developed (lb C &amp; S)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 sme</td>
</tr>
<tr>
<td>Security</td>
<td>1 surv., 2 sme</td>
<td>3</td>
<td>67%</td>
<td>1 sme; 1 lb</td>
</tr>
<tr>
<td>Shoe dealer</td>
<td>1 micro-, fix; 1 sme, fix</td>
<td>2</td>
<td>100%</td>
<td>1 maker, sme</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 maker, mne</td>
</tr>
<tr>
<td>Gardening services</td>
<td>1 sme</td>
<td>1</td>
<td>100%</td>
<td>1 lb (local to national)</td>
</tr>
<tr>
<td>House cleaning</td>
<td>1 sme</td>
<td>1</td>
<td>100%</td>
<td>1 lb, clean &amp; maint</td>
</tr>
<tr>
<td>Dressmaking</td>
<td>4 sme</td>
<td>4</td>
<td>75%</td>
<td>2 dress lb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dress &amp; shoemaking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 dress sme</td>
</tr>
<tr>
<td>Education</td>
<td>1 lb, 1 sme</td>
<td>2</td>
<td>100%</td>
<td>1 lb, priv. sch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 lb, educ cons</td>
</tr>
<tr>
<td>Dry cleaning</td>
<td>1 surv., house ch; 1 sme</td>
<td>2</td>
<td>100%</td>
<td>1 lb (laundry serv)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 lb</td>
</tr>
<tr>
<td>Events management</td>
<td>1 sme; 1 surv</td>
<td>2</td>
<td>100%</td>
<td>1 lb, (nat. to internat)</td>
</tr>
<tr>
<td>Food services</td>
<td>3 sme</td>
<td>3</td>
<td>100%</td>
<td>1 lb (catering)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 mne (supply chain)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 sme (retailing)</td>
</tr>
<tr>
<td>Hospitality</td>
<td>1 lb, 2 sme</td>
<td>3</td>
<td>100%</td>
<td>1 mne (B&amp;B)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 lb, 1 mne</td>
</tr>
<tr>
<td>Insurance</td>
<td>2 sme</td>
<td>2</td>
<td>100%</td>
<td>1 lb, 1 mne</td>
</tr>
<tr>
<td>Medical practices</td>
<td>2 lb; 2 sme</td>
<td>2</td>
<td>50%</td>
<td>1 lb</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 mne</td>
</tr>
<tr>
<td>Mental Health Private Hospital</td>
<td>1 lb</td>
<td>1</td>
<td>100%</td>
<td>1 mne</td>
</tr>
</tbody>
</table>
Table 5.1 above shows that there were 30 entrepreneurship initiatives. At their inception they were five (5) large businesses, one (1) micro-business, 20 small and medium enterprises (SMEs), and four (4) survivalists.

The entrepreneurs developed their businesses from their initial small scale to some higher business. In total, the different initial sectors showed improvement from as low as 50% to 100%. Collectively, only three (3) of the 30 enterprises did not transform from their original formation. These three made only 10% of all the enterprises that retained their original formation when 90% had reformed radically.

However, these 10% ‘unchanged’ enterprises had improved their business dramatically without changing the formations.

The original business types were:

**Table 5.2 Initial Business Types**

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4</td>
<td>1</td>
<td>20</td>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>

They progressed to:

**Table 5.3 Business Types After Progress**

<table>
<thead>
<tr>
<th></th>
<th>SME</th>
<th>Large business</th>
<th>MNE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>9</td>
<td>15</td>
<td>6</td>
<td>30</td>
</tr>
</tbody>
</table>

This development can be visualised as follows:

**Figure 5.1 Development of Entrepreneurs**

*Figure 5.1a Initial enterprises*

*Figure 5.1b Transformed the enterprises*
Remark

The figure above demonstrates an improvement of the enterprises. Formerly unregistered ones (survivalists and micro-businesses) grew into formal businesses. Some SMEs expanded to large while some large ones grew to become MNEs. Also, the distribution is not as wide as before, but slender and concentrated on fewer but larger enterprises.

5.3 POSSESSION OF ESSENTIAL ENTREPRENEURSHIP QUALITIES

Table 5.2 Essential Qualities of Entrepreneurs

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>2</td>
<td>1</td>
<td>17</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Management</td>
<td>2</td>
<td>1</td>
<td>19</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Risk taking</td>
<td>4</td>
<td>1</td>
<td>20</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Team building</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>3</strong></td>
<td><strong>70</strong></td>
<td><strong>20</strong></td>
<td><strong>101</strong></td>
</tr>
</tbody>
</table>

The survivalists and micro-businesses did not participate in team building (obviously because they do not have people to form teams). All of them, however, demonstrated the risk taking quality. Further, leadership and management qualities were possessed by about half of the survivalists, and the participating micro-business. Most SMEs possessed each and everyone of the qualities. Team building quality was the least possessed quality by 70% of the SMEs, while risk taking was the most possessed by 100% SMEs. All the large businesses possessed all the four qualities.

Figure 5.2 Essential Qualities of Entrepreneurs

Figure 5.1 shows that in terms of the qualities possessed by the entrepreneurs, risk taking was the highest and team building was the lowest. Management skill/quality was the second
highest quality possessed while leadership was the third highest. The test of independence follows to determine if certain essential qualities exist in specific business types.

**Test of independence**

A hypothesis of independence was performed to determine whether the possession of a quality was independent of the business type. In determining if it fitted the proportions, a goodness-of-fit test using chi-square is appropriate (Wackerly, Mendenhall & Scheaffer, 2008). The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Qualities possessed were independent of the business type} \]

\[ H_a : \text{Qualities possessed were not independent of the business type} \]

Let \( o_i \) denote the \( i^{th} \) observed frequencies and \( e_i \) the corresponding expected frequencies in a contingency table (e.g. frequency table). The value of the test statistic (Bless, Higson-Smith & Kagee, 2006) is given by the formula:

\[
\chi^2 = \sum_{i=1}^{k} \left( \frac{o_i - e_i}{e_i} \right)^2
\]

(5.1)

On small observed frequencies (less than 5), Simon (2002) recommends use of the Yates corrected chi-square equation given as:

\[
\chi^2 = \sum_{i=1}^{k} \left( \frac{|o_i - e_i| - 0.5}{e_i} \right)^2
\]

(5.2)

In both versions the chi-square statistics’ degrees of freedom (d.f.) is \( k-1 \) when the number of categories \( k \) is used (Curwin & Slater, 2002); or \( (c-1)(r-1) \) when the contingency table if a matrix with \( c \) columns and \( r \) rows is used (Tabachnick & Fidell, 2007). The rule is to reject the null hypothesis if the calculated test statistic exceeds the critical value from the table of chi-square statistics. Furthermore, all the tests are conducted at the 5% level of significance.

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.3a is a reproduction of Table 5.2 presented in shorthand notation, and Table 5.3b consists of entries derived from the hypothesis of independence.
Table 5.3 Essential Qualities of Entrepreneurs

Table 5.3a: Observed quality frequencies

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>2</td>
<td>1</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Mang</td>
<td>2</td>
<td>1</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Risk</td>
<td>4</td>
<td>1</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Team</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 5.3b: Expected quality frequencies

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>1.9802</td>
<td>0.7426</td>
<td>17.3267</td>
<td>4.9505</td>
</tr>
<tr>
<td>Mang</td>
<td>2.1386</td>
<td>0.8020</td>
<td>18.7129</td>
<td>5.3465</td>
</tr>
<tr>
<td>Risk</td>
<td>2.3762</td>
<td>0.8911</td>
<td>20.7921</td>
<td>5.9406</td>
</tr>
<tr>
<td>Team</td>
<td>1.5050</td>
<td>0.5644</td>
<td>13.1683</td>
<td>3.7624</td>
</tr>
</tbody>
</table>

Due to frequency values lower than five ($o_i < 5$) in Table 5.3a, equation (5.2) is used. Then, the value of the chi-square statistic is:

$$\chi^2 = \sum_{i=1}^{k} \left( \frac{|o_i - e_i| - 0.5}{e_i} \right)^2 = 1.9913.$$

Due to $c - r = 4$ in the contingency table involved, the d.f. = 9. Therefore, the critical value at 5% level of significance is $\chi^2_{0.05} = 16.9190$. The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the possession of a quality does not depend on a business type.

**Chronological generate from GABEK**

The history narrated by the 30 entrepreneurs regarding their entrepreneurship initiatives gave a positive impression that there was resolute leadership in the activities of the enterprises. Survivalists and micro-businesses did not demonstrate much of these qualities. Risk taking, on the other hand, was possessed by mostly the large businesses and SMEs, especially the SMEs that grew into large businesses and the large businesses that progressed to MNEs.

### 5.4 CHALLENGES/BARRIERS EXPERIENCES DURING ENTREPRENEURING

Table 5.4 Entrepreneurial Hurdles Experienced

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finances</td>
<td>4</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Competition</td>
<td>3</td>
<td>1</td>
<td>11</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Trade</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Regulations</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Taxes</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Conflicts in teams</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10</strong></td>
<td><strong>4</strong></td>
<td><strong>80</strong></td>
<td><strong>23</strong></td>
<td><strong>117</strong></td>
</tr>
</tbody>
</table>
Survivalists and micro-businesses did not feature in regulations, taxes and conflicts because they are neither formally registered nor have people to form teams. They were, however, challenged in ‘finances’, ‘competition’, ‘infrastructure’ and ‘trade’. The SMEs and large businesses were challenged by every barrier listed in Table 5.4. Taxes seemed to have burdened most SMEs (18 out of 20 = 90%). Finances troubled 7 (35%) of the SMEs, which was the least challenge for the SMEs. Other challenges were higher. For the large businesses, ‘infrastructure’, ‘regulations’ and ‘taxes’ were the most hurdles for the large business at 80% (4 out of 5) each. The least challenge of the large businesses was finance at 40% (2 out of 5). The rest of the challenges burdened 60% of the large businesses.

