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Overcoming Constraints to Innovation: A Study of Tanzanian Entrepreneurial Firms in the Food and Beverage Industry

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Dedication

I dedicated this work to my parents Mr. Pauline Mabu and Ms. Leocardia M. Kamalamo.

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Abstract

Entrepreneurial firms operating in resource-constrained and uncertain environments find it difficult to engage in innovation activities due to challenging innovation constraints. Innovation constraints may block potential innovative firms from getting their innovation efforts off the ground or prevent them from engaging in innovation activities in the first place. Despite facing several challenges still some firms can innovate and bring to the market innovative products, and even penetrate new niche markets by utilizing varied sources of ideas and information. These firms appear to have strategies to overcome a variety of innovation constraints and the critical question is how they overcome those challenges. Using empirical data drawn from the Tanzanian food and beverage industry, this study employed an explanatory sequential mixed methods approach to understand innovation behaviour of entrepreneurial firms in the context characterised by scarcity of resources and uncertainties. Three separate but inter-related research questions were examined and they sought to understand the factors constraining innovation efforts of the Tanzanian food and beverage manufacturers and how the constraints were overcome. The quantitative phase employed structural equation modeling technique to investigate the impact of financial, knowledge, market and regulatory constraints on innovation and firm performance, and the role of bricolage in overcoming innovation constraints. The findings indicated that financial, market and regulatory constraints collectively hindered innovation of potentially innovative enterprises in the industry. However, the relationship of knowledge constraints with innovation was negative but insignificant which suggested that knowledge constraints were perceived as of little importance by innovative firms. Entrepreneurial bricolage which is defined as firms' long-term behaviour of creating something from nothing by utilizing practical knowledge and creatively combining and transforming resources at hand into something new played a partial role in overcoming financial and market constraints, but such effects were absent in regulatory constraints. The implication for these results was that entrepreneurial bricolage was not a sole strategy that innovative firms employed to deal with various innovation constraints. Further qualitative research, with emphasis on uncovering other mitigation strategies was conducted and the results offered additional insights into innovation constraints that innovative firms considered important, how they affected their innnovation efforts, what caused them and how they were overcome. The study adds to the theory of bricolage by suggesting that innovation in resource-constrained and uncertain environment is an outcome of a mix of bricolage and conventional strategies. Recommendations for practice and policy are given to improve firm innovativeness.

Keywords: entrepreneurial bricolage, explanatory sequential mixed methods, innovation constraints, innovation, strategies, qualitative methods, quantitative methods

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Chapter 1 INTRODUCTION

1.1 Background of the study

Global forces of competition and dynamism of business environment in domestic and foreign markets have created pressures that threaten growth and survival of firms in all sectors in both developed and developing countries (Hadjimanolis, 1999; Madrid-Guijarro et al., 2009; Shiang & Nagaraj, 2011). Firms respond to these pressures by improving their innovative capabilities (McAdam et al., 2004), including developing products in efficient and effective ways (Vermeulen, 2005). Innovation is one of the critical factors that significantly contribute to sustained productivity growth and competitive advantage of both small and large enterprises (Galia & Legros, 2004; Hewitt-Dundas, 2006; Madrid-Guijarro et al., 2009; Rhee et al., 2010; Xie et al., 2010; Shiang & Nagaraj, 2011).

Although innovation is one of the factors contributing to firms' competitiveness, growth and survival; existing literature suggests that innovation is a difficult (Hadjimanolis, 1999); uncertain and risky (Xie et al., 2010; Zhu et al., 2012); costly (Xie et al., 2010; Coad et al., 2016) undertaking that occurs in resource-constrained and uncertain environment (Madrid-Guijarro et al., 2009; D'Este et al., 2014; Senyard et al., 2014). In such environments, however, while some enterprises succeed in introducing innovations, others decide not to engage in innovative activity because they probably failed to succeed in their previous attempts or innovation constraints are too strong for them to overcome (D'Este et al., 2012; Hölzl & Janger, 2013). Thus, these enterprises are discouraged by the constraints they face. Generally, innovation entails overcoming a wide range of systematic and structural constraints (Madrid-Guijarro et al., 2009a; D'Este et al., 2012). Larsen and Lewis (2007b) noted that introduction of innovations is an indication that firms have strategies in place to overcome innovation constraints.