The factors ‘innovation’ and ‘labour’ were also probed regarding whether they were part of the challenges or barriers for the entrepreneurship in the long-term since their inception. To the surprise of the study, no entrepreneur indicated these factors to have been among the challenges of the investigated entrepreneurs. As a result, these items are not included in the table above.

Figure 5.3 Entrepreneurial Hurdles Experiences

Figure 5.3 indicates that ‘conflicts in teams’ existed the least, followed by both finances and trade (equally). The highest experiences barrier was ‘taxes’, then ‘infrastructure. Next were both ‘competition’ and ‘regulations’.

**GABEK finding**

Large businesses engage in activities that deal with modern technologies, and more people such as conflict and conflict resolution. Survivalists and micro-businesses deal with less intense ones, but focus on making marginal profit. SME plays between these groups.
The test of independence follows.

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Barrier types are independent of the business type} \]

\[ H_a : \text{Barrier types are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.5a is a reproduction of Table 5.4 presented in short-hand notation, and Table 5.5b consists of entries derived from the hypothesis of independence.

<table>
<thead>
<tr>
<th>Table 5.5</th>
<th>Barriers of Entrepreneurs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table 5.5a: Observed quality frequencies</strong></td>
<td><strong>Table 5.5b: Expected quality frequencies</strong></td>
</tr>
<tr>
<td>Surv</td>
<td>Micro</td>
</tr>
<tr>
<td>Fin</td>
<td>4</td>
</tr>
<tr>
<td>Com</td>
<td>3</td>
</tr>
<tr>
<td>Infr</td>
<td>2</td>
</tr>
<tr>
<td>Trade</td>
<td>1</td>
</tr>
<tr>
<td>Reg</td>
<td>0</td>
</tr>
<tr>
<td>Taxes</td>
<td>0</td>
</tr>
<tr>
<td>Confl</td>
<td>0</td>
</tr>
</tbody>
</table>

Again some frequency values are lower than five \((o_i < 5)\) in Table 5.5a, equation (5.2) is used. Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 94.2394.
\]

Due to \(c = 4\) and \(r = 7\) in the contingency table involved, the d.f. = 18. Therefore, the critical value at 5% level of significance is \(\chi^2_{0.05} = 28.8693\). The test statistic exceeds the critical value. Thus the hypothesis of independence must be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the barriers affected the types of enterprises differently.
## 5.5 SKILL SET OF THE ENTREPRENEURS

### Table 5.6 Skills Set Presence in Entrepreneurs

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness</td>
<td>4</td>
<td>1</td>
<td>20</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Synergy</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Innovation</td>
<td>4</td>
<td>1</td>
<td>18</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>Conflict resolution</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Task optimisation</td>
<td>4</td>
<td>1</td>
<td>19</td>
<td>5</td>
<td>29</td>
</tr>
<tr>
<td>Networking</td>
<td>1</td>
<td>0</td>
<td>15</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>3</strong></td>
<td><strong>93</strong></td>
<td><strong>24</strong></td>
<td><strong>133</strong></td>
</tr>
</tbody>
</table>

Survivalists and micro-business do not show to involve the skills sets of ‘synergy’ and ‘conflict resolution’. All the survivalists and the microbusiness involved showed to have had ‘willingness’, ‘innovation’ and ‘task optimisation’. Only one (25%) survivalist seemed to have applied networking. Also, the micro-business did not seem to involve ‘networking’.

The SMEs and large businesses involved all the skills in Table 5.6. they all showed ‘willingness’. The SMEs showed high involvement in ‘task optimisation’ (18 of 20 = 90%) and ‘innovation’ (19 of 20 = 95%).

All the large businesses showed ‘willingness’, ‘innovation’ and ‘task optimisation’. Another high proportion of them (4 of 5 ≈ 80%) were ‘networking’, 60% (3 of 5) were involved in ‘synergetic’ ventures, and 40% (2 of 5) were in conflict resolution.

### Figure 5.4 Skills Set Presence in Entrepreneurs

![Skills Set Presence in Entrepreneurs](image-url)
Figure 5.4 shows that all the entrepreneurs were willing to participate. This was followed by ‘task optimisation’, ‘innovation’ and then ‘networking’. The lowest skill was on ‘synergy’, and then ‘conflict resolution’.

**GABEK finding**

Large businesses deal with activities of long term growth while survivalists and micro-businesses are more for immediate subsistence. These enabled businesses and some SMEs to improve to multinational status.

The test of independence follows.

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Skills set forms are independent of the business type} \]
\[ H_a : \text{Skills set forms are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.7a is a reproduction of Table 5.6 presented in short-hand notation, and Table 5.7b consists of entries derived from the hypothesis of independence using Table 5.6 frequency values:

**Table 5.7 Skills Set of Entrepreneurs**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will</td>
<td>4</td>
<td>1</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Syn</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Inn</td>
<td>4</td>
<td>1</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Conf</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Task</td>
<td>4</td>
<td>1</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Net</td>
<td>1</td>
<td>0</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will</td>
<td>2.9323</td>
<td>0.6767</td>
<td>20.9774</td>
<td>5.4135</td>
</tr>
<tr>
<td>Syn</td>
<td>1.0752</td>
<td>0.2481</td>
<td>7.6917</td>
<td>1.9850</td>
</tr>
<tr>
<td>Inn</td>
<td>2.7368</td>
<td>0.6316</td>
<td>19.5789</td>
<td>5.0526</td>
</tr>
<tr>
<td>Conf</td>
<td>1.4662</td>
<td>0.3383</td>
<td>10.4887</td>
<td>2.7068</td>
</tr>
<tr>
<td>Task</td>
<td>2.8346</td>
<td>0.6541</td>
<td>20.2782</td>
<td>5.2331</td>
</tr>
<tr>
<td>Net</td>
<td>1.9549</td>
<td>0.4511</td>
<td>13.9850</td>
<td>3.6090</td>
</tr>
</tbody>
</table>

Again some frequency values have lower than five \((o_i < 5)\) in Table 5.7a, equation (5.2) is used. Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i)^2 - 0.5}{e_i} = 2.6942.
\]
Due to $c = 4$ and $r = 6$ in the contingency table involved, the d.f. = 15. Therefore, the critical value at 5% level of significance is $\chi^2_{0.05} = 24.9958$. The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the skills for the various business levels are required to differ.

**Further remark**

Risk taking and ‘teamwork’ were probed earlier. They are then, not repeated here. However, on ‘teamwork’ it was probed which form (transition process, action process, interpersonal process) was used in the case of those who used it.

5.6 **PSYCHOLOGICAL MAKE-UP**

5.6.1 **Levels of Education**

**Table 5.5** Levels of Education Acquired

<table>
<thead>
<tr>
<th></th>
<th>Matric</th>
<th>Tertiary</th>
<th>Business courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>30</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Figure 5.5** Educational Levels of Entrepreneurs

The entrepreneurs had all acquired matric certificate. Also, they all had done some business courses. In addition, a large 90% proportion also had tertiary qualifications against only 10% that had no tertiary qualifications.
Table 5.6  Levels of Tertiary Education Acquired

<table>
<thead>
<tr>
<th></th>
<th>M+3</th>
<th>M+4</th>
<th>Master’s degree</th>
<th>Doctoral degree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>7</td>
<td>6</td>
<td>0</td>
<td>27</td>
</tr>
</tbody>
</table>

Of the 27 who had tertiary qualifications, 14 (51.9%) had the level of a bachelor’s degree, seven (25.9%) had the level of an Honours degree (of four year bachelor’s degree), and the other six (22.2%) had master’s degrees. There was no one with a doctoral degree.

5.6.2  Work Experience

Table 5.7  Work Experiences of Entrepreneurs

<table>
<thead>
<tr>
<th></th>
<th>0 – 5 yrs</th>
<th>5 – 10 yrs</th>
<th>10 – 15 yrs</th>
<th>15 – 20 yrs</th>
<th>20 – 25 yrs</th>
<th>25 – 30 yrs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>9</td>
<td>13</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

The data appearance and preliminary analysis seem to suggest that a symmetric form and/or binomial form are indicated.

Figure 5.6  Histogram of Work Experiences of Entrepreneurs

This can be presented as a distribution in a group data form, or frequency table as follows:

Table 5.8  Frequency Distribution of Work Entrepreneurs’ Experiences

<table>
<thead>
<tr>
<th>x</th>
<th>2.5</th>
<th>7.5</th>
<th>12.5</th>
<th>17.5</th>
<th>22.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>2</td>
<td>9</td>
<td>13</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Cum f</td>
<td>2</td>
<td>11</td>
<td>24</td>
<td>29</td>
<td>30</td>
</tr>
</tbody>
</table>

The basic descriptive statistics follow below:
Mean

\[ \overline{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i} = \frac{345}{30} = 11.5 \]

Standard deviation

\[
s = \sqrt{\frac{\sum_{i=1}^{n} f_i (x_i - \overline{x})^2}{\sum_{i=1}^{n} f_i - 1}} = \sqrt{\frac{620}{29}} = 4.62.
\]

By looking at the cumulative frequencies (Cum f row) in Table 5.8 and referring back to locate the mode and median at Table 5.7, the class interval 10 – 15 years is the modal class, the median class and the mean class. This observation continues to support the hypothesis of a symmetric distribution of the work experiences of the entrepreneurs.