Prior research on innovation constraints is fragmented - one strand of literature (hereinafter referred to as "constraint literature") focuses on identification of constraints and investigation of the relationships between constraints and innovation, and firm performance (Madrid-Guijarro et al., 2009; D'Este et al., 2012; Nikolić et al., 2015; Amara et al., 2016; Coad et al., 2016). Another line of literature concentrates on exploration of strategies for overcoming innovation constraints(Larsen & Lewis, 2007c; D'Este et al., 2014b; Griffin et al., 2014; Reinhardt et al., 2019). Studies that take an integrative approach to investigating both innovation constraints and mitigation strategies are scarce; though the approach is useful in enriching our understanding of innovation activities of enterprises operating in business environment characterized by resource scarcity and uncertainties

The “constraint literature” differs significantly in focus between developing and developed countries. Whereas research in developing countries concentrates on identification and exploration of relative importance of different factors in impeding innovation using qualitative methods(Mpangile et al., 2008; Nikolic et al., 2015; Amara et al., 2016b; Voeten et al., 2016), similar studies in developed countries investigate the impact of constraints on innovation (Gibbert et al., 2007a; Amara et al., 2016b) and firm performance (Coad et al., 2016). These studies employ econometric models to test the effects of financial, knowledge, market and regulatory constraints on innovation (Keupp & Gassmann, 2013; Efthyvoulou & Vahter, 2016a; Pellegrino, 2018) or firm performance (Coad et al., 2016b). This approach reflects the growing importance of quantitative techniques in the study of innovation constraints and relevance of findings in practice and providing inputs for policy developments. Availability of large-scale datasets collected every three years through Community Innovation Surveys in developed countries, in particular Europe, allows researchers in those countries to apply econometric models. However, such datasets are not available in developing countries.

Guided by entrepreneurial theory of bricolage, the present study addressed the above gaps in the literature and employed a mixed-methods sequential explanatory design to investigate the impact of innovation constraints on innovation and mitigation strategies in a single study. The quantitative techniques were used to investigate the relationships of innovation constraints with innovation and firm performance, and the role of entrepreneurial bricolage in reducing the impact of various innovation constraints on innovation. The qualitative research explored strategies that innovative firms employed to overcome the constraints in their innovation process. The sample for this study was drawn from the Tanzanian food and beverage industry.

The Tanzanian food and beverage industry represents innovation environment that would be interpreted as unfavourable settings for innovation activities to take place. Several lines of evidence indicated that the incumbent firms found it extremely difficult to undertake innovation activities(Diez et al., 2000; CTI, 2008; Mpangile et al., 2008; Charles & Mambi, 2013; CTI, 2017). Previous studies, however, (Fuglsang & Sørensen, 2011; Salunke et al., 2013; Senyard et al., 2014) suggested that entrepreneurial firms operating in resource-constrained and uncertain business environment employed entrepreneurial bricolage to overcome innovation challenges. Bricolage is an entrepreneurial behaviour of making do with available resources through creative recombination (Baker et al., 2003; Bacq et al., 2015). An entrepreneurial bricoleur constantly refuses to accept environmental limitations as defined by institutional or cultural settings, instead creatively recombine existing resources for new purpose to address innovation

problems and opportunities (Baker & Nelson, 2005; Gundry et al., 2011). Entrepreneurial bricolage distinguishes innovative enterprises from non-innovative, more innovative enterprises from less innovative enterprises, and high growth enterprises from enterprises with stagnant growth.

Research evidence suggests that firms which are highly engaged in entrepreneurial bricolage are more innovative than firms with limited application of bricolage (Salunke et al., 2013; Senyard et al., 2014). On the other hand, the literature indicates that innovation performance and high growth is observed in firms integrating bricolage with other strategies (Baker & Nelson, 2005). Differences in the impact of bricolage on innovation performance provided an avenue for in-depth exploration of other strategies that might be used by innovative firms to supplement bricolage.