Median from grouped data

\[
M_d = L + w \left( \frac{n}{2} - F_c \right) \left( \frac{1}{f_m} \right)
\]

where

\[ L = \text{lower class boundary of median class} \]

\[ n = \text{total number of values} \]

\[ F_c = \text{cumulative frequency of the group before median group} \]

\[ w = \text{group width} \]

\[ f_m = \text{frequency of the median class} \]

Then, from Table 5.7 we have:
\[ M_d = L + w \frac{n - F_c}{f_m} \]
\[ = 10 + 5 \frac{30}{13} = 11.54. \]

**Mode from grouped data**

\[ M_o = L + w \frac{f_m - f_{m-1}}{(f_m - f_{m-1}) - (f_m - f_{m+1})} \]

where

\( L \) = lower class boundary of median class

\( f_{m-1} \) = frequency of the class before the modal class

\( f_m \) = frequency of the median class

\( f_{m+1} \) = frequency of the class after the modal class

\( w \) = group width

Then, from Table 5.7 we have:

\[ M_o = L + w \frac{f_m - f_{m-1}}{(f_m - f_{m-1}) - (f_m - f_{m+1})} \]
\[ = 10 + 5 \frac{13 - 9}{(13 - 9) - (13 - 5)} = 5 \]

### 5.6.2 Genders of Entrepreneurs

<table>
<thead>
<tr>
<th>Table 5.8 Genders of Entrepreneurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>
Participation of women in entrepreneurship is not showing to be matching the high extent to which men are participating.

**Remark**

The entrepreneurs were not comfortable disclosing their ages, but their levels of education and work experiences were able to guide on their approximate ages. More experienced ones were approximated to be in their late fifties. These were the ones who had also shown highest growths in their enterprises.

### 5.6.3 Project Entrepreneurship

**Table 5.9 Project Entrepreneurship Approach**

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intense project entr.</td>
<td>3</td>
<td>1</td>
<td>13</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Ordinary project entr.</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>1</strong></td>
<td><strong>20</strong></td>
<td><strong>5</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Initially, there was an option for the entrepreneurs to indicate if they did not engage in project entrepreneurship. The row has been excluded as it had only zero entries.

The micro-businesses and SMEs did not use ‘ordinary project entrepreneurship’ at all. All of them only used ‘intense project entrepreneurship’. Only some few survivalists and the SMEs used ‘ordinary project management’. The graph follows to demonstrate this fact.
Test of independence

The test of independence follows.

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0: \text{Project management levels are independent of the business type} \]
\[ H_a: \text{Project management levels are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.10a is a reproduction of Table 5.9 presented in short-hand notation, and Table 5.10b consists of entries derived from the hypothesis of independence using Table 5.9 frequency values:

Table 5.10 Skills Set of Entrepreneurs

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inten</td>
<td>3</td>
<td>1</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Ordin</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inten</td>
<td>2.9333</td>
<td>0.7333</td>
<td>14.6667</td>
<td>3.6667</td>
</tr>
<tr>
<td>Ordin</td>
<td>1.0667</td>
<td>0.2667</td>
<td>5.3333</td>
<td>1.3333</td>
</tr>
</tbody>
</table>

Again, with frequency values lower than five \( o_i < 5 \), equation (5.2) is used. Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 1.57667.
\]
Due to $c = 4$ and $r = 2$ in the contingency table involved, the d.f. = 3. Therefore, the critical value at 5% level of significance is $\chi^2_{0.05} = 7.8147$. The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% level of significance to believe that the project management levels are independent of the business types.

### 5.6.4 Innate Ability vs. Public Perception

#### Table 5.11 Innate Ability vs. Public Perception Leaning

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innate ability</td>
<td>0</td>
<td>0</td>
<td>17</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Public opinion</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Mix of both</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Other makeup (specify)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>None explicitly</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>1</strong></td>
<td><strong>20</strong></td>
<td><strong>5</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Survivalists and micro-business do not consciously use ‘innate ability’ or ‘public perception’, but rather an unconscious mix of both. SMEs apply all the options with ‘innate ability’ being the highest at 85% (17 out of 20). Public opinion is applied only by 15% while among these 20, 40% (8 out of 20). One (20%) of large businesses apply ‘innate ability’ while the rest (80%) apply ‘Other makeup’ that are described in the Table 5.13.

Figure 5.9 Innate vs. Public Opinion

Innate ability applied the most. Other makeup (specified in next table) is the next highest, but much lower than ‘innate ability’. Slightly below ‘Other makeup’ are ‘mix of both’. The ‘public opinion’ features also lowly. The test of independence follows.
Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Psychological makeup varieties are independent of the business type} \]
\[ H_a : \text{Psychological makeup varieties are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.12a is a reproduction of Table 5.11 presented in short-hand notation, and Table 5.12b consists of entries derived from the hypothesis of independence using Table 5.11 frequency values:

**Table 5.12 Skills Set of Entrepreneurs**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inten</td>
<td>0</td>
<td>0</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Ordin</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Mix</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inten</td>
<td>2.4000</td>
<td>0.6000</td>
<td>12.0000</td>
<td>3.0000</td>
</tr>
<tr>
<td>Ordin</td>
<td>0.4000</td>
<td>0.1000</td>
<td>2.0000</td>
<td>0.5000</td>
</tr>
<tr>
<td>Mix</td>
<td>1.0667</td>
<td>0.2667</td>
<td>5.3333</td>
<td>1.3333</td>
</tr>
<tr>
<td>Other</td>
<td>1.2000</td>
<td>0.3000</td>
<td>6.0000</td>
<td>1.5000</td>
</tr>
<tr>
<td>None</td>
<td>0.2667</td>
<td>0.0667</td>
<td>1.3333</td>
<td>0.3333</td>
</tr>
</tbody>
</table>

Again some frequency values are lower than five \((o_i < 5)\), equation (5.2) is used. Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 15.1979.
\]

Due to \(c = 4\) and \(r = 5\) in the contingency table involved, the d.f. = 12. Therefore, the critical value at 5% level of significance is \(\chi^2_{0.05} = 21.0261\). The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the psychological makeup varieties are independent of the business type.

**GABEK finding**

The ‘Other makeup’ responses were specified as ‘desperation to survive’ and ‘determination to succeed’. These are unpacked further below.
Table 5.13 Other Psychological Make-Up

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desperation to survive</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Determination to succeed</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>4</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

The ‘other’ psychological makeup of survivalists and the micro-business were ‘desperation to survive’. None of these types of businesses indicated ‘determination to succeed’ as their psychological makeup.

A tiny percentage of large businesses (25% ≈ 1 out of 4) indicated its psychological makeup as desperation to survive, which was the response by all the survivalists and the involved micro-business.

Of the two ‘Other psychological makeups’ that emerged, five (55.6%) were desperate to survive, and four (44.4%) were determined to succeed.

The test of independence follows.

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Psychological makeup varieties are independent of the business type} \]

\[ H_a : \text{Psychological makeup varieties are not independent of the business type} \]
The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.12a is a reproduction of Figure 5.3 presented in short-hand notation, and Figure 5.12b consists of entries derived from the hypothesis of independence using Figure 5.11 frequency values:

**Table 5.14 Other psychological makeup**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desp</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Deter</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desp</td>
<td>1.6667</td>
<td>0.5556</td>
<td>0.5556</td>
<td>2.2222</td>
</tr>
<tr>
<td>Deter</td>
<td>1.3333</td>
<td>0.4444</td>
<td>0.4444</td>
<td>1.7778</td>
</tr>
</tbody>
</table>

Due to frequency values lower than five \((o_i < 5)\), equation (5.2) is used. Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 2.1879
\]

Here, \(c = 4\) and \(r = 2\) in the contingency table involved, the d.f. = 3. Hence, the critical value at 5% level of significance is \(\chi_{0.05}^2 = 1.9913\) The test statistic exceeds the critical value. Then the hypothesis of independence is rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the possession of the two psychological makeups desperation vs. determination) depended on the business types.

### 5.7 ENTREPRENEURIAL STYLES

**Table 5.15 Entrepreneurial style used**

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darwinians</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Communitarians</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Missionaries</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>1</strong></td>
<td><strong>20</strong></td>
<td><strong>5</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

The entrepreneurial styles used in their ground breaking appear above. Large businesses did not use Darwinian approach, micro-business did not use ‘missionaries’ and both survivalists and micro-businesses did not use ‘Communitarian’ method.

Survivalists used Darwinian methods the most (75% = 3/4), SMEs also used Communitarian the most (45% = 9/20). Most large businesses used Communitarian (80% = 4/5).
The test of independence follows.

The null hypothesis being tested and the alternative hypothesis are given by:

- $H_0$: Entrepreneurial styles used are independent of the business type
- $H_a$: Entrepreneurial styles used are not independent of the business type

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.16a is a reproduction of Table 5.15 presented in short-hand notation, and Table 5.16b consists of entries derived from the hypothesis of independence using Table 5.15 frequency values:

**Table 5.16 **Entrepreneurial styles used

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darw</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Com</td>
<td>0</td>
<td>0</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Miss</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darw</td>
<td>1.7333</td>
<td>0.4333</td>
<td>8.6667</td>
<td>2.1667</td>
</tr>
<tr>
<td>Com</td>
<td>2.8000</td>
<td>0.7000</td>
<td>14.0000</td>
<td>3.5000</td>
</tr>
<tr>
<td>Miss</td>
<td>0.8000</td>
<td>0.2000</td>
<td>4.0000</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Due to frequency values lower than five ($o_i < 5$), equation (5.2) is used. Then, the value of the chi-square statistic is:

$$
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i)^2}{e_i} = 7.4739.
$$
Here, $c = 4$ and $r = 3$ in the contingency table involved, the d.f. = 6. Hence, the critical value at 5% level of significance is $\chi^2_{0.05} = 12.5916$. The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the possession of the entrepreneurial styles used was not based on the business types.