1.2 The context of the study: the Tanzanian food and beverage industry

Processed food and beverages represent about 70% of food purchases in Eastern and Southern Africa, while the demand for manufactured food and beverage is expected to increase at an average rate of 7% and 8% yearly over the next three decades (Ijumba et al., 2015). As world's future population is estimated to increase by 2.5 billion people to reach 9 billion in 2050, more growth is expected to occur in Africa and Asia (Wilkinson & Roch, 2006). Population growth is associated with urbanization. In Tanzania, for example, rapidly increasing urbanization and changing lifestyles has resulted in a growing demand for processed staple food and convenience foods in markets (Diez et al., 2000). Wilkinson and Rocha (2006) argue for changes in the food systems from traditional to modern food systems, which are based on packaged food production and supermarket retail outlets.

The Tanzanian food and beverage industry supports security and sustainability of agricultural sector; and its development creates opportunities for strategic partnerships with farmers (Sutton & Olomi, 2012). Such relations increase production and quality of cash crops. The industry contributes significantly to poverty reduction by increasing rural incomes through value addition to products and creates both direct employment and indirect through provision of reliable markets for farmers and formation of linkages with wholesalers and retailers respectively (Diez et al., 2000; Ruteri & Xu, 2009). Tanzania National statistics shows that about 75% of Tanzanian population is engaged in farming while direct employment in the food and

beverage industry is about 92,334 people (NBS & MITI, 2016)[1]. Thus, the industry is crucial in a country like Tanzania where the demand for processed food is on the rise due to increased disposable income and migration to cities.

1.3 Characteristics of Tanzanian food and beverage industry

Manufacturing is defined as chemical or physical transformation of materials, substances, or components into new products as well as substantial alteration, renovation or reconstruction of goods (NBS & MITI, 2016). In the food and beverage industry, transformation involves products of agriculture, forestry and fishing. The food products and beverages resulting from transformation process are easily marketable and can be prepared and served by consumers. The Tanzanian food and beverage industry is undergoing transformations in terms of processing, distribution and marketing where much of processed food is sold through retail channels especially supermarkets (Ruteri & Xu, 2009). These transformations aim at responding to stiff competition in the local markets from food and beverage imports (Ijumba et al., 2015).

The Census of Industrial Production, 2013 which covered all establishments located in the Mainland Tanzania, indicated that 19,773 firms were food and beverage manufacturers, which was equivalent to 40.8% of all industrial sector establishments (NBS & MITI, 2016). Out of 19,773 firms, 429 were large enterprises (ibid). Classification of enterprises in Tanzania is based on two criteria: the number of employees and total capital investment in machinery and equipment (URT, 2003)[2]. Businesses are classified as micro-enterprises, small enterprises, medium sized enterprises and large enterprises regardless of whether they are manufacturing firms or service providers. Table 1.1 below illustrates this classification.

[1] NBS = National Bureau of Statistics; MITI = Ministry of Industry, Trade and Investment
[2] URT = United Republic of Tanzania

Table 1. 1: Classification of firms by size in Tanzania

Categories	Number of Employees	Capital Investment (in British Pound- GBP)
Micro-enterprises	1 - 4	Up to £1,798
Small enterprises	5 - 19	Above £1,798 to £71,917
Medium-sized enterprises	20 - 99	Above £71,917 to £287,666
Large enterprises	100 and above	Above £287,666

Exchange rate £1 = TZS 2,781 as on 24th February 2017

Source: Bank of Tanzania

A larger proportion of micro and small enterprises and a relatively smaller percentage of medium and large enterprises characterize the structure of food and beverage industry (Ijumba et al, 2015; Ruteri & Xu, 2009). The national statistics recognizes eight formal food-manufacturing sub-industries: sugar, fish and milk processing, beverages, tea and coffee, edible oil production, grain milling, and bakeries and confectionaries (Sutton & Olomi, 2012). Of these, coffee, edible oil, and beverage sub-sectors are major contributors to national economy in terms of exports, direct and indirect employment.

Many of micro and small firms operate informally while medium and large enterprises are formally registered and possess large capacity output by using modern technologies (Ruteri & Xu, 2009). Micro and small food and beverage processors produce identical goods whereas medium and large enterprises produce differentiated and high-quality products that are sold to wholesalers and large retailers especially supermarkets (Ijumba et al., 2015). Food and beverage producers use responsive market approach to meeting customers' needs and this strategy seems to bring success to many companies (Ruteri & Xu, 2009). Large companies have co-ordinated information flows from downstream to upstream that helps them control unnecessary wastages and losses (Ruteri & Xu, 2009; Sutton & Olomi, 2012).