5.8 BUSINESS FINANCING

This section wanted to establish how the start-up capitals of the businesses were financed, such as it was bootstrapping or external finances. In case of each one, how exactly happened was also established.

Table 5.17 Capital Financing Methods Used

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootstrapping</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>External finance</td>
<td>1</td>
<td>0</td>
<td>17</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>1</strong></td>
<td><strong>20</strong></td>
<td><strong>5</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

The methods used to finance the start-up capital for all the entrepreneurs were bootstrapping and external finances. The micro-business did not use external finances (mainly because it is not registered). Large businesses did not use bootstrapping, all used external finances. The survivalist used mostly bootstrapping (at 75% = 3/4) while the SMEs used mostly external funding (at 85% = 17/20).

Figure 5.12 Capital Financing Methods Used

The test of independence follows.
Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Capital finance methods used are independent of the business type} \]
\[ H_a : \text{Capital finance methods used are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.18a is a reproduction of Table 5.17 presented in short-hand notation, and Table 5.18b consists of entries derived from the hypothesis of independence using Table 5.17 frequency values:

<table>
<thead>
<tr>
<th>Table 5.18</th>
<th>Capital Financing Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 5.18a: Observed quality frequencies</td>
<td>Table 5.18b: Expected quality frequencies</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Boot</td>
<td>3</td>
</tr>
<tr>
<td>Ext</td>
<td>1</td>
</tr>
</tbody>
</table>

Due to frequency values lower than five \((o_i < 5)\), equation (5.2) is used. Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^k \left( \frac{|o_i - e_i| - 0.5}{e_i} \right)^2 = 4.7050.
\]

Here, \(c = 4\) and \(r = 2\) in the contingency table involved, the d.f. \(= 3\). Hence, the critical value at 5% level of significance is \(\chi^2_{0.05} = 7.8147\). The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the capital finance methods used are independent of the business type.

<table>
<thead>
<tr>
<th>Table 5.19</th>
<th>Bootstrap Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Survivalist</td>
</tr>
<tr>
<td>Owner finance</td>
<td>1</td>
</tr>
<tr>
<td>Minimising accounts</td>
<td>0</td>
</tr>
<tr>
<td>Joint utilisation</td>
<td>0</td>
</tr>
<tr>
<td>Minimise inventory</td>
<td>1</td>
</tr>
<tr>
<td>Subsidy finance</td>
<td>0</td>
</tr>
<tr>
<td>Personal debt</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>
Two bootstrapping methods, ‘sweat equity’ and ‘delaying payments’, did not apply in the entrepreneurial enterprises of the study. Also, large business did not use any bootstrapping method to finance their business at any stage of the development of the businesses.

**Figure 5.13  Bootstrapping Methods Used**

![Chart showing bootstrapping methods used]

<table>
<thead>
<tr>
<th>Method</th>
<th>Survivalist</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business loans</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Crowdfunding</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Hedge funds</td>
<td>0</td>
<td>12</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1</strong></td>
<td><strong>17</strong></td>
<td><strong>5</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

The external funding methods used excluded ‘angel investors’, ‘venture capital investment’, and ‘alternative asset management’. Crowdfunding is not possible with survivalist, who also did not use hedge funds. The SMEs featured highly in hedge funds (over 70% ≈ 12/17), and also mildly in crowdfunding (18% ≈ 3/17) and business loans (12% ≈ 12/17).

**Figure 5.14  External funding methods used**

![Pie chart showing external funding methods]

- Business loans: 60.9%
- Crowdfunding: 17.4%
- Hedge funds: 21.7%
The overall leading external funding method used by the entrepreneurs was hedge funds at over 60% share while the other two methods were much less.

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{External funding methods used are independent of the business type} \]
\[ H_a : \text{External funding methods used are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.21a is a reproduction of Table 5.20 presented in short-hand notation, and Table 5.21b consists of entries derived from the hypothesis of independence using Table 5.20 frequency values:

**Table 5.21 External funding method used**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus loans</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Crowdfund</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Hedge funds</td>
<td>0</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus loans</td>
<td>0.1739</td>
<td>2.9565</td>
<td>0.8696</td>
</tr>
<tr>
<td>Crowdfund</td>
<td>0.2174</td>
<td>3.6957</td>
<td>1.0870</td>
</tr>
<tr>
<td>Hedge funds</td>
<td>0.6087</td>
<td>10.3478</td>
<td>3.0435</td>
</tr>
</tbody>
</table>

The frequency values lower than five \( (o_i < 5) \) warrant the use of equation (5.2). Then, the value of the chi-square statistic is:

\[ \chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 1.6184. \]

Here, \( c = 3 \) and \( r = 3 \) in the contingency table involved, the d.f. = 4. Hence, the critical value at 5% level of significance is \( \chi^2_{0.05} = 9.4877 \). The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the external funding methods were not based on the business type.
## 5.9 FINANCIAL MANAGEMENT

### Table 5.22 Knowledgeable in financial management

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>1</td>
<td>20</td>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>

About 50% of survivalists did not know financial management, the micro-business owner knew it, most SMEs (70% ≈ 14/20) did not know it while all the large ones knew it. The low businesses seemed to be the ones lacking the financial management knowledge the most. The visual display on ‘knowing’ vs ‘not knowing’ follows.

**Figure 5.15 Financial management knowledge**

![Financial management knowledge](image)

Most respondents lacked the knowledge of financial management. GABEK software could pick that the large business entrepreneurs had this skill, while the informal ones (survivalists and micro-businesses) did not have the skill.

### Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:

\[
H_0 : \text{External funding methods used are independent of the business type} \\
H_a : \text{External funding methods used are not independent of the business type}
\]
The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.23a is a reproduction of Table 5.22 presented in short-hand notation, and Table 5.23b consists of entries derived from the hypothesis of independence using Table 5.22 frequency values:

**Table 5.23 Knowledge of financial management**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Not</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have</td>
<td>1.7333</td>
<td>0.4333</td>
<td>8.6667</td>
<td>2.1667</td>
</tr>
<tr>
<td>Not</td>
<td>2.2667</td>
<td>0.5667</td>
<td>11.3333</td>
<td>2.8333</td>
</tr>
</tbody>
</table>

The frequency values lower than five \( (o_j < 5) \) leads to use of equation (5.2). Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{j=1}^{k} \frac{(o_j - e_j)^2}{e_j} = 10.4374.
\]

Here, \( c = 4 \) and \( r = 2 \) in the contingency table involved, the d.f. = 3. Hence, the critical value at 5% level of significance is \( \chi^2_{0.05} = 7.8143 \). The test statistic exceeds the critical value. Then the hypothesis of independence is rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that external financing does not depend on the business type.

**Table 5.24 Use of financial management**

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Sometimes</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2</strong></td>
<td><strong>6</strong></td>
<td><strong>5</strong></td>
<td><strong>13</strong></td>
</tr>
</tbody>
</table>

The findings were that:

All the large businesses showed to have utilised financial management.

A large proportion of SMEs (67% ≈ 4/6) used financial management always, while (about 17% ≈ 1/6) used it sometimes and another 17% never used it.

About 50% of survivalist used it sometimes and another 50% never use it.
Most users of financial management (over 69% ≈ 9/13) use it always. The ‘sometimes’ and ‘never’ frequencies featured equally at about 15% (2 out of 13). The independence test is next.

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Financial management usage frequencies are independent of the business type} \]

\[ H_a : \text{Financial management usage frequencies are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.25a is a reproduction of Table 5.24 presented in short-hand notation, and Table 5.25b consists of entries derived from the hypothesis of independence using Table 5.24 frequency values:

**Table 5.25 Financial management usage**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Sometimes</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>1.3846</td>
<td>4.1538</td>
<td>3.4615</td>
</tr>
<tr>
<td>Sometimes</td>
<td>0.3077</td>
<td>0.9231</td>
<td>0.7692</td>
</tr>
<tr>
<td>Never</td>
<td>0.3077</td>
<td>0.9231</td>
<td>0.7692</td>
</tr>
</tbody>
</table>

The frequency values lower than five \((o_i < 5)\) lead to the use of equation (5.2). Then, the value of the chi-square statistic is:
Here, c = 3 and r = 3 in the contingency table involved, the d.f. = 4. Hence, the critical value at 5% level of significance is $\chi_{0.05}^2 = 9.4877$. The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the using financial management methods did not depend on a business type.

Table 5.26  Willingness to learn financial management

<table>
<thead>
<tr>
<th></th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>1</td>
<td>14</td>
<td>16</td>
</tr>
</tbody>
</table>

Surprisingly there are few who do not have knowledge but still not willing to learn financial management. However most (about 88% ≈ 14 out of 16) want to learn the skill.

Figure 5.17  Interest level to learn financial management

Most entrepreneurs show willingness to learn financial management. However, worryingly, there are some who do not wish to learn the skill.

Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:

$\chi^2 = \sum \frac{(o_i - e_i - 0.5)^2}{e_i} = 1.7222.$
$H_0$ : Willingness to learn tendencies are independent of the business type

$H_a$ : Willingness to learn tendencies are not independent of the business type

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.27a is a reproduction of Table 5.26 presented in short-hand notation, and Table 5.27b consists of entries derived from the hypothesis of independence using Table 5.26 frequency values:

**Table 5.27 Financial management usage**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro-busi</th>
<th>SME</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro-busi</th>
<th>SME</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1.7500</td>
<td>0.8750</td>
<td>12.2500</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>0.3750</td>
<td>0.1875</td>
<td>2.6250</td>
<td>3</td>
</tr>
</tbody>
</table>

The frequency values lower than five ($o_i < 5$) lead to the use of equation (5.2). Then, the value of the chi-square statistic is:

$$
\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 0.7700.
$$

Here, $c = 3$ and $r = 2$ in the contingency table involved, the d.f. = 2. Hence, the critical value at 5% level of significance is $\chi^2_{0.05} = 5.9915$. The test statistic does not exceed the critical value. Therefore, the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that willingness to learn financial management is irrespective of the business types.

### 5.10 APPLIED PREDICTORS OF ENTREPRENEURIAL SUCCESS

This section was basically measuring the level of preference for each predictor by the various business types.

**Table 5.28 Entrepreneurial predictor appearing**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Markets</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Industry</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Team</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Company</td>
<td>3</td>
<td>1</td>
<td>18</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Status</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>5</strong></td>
<td><strong>73</strong></td>
<td><strong>19</strong></td>
<td><strong>109</strong></td>
</tr>
</tbody>
</table>

75
Survivalists did not feature in team but featured in every other entrepreneurial predictor that appear in the table above. Startlingly, large businesses showed limited involvement of ‘team’ at 40% (2 out of 5).

The larges businesses, however, involve ‘methods’ and ‘markets’ at 80% each. SMEs were also low on their involvement of team at 45% (9 out of 20). However, the SMEs were high in ‘company’ involvement at 90% and ‘industry’ involvement at 80%.

Figure 5.18  Entrepreneurial predictors involved

Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Entrepreneurship success predictors are independent of the business type} \]
\[ H_a : \text{Entrepreneurship success predictors are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.29a is a reproduction of the observed frequencies. Table 5.29b consists of entries from the hypothesis of independence using Table 5.28 frequency values:
Table 5.29  Entrepreneurial predictors usage

Table 5.29a: Observed quality frequencies

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meth</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Mark</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Indus</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Team</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Comp</td>
<td>3</td>
<td>1</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Status</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 5.29b: Expected quality frequencies

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meth</td>
<td>1.9817</td>
<td>0.8257</td>
<td>12.0550</td>
<td>3.1376</td>
</tr>
<tr>
<td>Mark</td>
<td>2.0917</td>
<td>0.8716</td>
<td>12.7248</td>
<td>3.3119</td>
</tr>
<tr>
<td>Indus</td>
<td>2.5321</td>
<td>1.0550</td>
<td>15.4037</td>
<td>4.0092</td>
</tr>
<tr>
<td>Team</td>
<td>1.2110</td>
<td>0.5046</td>
<td>7.3670</td>
<td>1.9174</td>
</tr>
<tr>
<td>Comp</td>
<td>2.7523</td>
<td>1.1468</td>
<td>16.7431</td>
<td>4.3578</td>
</tr>
<tr>
<td>Status</td>
<td>1.4312</td>
<td>0.5963</td>
<td>8.7064</td>
<td>2.2661</td>
</tr>
</tbody>
</table>

The frequency values lower than five \( (o_i < 5) \) leads to use of equation (5.2). Then, the value of the chi-square statistic is:

\[
\chi^2 = \sum_{i=1}^{k} \left( \frac{|o_i - e_i| - 0.5}{e_i} \right)^2 = 2.0469.
\]

Here, \( c = 3 \) and \( r = 2 \) in the contingency table involved, the d.f. = 2. Hence, the critical value at 5% level of significance is \( \chi^2_{0.05} = 5.9915 \). The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the entrepreneurial success predictors apply to every business type.

Table 5.30  ‘Methods’ distribution

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy establishment</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Human staff maintenance</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Availing materials</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Using unique bus advantage</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Ensure good org. &amp; coord.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Congr. to societal culture</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
<td><strong>12</strong></td>
<td><strong>4</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

There was no featuring of ‘Availing materials’ and ‘Congr. to societal culture’, and little of ‘Ensuring good organisation and co-ordination’.
The strategy establishment is the highest involved, followed by ‘use of unique business advantages’. The next one is ‘Human staff maintenance, and as was indicated, the least is ‘ensuring good organisation and coordination’.

Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:

\[
H_0 : \text{Entrepreneurship success predictors (method) are independent of the business type} \\
H_a : \text{Entrepreneurship success predictors (method) are not independent of the business type}
\]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.31a is a reproduction of the observed frequencies. Table 5.31b consists of entries from the hypothesis of independence using Table 5.30 frequency values:

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Str est</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Hum</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Org</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Adv</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Str est</td>
<td>1.0526</td>
<td>0.5263</td>
<td>6.3158</td>
<td>2.1053</td>
</tr>
<tr>
<td>Hum</td>
<td>0.3158</td>
<td>0.1579</td>
<td>1.8947</td>
<td>0.6316</td>
</tr>
<tr>
<td>Org</td>
<td>0.5263</td>
<td>0.2632</td>
<td>3.1579</td>
<td>1.0526</td>
</tr>
<tr>
<td>Adv</td>
<td>0.1053</td>
<td>0.0526</td>
<td>0.6316</td>
<td>0.2105</td>
</tr>
</tbody>
</table>

The frequency values lower than five \((o_i < 5)\) leads to use of equation (5.2). Then, the value of the chi-square statistic is:
Here, \( c = 4 \) and \( r = 4 \) in the contingency table involved, the d.f. = 9. Hence, the critical value at 5% level of significance is \( \chi^2_{0.05} = 1.9913 \). The test statistic exceeds the critical value. Then the hypothesis of independence is rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the method of predicting entrepreneurial success depends on the business type.

**Table 5.32 Markets distribution**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2B model</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>High growth</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Target idle customers</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
<td><strong>11</strong></td>
<td><strong>4</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

Survivalist and micro-business avoid business-to-business models and instead feature in targeting idling customers. The former seems to favour high growth opportunities. SME use the three strategies, but lead in ‘targeting idling clients’ (45% ≈ 5/11). Large businesses use all methods, but use high growth opportunities the most.

**Figure 5.20 Markets distribution**

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:
Entrepreneurship success predictors (market) are independent of the business type

$H_0$: Entrepreneurship success predictors (market) are independent of the business type

$H_a$: Entrepreneurship success predictors (market) are not independent of the business type

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.33a is a reproduction of the observed frequencies. Figure 5.33b consists of entries from the hypothesis of independence using Figure 5.32 frequency values:

**Table 5.33 Markets distribution**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2B</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>High</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Tar</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5.33a: Observed quality frequencies

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2B</td>
<td>0.3333</td>
<td>0.1667</td>
<td>1.8333</td>
<td>0.6667</td>
</tr>
<tr>
<td>High</td>
<td>0.7778</td>
<td>0.3889</td>
<td>4.2778</td>
<td>1.5556</td>
</tr>
<tr>
<td>Tar</td>
<td>0.8889</td>
<td>0.4444</td>
<td>4.8889</td>
<td>1.7778</td>
</tr>
</tbody>
</table>

Table 5.33b: Expected quality frequencies

The frequency values lower than five ($o_i < 5$) leads to use of equation (5.2). Then, the value of the chi-square statistic is:

$$\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i - 0.5)^2}{e_i} = 1.2482.$$ 

Here, $c = 4$ and $r = 3$ in the contingency table involved, the d.f. = 6. Hence, the critical value at 5% level of significance is $\chi^2_{0.05} = 1.9913$. The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the markets of entrepreneurial success do not depend on a business type.

**Table 5.34 Industry distribution**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing ind.</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>High tech imp</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Low cap int</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Small firm size</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
<td><strong>1</strong></td>
<td><strong>16</strong></td>
<td><strong>3</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

Survivalist and micro-business did not feature in ‘growing industries’ and ‘high technology impact’. The latter also did not feature in ‘small firm size’ option. They both featured on ‘low capital intensity’.

80
Large businesses did not feature in ‘Low capital intensity’ and ‘small firm size’ (which is obvious in case of small size). The large business participation in ‘growing industry’ was higher (67%) than the one for ‘high technology impact’ (33%). SME use the three strategies, but lead in ‘growing industries’ (44% ≈ 7/16).

Table 5.35  Team distribution

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large, diverse</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Qualifications</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Mgt exper</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Rel/dir exper</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Fulltime work exp</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Congr. to societ culture</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>2</td>
<td>11</td>
</tr>
</tbody>
</table>

Survivalists and micro-businesses did not feature in this section, due to zero frequencies everywhere.

Figure 5.21  Team distribution

Aspects that featured from highest to lowest in distributions are qualification, large diverse sizes, management experience, and experience.

Test of independence

The null hypothesis being tested and the alternative hypothesis are given by:
*H₀*: Team distribution predictors are independent of the business type

*Hₐ*: Team distribution predictors are not independent of the business type

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.36a is a reproduction of the observed frequencies. Figure 5.36b consists of entries from the hypothesis of independence using frequency values:

**Table 5.36 Team distribution**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>SME</th>
<th>Large businesses</th>
<th>Table 5.36a: Observed quality frequencies</th>
<th>Table 5.36b: Expected quality frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large, div</td>
<td>2</td>
<td>1</td>
<td>Large, div</td>
<td>2.4546</td>
</tr>
<tr>
<td>Qualif</td>
<td>3</td>
<td>1</td>
<td>Qualif</td>
<td>3.2727</td>
</tr>
<tr>
<td>Magt exp</td>
<td>2</td>
<td>0</td>
<td>Magt exp</td>
<td>1.6364</td>
</tr>
<tr>
<td>Rel/dir exp</td>
<td>1</td>
<td>0</td>
<td>Rel/dir exp</td>
<td>0.8182</td>
</tr>
<tr>
<td>Fulltime work exp</td>
<td>1</td>
<td>0</td>
<td>Fulltime work exp</td>
<td>0.8182</td>
</tr>
</tbody>
</table>

The frequency values lower than five (*oᵢ < 5*) leads to use of equation (5.2). Then, the value of the chi-square statistic is:

\[ \chi^2 = \sum_{i=1}^{k} \frac{(oᵢ - eᵢ - 0.5)^2}{eᵢ} = 1.5151. \]

Here, *c = 2* and *r = 5* in the contingency table involved, the d.f. = 4. Hence, the critical value at 5% level of significance is \( \chi^2_{0.05} = 9.4877 \). The test statistic does not exceed the critical value. Then the hypothesis of independence cannot be rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the team distribution predictors do not depend on the business type.

**Table 5.37 Company distribution**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written bus plan</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Single offering</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Dim.-based comp</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Intense marketing</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Tight fin controls</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Start-up capital</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Corporation</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3</strong></td>
<td><strong>1</strong></td>
<td><strong>18</strong></td>
<td><strong>3</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

SMEs and large businesses operate by preparing business plans, which other business types do not do.
Business plans are the most featuring predictors of success of entrepreneurship. It is followed by single offering. At third position are start-up capital and corporation. Fourth position is occupied by intense marketing and tight financial controls. The least featuring is dimension-based competition.

**Test of independence**

The null hypothesis being tested and the alternative hypothesis are given by:

\[ H_0 : \text{Company distribution predictors are independent of the business type} \]

\[ H_a : \text{Company distribution predictors are not independent of the business type} \]

The observed frequencies and the expected frequencies are required in the formula. They are presented together below, where Table 5.38a is a reproduction of the observed frequencies. Figure 5.38b consists of entries from the hypothesis of independence using frequency values:

**Table 5.38  Team distribution**

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus pl</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Singl</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Dim</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Intens</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tight</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Start-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Corp</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Surv</th>
<th>Micro</th>
<th>SME</th>
<th>Large businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus pl</td>
<td>1.0800</td>
<td>0.3600</td>
<td>6.4800</td>
<td>1.0800</td>
</tr>
<tr>
<td>Singl</td>
<td>0.6000</td>
<td>0.2000</td>
<td>3.6000</td>
<td>0.6000</td>
</tr>
<tr>
<td>Dim</td>
<td>0.1200</td>
<td>0.0400</td>
<td>0.7200</td>
<td>0.1200</td>
</tr>
<tr>
<td>Intens</td>
<td>0.2400</td>
<td>0.0800</td>
<td>1.4400</td>
<td>0.2400</td>
</tr>
<tr>
<td>Tight</td>
<td>0.2400</td>
<td>0.0800</td>
<td>1.4400</td>
<td>0.2400</td>
</tr>
<tr>
<td>Start-</td>
<td>0.3600</td>
<td>0.1200</td>
<td>2.1600</td>
<td>0.3600</td>
</tr>
<tr>
<td>Corp</td>
<td>0.3600</td>
<td>0.1200</td>
<td>2.1600</td>
<td>0.3600</td>
</tr>
</tbody>
</table>

The frequency values lower than five \((o_i < 5)\) leads to use of equation (5.2). Then, the value of the chi-square statistic is:
\[ \chi^2 = \sum_{i=1}^k \left( \frac{|o_i - e_i| - 0.5}{e_i} \right)^2 = 17.3611. \]

Here, \( c = 4 \) and \( r = 7 \) in the contingency table involved, the d.f. = 18. Hence, the critical value at 5% level of significance is \( \chi^2_{0.05} = 1.9913 \). The test statistic exceeds the critical value. Then the hypothesis of independence is rejected. This implies that there is enough statistical evidence at the 5% significance level to believe that the company distribution predictors do not depend on the business type.

### Table 5.39 Status distribution

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Survivalist</th>
<th>Micro-business</th>
<th>SME</th>
<th>Large business</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wealth</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Demography</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

On status distribution, all these respondents entered entrepreneurship in order to be wealthy.

### 5.11 QUALITATIVE DISCOVERIES

Through the programme, it was established that the entrepreneurs were aged form eight (8) years to about 36 years. They started in house cleaning, security, shoe fixing, sewing, home tutoring, domestic, street cooking, local transport, insurance, medical practice and mental health assistance.

The text analysis showed that the enterprises started small, and gradually improved as they got to settle in the trade. Many applied the various methods described. In many instances lower types were less sophisticated and almost static. The larger ones were more sophisticated and dynamic, and demonstrating complexities in their processes. They were generally applying the modern methods of trade.

The findings show that the smaller ones improved by adding more complexities, such as diversifying their markets, involving technologies, and increasing their aggression, including being ruthless in approaching competition.

The large businesses and SMEs which became MNEs were also networking more, and also with international business associates. Survivalists and micro-businesses also intensified their approaches, and elevated their approaches to compete with higher business categories. When
they realised that they were restricted by being informal, they then registered their businesses to formalise them. While these was happening some SMEs were matching larger businesses and could employ more workers while generating revenue to reach the higher status. Hence, they became large. On the other hand, some large businesses and SMEs traded aggressively up to the international echelons to earn the status of MNEs.

The revelation is that the entrepreneurship, due to willingness, produced quality drudgeries in their businesses processes. Many entrepreneurs treated their clients with respect in most cases. In cases where employees were involved, they were also urged to perform well, and were also supported and appreciated. These happened almost always. Therefore there was an unremitting process of continuous improvement. GABEK confirmed that these appreciations and appraisals embraced people, equipment, suppliers, materials and procedures to achieve high quality and increases operational effectiveness. As a result, the growth of ventures of entrepreneurship depended on TQM (see Appraisal Smart Ltd, 2011; Heizer & Render, 2008). This conclusion is made because the TQM philosophy is centred on the epitome that every aspect of the organisation should be enriched.

The six-sigma approach is also covered, since quality is its main focus. Further, these entrepreneurs did not waste time. In fact, they saved time in their activities, their efforts and materials while attempting to improve quality in their whole organisations. There was value added to the entrepreneurs’ approaches. This shows that the lean approach was also covered (section 2.2.4.2).

In the case especially of the large businesses, while improving quality and saving time, there was evidence also of formal record keeping (or documentation), analysis of their work, and also trained their employees. They also improved the turnaround time on every aspect of their work. This is the lean six-sigma approach (section 2.2.4.3).

Survivalists and micro-businesses either used technology minimally, or did not use it at all, especially at the beginning. They were growing in their technology use, and varied widely in their incorporation of technology in their operations. The ones that grew better relied more on technology than the ones that were growing slowly. The large businesses were dependent on technology in every aspect of their businesses. Some of the SMEs were also using technology. All the SMEs that grew to large businesses relied on technology always. This was the main boost even for the ones that also hopped later to MNEs. This means that the
approach of business process management (section 2.2.4.4) was used disparately by the different entrepreneurs, which seemed to have been based on the business type.

All the entrepreneurs that participated used systems for creating successful and sustainable enterprises, which was their reason for having passed the test of three to five years of failing of most South African small businesses (Ladzani, 2010; Ladzani & Van Vuuren, 2002). They embraced successful customer outcomes (SCO) and were transforming, which was the reason for the improvement of most of these enterprises as depicted in Figure 5.1 and the transition shown from Table 5.2 to Table 5.3. This was the demonstration of the ‘outward-in’ method in these businesses.

The process optimisation strategies of section 2.2.4 were clearly demonstrated in the above discussion. Another exposé was that the enterprises saved money while adding quality using their approaches. The BPO, therefore, has a huge contribution to make regarding the concept and application of value engineering (or value analysis). According to Seeletse (2001, 2015b, 2016), value engineering entails the operations research methods of eliminating waste while adding components that increase the worth of an entity. The cost-saving led to more profits and subsequently to sustainability and growth of these enterprises.

5.12 DEDUCTION

At the beginning (first level) of entrepreneurship, almost all the entrepreneurs start with a business idea, and willingness to exploit the idea. The intensity of the entrepreneurs’ efforts, as well as the rationality supporting those efforts, are the main determinants of success or failure of a business initiative. This approach is consistent with the philosophy of operations research that the optimisation level determines the level of benefits.

The next stage (second level) requires a well-thought approach into the business operations from startup (administrative and launching) to commencement of operations. The manner of approach and intensity depends on the size of an enterprise, as well as the ambition of the involved entrepreneur(s). These also determine the level of business optimisation which likely to happen in an enterprise's business processes.

According to the study details in this chapter, this level is more intense for large businesses and is more relaxed on lower business groups. The study findings indicate that growth of
SMEs and lower business growth occurred in cases where these low business categories engaged in sophisticated business methods, operations and processes. They therefore serve a guide as to what makes an enterprise to grow, and why some entrepreneurs fail to succeed in their business initiatives/venture.

The other stage (third level) occurs when the business survives. They determine the survival and failure of enterprises. It is therefore the last level which is long term, and is more about the business processes.

Furthermore, there are also other untold realities which take place as a result of uniqueness of individual entrepreneurs, such as their backgrounds and attitude towards the whole business opportunity. These realities could be weaknesses that lead to barriers overcome the efforts of the entrepreneur, or which produce strenths for the entrepreneurs to overcome the prevailing business challenges.

The findings also show some specific examples in which domestic cleaners ended up running laundry that offered clothes washing (including dry cleaning), ironing and other services as a registed SME. A house tutor surivalist who offered after-hour tutoring went on to operate as a finishing school (catering matric repeaters), and ended up operating a formally registered private college. A shoe fixer micro-business transformed through to SME and up to being a large shoe manufacturer. A night DJ (disc jockey) survivalist expanded through micro- and then SME up to large business as a service provider offering ‘baby shower parties’ ‘bridal showers’, décor and tents, as well as themes, among others.

Another example revealed a road side food cook survivalist growing through cooking at parties/functions, attending short courses in business and catering and currently operating as an SME in catering and supply chain management. A part-time micro-business entrepreneur in tour guiding advancing to hotel ownership and airport transport services. This particular one took advantage of opportunities of regular sporting events taking place in the country.

The explanations given in the finding showed that the processes of business used were made more worthy every time these businesses attempted to grow. These were therefore improved towards optimisation. In these examples the optimisation levels of business processes showed to be positively correlated with the advancement of the businesses.
These enterprises applied the business process optimisation methods discussed in section 2.2.4 and also involved value engineering methods of operations research to improve quality as well as increase their revenue and profits. They remained competitive and grew stronger most of the time. The complexity and intensity of incorporation of modern methods and the use of technology was more for larger enterprises and less for the smaller ones. The smaller ones that incorporated these attributes in their businesses were also found to have accelerated their growth even faster.

The study also found out that knowledge of the methods of business and the experiences gained through practice were the main enhancers of use of the modern business methods. The entrepreneurs did not consciously apply the scientific methods. However, in the case of larger businesses, they were aware of the methods and applied these methods deliberately. In the case of survivalists and the micro business, they applied the methods from knowledge and viewpoints of business.

5.13 CONCLUSION

The chapter showed many variables at different levels and stages of businesses defining the multiple ways of entrepreneurship practices. It discovered that contrary to normal business process optimisation (BPO), optimisation of business processes in entrepreneurship starts at the formation of an enterprise because it is more about the survival or failure. Unoptimised entrepreneurship initiatives do not make it to business and enterprise levels. The next chapter illustrates the BPO model in a modest flowchart form, and concludes the study.
CHAPTER 6: MODEL PRESENTATION AND CONCLUSION

6.1 INTRODUCTION

The previous chapter provided details of the various modern techniques in business, and the way different enterprises approached them in their operations. This chapter uses the findings derived from the previous chapter to demonstrate business process optimisation (BPO) in a multifaceted fashion of many levels and multiple variables.

6.2 STUDY CONCLUSION

The section summarises the findings from Chapter 5 in a concrete and abstract form, but at an operational level to assist management science practice.

6.2.1 First Level

The previous chapter showed that at the first level \( L_1 \), there are prerequisite steps to be fulfilled before actual entrepreneurship can commence/materialise. It was made of two fundamental variables ‘Idea generation’ \( I \) and Willingness \( W \) to exploit the idea. Thus,

\[
L_1 = I + W
\]

This level caters for every entrepreneurship initiative. The next level leads to the decision on the types of business, which in this study were large business, micro-businesses, SMEs and survivalists.

From operations research approach, \( I \) needs to be well defined. This means that the idea has to be straightforward, measurable, achievable, realistic, and time-bound (or SMART). At this point statistical measures can be placed into operation, such measures of potential for the business given by probability of business success. Also, time-based deliverables can also be designed in the processes of various activities of formation of the business, and which will later translate into action when the business has commenced. Without an optimised \( I \), there will not be a vision for business.

Regarding \( W \), it is fully dependent on \( I \) since by definition, it represents willingness to assist the \( I \). Clueless \( W \) will not assist business \( I \) operationalisation. Information about the
industry in mind is vital. These will be about industry growth/decline, trends, competition and the market requirements and profile. Self-positioning as an entrepreneur, as well as support and possible approaches, is also important.

Optimisation of level (6.1) occurs when the probability of success warrants continuing with the initiatives for ‘entrepreneurshipping’. Also, as a confirmed prerequisite, it is definitely the leading/top level. A warning is that if the potential is measured from inadequate information, or is calculated incorrectly, it may mislead the process.

6.2.2 Second Level

One important level is the correct self-measure of possession of essential qualities \( L_2 \) that make an entrepreneurship successful before embarking on business operations. From literature, these qualities were given as leadership \( L \), management \( M \), risk control \( R \) and teambuilding \( T \). This study identified financial management \( F \) as an essential quality as well. A tentative full model for the ‘essential quality step’ could appear as:

\[
L_2 = L + M + R + T + F
\]  

(6.2)

Unlike in level (6.1), the attributes in this level are independent of each other. Therefore, optimising level (6.2) requires that each quality attribute be optimised at the ‘local’ level. It is thus necessary for entrepreneurs to ensure possession of the qualities necessary the business they envisage. Missing a quality attribute that applies to the envisaged business lowers the level of optimisation.

As shown in the tests of independence, optimisation when entrepreneuring for large business requires that all the five qualities must be fully understood. For lower business categories, optimisation can occur even when some quality attributes are missing, such as teambuilding an in some less risky cases, risk control may be inapplicable. This means unsophisticated businesses may require a level (6.2) that is less complex than it appears. However, it cannot be less complex when compared to level (6.1).

Another aspect if importance is that when the smaller types of businesses advanced to higher levels (as illustrated in Figure 5.1), it was due to progressive incorporation of initially missing quality attributes. The inclusion was shown to enable penetration of smaller businesses into
mainstream business practices, thereby confronting competition directly. This, by induction, shows that even niche businesses can face competition when armed with essential attributes of quality. At the same time, this implies that these attributes, collectively, have a capability to offset competition. That is, when optimised, these attributes are anti-competition robust.

6.2.3 Third Level

Based on the findings from Chapter 5, the skills set of entrepreneurs consists of ‘willingness’, ‘synergy, ‘innovation, conflict resolution’, ‘task optimisation’ and ‘networking’. Since ‘willingness’ ($W$) was found in level 1, it shows that it is an attribute that cascades into different levels. Task optimisation ($P$) is an attribute which is always necessary in every business activity. Other elements were found to be applicable in large businesses. This is justified by the tests conducted in Chapter 5, in which only higher business types had incorporated synergy ($S$), innovation ($N$), conflict resolution ($C$) and networking ($K$) in their business operations; and also on the revelation that the entities that advanced to bigger businesses managed to advance because of continual incorporation of these elements. The third level is therefore:

$$L_3 = W + P + S + N + C + K$$

(6.3)

Optimising this level also requires localised optimisation, but still being mindful that this level could be collinear with level 1 in equation (6.1) due to $W$, but still necessary.

6.2.4 Psychological Makeup

The literature has over the years given credence to age, gender, educational level ($E$), work experience ($X$), project entrepreneurship ($H$), innate ability ($B$) and public perception for management of business. This study demonstrated that in entrepreneuring, age and gender are immaterial. It also established that work experience in actual entrepreneurships and with entrepreneurs ($U$) is an enabling factor in entrepreneurship. The psychological makeup is not like a level. Rather, it is a trait that an entrepreneur possesses and acquires any time before or during the course of entrepreneuring in order to enhance entrepreneurial growth and success.

These makeup elements carry on from level one, and continue with the business history. As a result, it is a level that interfaces with all the levels. Furthermore, psychological level brings
the behavioural aspect into the business. These psychological makeup ($Psy$) elements are therefore useful in changing the behaviour of entrepreneurs where they should be enhanced. This level is therefore:

\[ Psy = E + X + H + B + U \]  \hspace{1cm} (6.4)

The optimisation could again be applied at localised level. For example, $E$ can be improved by studying further; $X$ can be done prior to entrepreneuring, and so forth. The fact is that this level, takes place parallel and across all the other levels.

This level should take place alongside financial management ($FinMgt$), which should be meticulously done from the first amount of money placed against a business operation and which comes as a result of returns/revenues. Though incommensurate, the entrepreneurship lifelong level ($EntLife$) may be presented as:

\[ EntLife = Psy + FinMnt \]  \hspace{1cm} (6.5)

The optimisation as usual, occurs at local level.

6.3 DISCUSSION

The fundamental levels of entrepreneurship are basically three, based on the experiential and empirical understanding in this research. Each level has many variables (hence, multivariate), and the variables are incommensurate as they differ in ways of measurement. Also, the levels were presented in linear regression form. The levels should not be too many in order to provide a realistic and practical business model for entrepreneuring (Hox, 2002). The variables should also not be too many for the same reason. Also, the levels should not be too few because they should present all the important aspects of the business (De Wit & van Keulen, 2011).

The levels in equations (6.1) to (6.5) complete the multilevel modelling of BPO in entrepreneurial business activities. These equations have between two and six variables on the largest entrepreneurships. This could be less than six when the business types become less dynamic and smaller. Also, each equation is a special case of the broader generalised linear model. This completes the multilevel multivariate model, to be visualised next.
6.4 MULTILEVEL MULTIVARIATE BPO MODEL

The described explanation takes the form below

**Figure 6.1 Multilevel multivariate BPO model**

- **Level 1**
  
  \[ L_1 = I + W \]

- **Level 2**
  
  \[ L_2 = L + M + R + T + F \]

- **Level 3**
  
  \[ L_3 = W + P + S + N + C + K \]

**Describing the model**

The model is a short display of the discussions and findings in the study. The variables in the model were founded through the empirical study. Experiences and successfully growing entrepreneurs provided the details. Statistical tests were also given to show that some business types do not match others in terms of their needs/requirements. This fact led to the understanding that optimisation of large businesses and small ones may differ. However, the model is presented as a generic version of the aggregated findings.

6.5 RECAP

Despite Level 2’s suspected dependence of Level 1, and the assumed correlation between Level 1 and Level 3, the study recommends the:
• Adaptation and optimisation of business processes in entrepreneurship at each level separately, and
• Optimisation of each variable (business operation) separately and independently of other variables.
REFERENCES


Appendix A: Collection Tools

Informed Consent

SEFAKO MAKGATHO HEALTH SCIENCES UNIVERSITY CONSENT FORM

Statement concerning participation in a Research Project:

MULTIVARIATE MULTILEVEL MODELLING OF BUSINESS PROCESSES
OPTIMISATION IN ENTREPRENEURSHIPS

I have read the information on the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurised to participate in any way.

I am aware that the material in the questionnaire answers I provide may be used in scientific publications which will be electronically available throughout the world. I consent to this, provided that my name is not revealed.

I understand that participation in this Study is completely voluntary and that I may withdraw from it at any time and without supplying reasons.

I know that this Study has been approved by the Sefako Makgatho University Research Ethics Committee (SMUREC), Sefako Makgatho Health Sciences University. I am fully aware that the results of this Study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this Study

__________________________  ____________________
Name of participant                                   Signature of participant

__________________________  ________________  ____________________
Place                            Date                                        Witness

Statement by the Researcher

I provided written information regarding this Study
I agree to answer any future questions concerning the Study as best as I am able.
I will adhere to the approved protocol.

Mantepu T MaseTshaba       ______________       ___________    ______________
Name of Researcher                Signature                     Date                           Place
**Questionnaire Extract**

\( X_{11} = \text{Time Saving} \)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>My current work processes are time consuming</td>
</tr>
<tr>
<td>I spent my time on unnecessary administration processes</td>
</tr>
<tr>
<td>I spent my time in travel</td>
</tr>
<tr>
<td>I spent my time in unproductive meetings</td>
</tr>
</tbody>
</table>

\( X_{12} = \text{Follow Ups} \)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>My work processes involve following up with people from other divisions</td>
</tr>
<tr>
<td>People from other divisions need to be followed up with often</td>
</tr>
<tr>
<td>People from other divisions do not work effectively</td>
</tr>
<tr>
<td>People from other divisions are hard to find</td>
</tr>
<tr>
<td>People from other divisions take leave too often and leave no one in charge</td>
</tr>
</tbody>
</table>

\( X_{13} = \text{Multiple Systems} \)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have to work on many systems to complete my tasks</td>
</tr>
<tr>
<td>There are too many systems needed to complete a task</td>
</tr>
<tr>
<td>Tasks could be performed only one system</td>
</tr>
</tbody>
</table>

\( X_{14} = \text{Technological Processes} \)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot of my work involves manual processes</td>
</tr>
<tr>
<td>My work requires good computer skills</td>
</tr>
<tr>
<td>I receive sufficient support from the Information Technology department</td>
</tr>
<tr>
<td>I have been adequately trained in all technological processes</td>
</tr>
<tr>
<td>The organisation invests in the latest technology</td>
</tr>
<tr>
<td>The organisation's technological network works efficiently</td>
</tr>
</tbody>
</table>

\( X_{15} = \text{Customer Service Delivery} \)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>My current work processes allows for the best customer service to be delivered</td>
</tr>
<tr>
<td>Services and Products are always available for delivery</td>
</tr>
<tr>
<td>Processes allow for timeous delivery</td>
</tr>
<tr>
<td>Processes allow for satisfactory service</td>
</tr>
</tbody>
</table>

\( X_{16} = \text{Cost Effective Processes} \)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that my current work processes are cost efficient</td>
</tr>
<tr>
<td>Some of the work processes are unnecessary and costly</td>
</tr>
<tr>
<td>There could be better work processes than the present</td>
</tr>
</tbody>
</table>
### X_{17} = Competitiveness in the Organisation
- The current business processes allows my organisation to be competitive
- The business processes reduces productivity
- The business processes slow down delivery
- The business process improve the quality of service
- The business processes allow for healthy competition with peer organisations

### X_{18} = Ability to Attract New Clients
- Customer service is the focus of the business
- The business rewards customers for patronage
- The business rewards customers for loyalty
- The business is accessible
- The business maintains online presence
- The business provides extra special products than the norm
- The business generates conversation

### X_{19} = Increase in Profits
- Products / Services are better than Competitors'
- Production / Service is faster than competitors
- Production / Service is cheaper than competitors', maintaining or increasing level of quality.
- Offer better follow-up and support services than competitors
- Guarantees and warranties of satisfaction are more extensive than of competitors.
- Product easier to acquire and more readily available than those of competitors.
- Prices and terms more attractive and convenient than those of competitors.
- Additional products and services are added to offerings, at the same price.

### X_{21} = Suitable Business Framework Mapping
- All business processes are mapped in a suitable business framework
- All business processes have been mapped
- All business processes are programmed on the business framework

### X_{22} = Access to Mapped Processes
- I have access to all mapped processes
- Process maps are easier to understand and use
- Basic symbols used are universal
- Mapped Processes are shared among process users
### $X_{23}$ = Risk Identification

<table>
<thead>
<tr>
<th>The processes allow for the easy identification of risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk assessment policies are clearly defined</td>
</tr>
<tr>
<td>Processes do not allow for loopholes</td>
</tr>
<tr>
<td>Risks are easily identifiable</td>
</tr>
<tr>
<td>Risk management procedures are known by all employees</td>
</tr>
</tbody>
</table>

### $X_{24}$ = Process Updating

<table>
<thead>
<tr>
<th>Risks are mitigated and processes are updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>The organisation has an off-site back up system</td>
</tr>
<tr>
<td>The organisation has independent auditors</td>
</tr>
<tr>
<td>The organisation updates its processes regularly</td>
</tr>
</tbody>
</table>

### $X_{31}$ = Initiative Organisation Strategies

<table>
<thead>
<tr>
<th>Process change initiatives are influenced by the organisation’s strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual development is encouraged</td>
</tr>
<tr>
<td>Rewards are offered for high achievers</td>
</tr>
<tr>
<td>Business processes are continuously reviewed in my area</td>
</tr>
</tbody>
</table>

### $X_{32}$ = Process Change Effective Management

<table>
<thead>
<tr>
<th>My organization has effective mechanisms for managing process change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process training is provided to employees after a process change initiative is implemented</td>
</tr>
<tr>
<td>Staff are involved in the process change from start to finish</td>
</tr>
<tr>
<td>Staff are encouraged to own business processes</td>
</tr>
</tbody>
</table>

### $X_{34}$ = Process Training Provided for Effecting Process Change Initiative

<table>
<thead>
<tr>
<th>My organization has effective mechanisms for managing process change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process training is provided to employees after a process change initiative is implemented</td>
</tr>
<tr>
<td>Staff are involved in the process change from start to finish</td>
</tr>
<tr>
<td>Staff are encouraged to own business processes</td>
</tr>
</tbody>
</table>

### $X_{35}$ = Staff involved in the process change from start to finish

<table>
<thead>
<tr>
<th>Staff have an opportunity to have an impact on the direction of process change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff opinions are sourced before decisions are made</td>
</tr>
<tr>
<td>Staff feel they have the power to positively initiate change</td>
</tr>
<tr>
<td>Process change plans involve as many people as possible</td>
</tr>
<tr>
<td>Process change information is shared to the rest of employees</td>
</tr>
</tbody>
</table>
APPENDIX B: SMUREC APPROVAL LETTER

Sefako Makgatho Health Sciences University
Research & Postgraduate Studies Directorate
Sefako Makgatho University Research Ethics Committee
(SMUREC)

Molotlegi Street, Ga-Rankuwa 0208
Tel: (012) 521 5617/8 Fax: (012) 521 3749
Email: lorato.phiri@amu.ac.za
P.O. Box 163 Medunsa 0204

APPROVAL NOTICE - NEW APPLICATION

03 November 2016

Ms MT MaseTshaba
Department of Statistics & Operations Research
P.O Box 107
Medunsa, 0204

MEETING: 09/2016

SMUREC Ethics Reference Number: SMUREC/P/296/2016: PG

The New Application received on 17 October 2016, was reviewed by members of Sefako Makgatho University Research Ethics Committee 03 November 2016 and was approved on 03 November 2016.

Title: Multivariate multilevel modeling of business processes optimization in Entrepreneurships

Researcher: Ms MT MaseTshaba
Supervisor: Prof SM Seelose
Department: Statistics & Operations Research
School: Pathology & Pre-Clinical Sciences
Degree: PhD Science

Please note the following information about your approved research protocol:

Protocol Approval Period: 03 November 2016 - 03 November 2017

Please remember to use your protocol number (SMUREC/P/296/2016: PG) on any documents or correspondence with the REC concerning your research protocol.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modification, or monitor the conduct of your research and the consent process.

After Ethical Review: Please note a template of the progress report is available in the Research Office and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit. Translation of the consent document in the language applicable to the study participants should be submitted.


Sincerely

[Signature]

PROF DA OGUNBANDI
CHAIRPERSON SMUREC

Date: 03/11/2016