The Tanzanian food and beverage industry occupies a significant segment in the manufacturing sector and economy. It contributed about 50% of the total manufacturing value added (MVA) and about 27.58% of GDP in 2012 (URT & UNIDO, 2013)[3]. About 29.9% of all registered

[3] UNIDO = United Nations Industrial Development Organization

enterprises are food and beverage manufacturers whose contribution to total export sales and employment amounted to 53% and 54.5% in 2016 respectively within the manufacturing sector (URT, 2018). The MVA contributed by food and beverage industry in the manufacturing sector increased to about 60% in 2013 from 50% in 2012 (NBS & MITI, 2016). The industry also plays a significant role in meeting increased demand for processed food resulting from growth in income and urban population and new consumer demands (Ijumba et al., 2015) and is a key component of the value chain in the economy (Mmasa, 2013).

Even though the industry leads in many aspects in the manufacturing sector, its overall performance is not at its potential. There is a growing concern over substantial amounts of post-harvest losses, with 30 to 40 percent of agricultural produce and about 50-80 percent of fruits and vegetables are being lost each year (Mmasa, 2013). Dietz et al. (2000) observed that 5 to 10% of all produced vegetables and fruits in Tanzania was processed to meet only 8% of domestic demand, while over 90 percent of the demand was met by imports. The industry still experiences inadequacies in value addition in agricultural produce, and non-adherence to grades, standards and quality in processed products marketing while many products are marketed in raw forms or exported unprocessed (Mmasa, 2013; Dietz et al., 2000).

The food and beverage industry offers an interesting study context because of its role in the Tanzanian manufacturing sector but also the intensity and variety of constraints present in the industry. It is one of the industries with the longest list of constraints ranging from scarcity of resources to uncertainties in the business environment. Previous studies (Diez et al., 2000; Mpangile et al., 2008; Sutton & Olomi, 2012; Charles & Mambi, 2013) found red tapes, low demand for innovative products, scarcity of financial and human resources, high degree of informality, counterfeits, high costs of innovation, lack of modern technologies, poor quality and high cost of packaging materials, shortage of raw materials etc. as the most prevalent constraints in the industry. Fortuin and Omta (2009) argue that a myriad of internal and external constraints leads to poor performance on innovation and growth. However, despite facing all these challenges still some firms in the industry can innovate and bring to the market innovative products, and even penetrate new niche markets by utilizing varied sources of ideas and information (Mpangile et al., 2008; Nandonde, 2018). These entrepreneurial firms appear to have strategies in place to overcome a variety of constraints to create innovation. However, little is known on how they overcome innovation constraints facing them when undertaking innovation activities.

1.4 Research gaps

Although prior studies on innovation constraints provide valuable knowledge of the factors constraining innovations, they remain limited in terms of methodological approaches, regional coverage, analysis of the effects of innovation constraints on firm performance, analysis of the factors contributing to the reduction of negative effects of innovation constraints and exploration of mitigation strategies. One strand of literature (Canepa & Stoneman, 2008; Efthyvoulou & Vahter, 2016b; Durmusoglu et al., 2018; Pellegrino, 2018) focuses on identification and examination of the relationships of innovation constraints with innovation performance (the "constraint literature") while another line of research (Rao & Drazin, 2002b; Smith, 2007; D'Este et al., 2014a; Marvel & Patel, 2018) explores the mitigation strategies for innovation constraints. So far, there have been limited studies that take an integrative approach to studying innovation constraints and mitigation strategies in a single study (Larsen & Lewis, 2006; 2007b). Integration of approaches is useful in providing a better understanding of research problems and complex phenomena and adds insights which might be missed out when monomethods are used(Molina-Azorín, 2011). It also allows clarification of the results obtained from one method with the findings of another method, mutual confirmation of the findings and the use the findings of one method to inform the use of other methods (Greene et al., 1989; Johnson & Onwuegbuzie, 2004; Bergman, 2011).

Many studies on innovation constraints in developing countries are qualitative in nature (Hadjimanolis, 1999; Diez et al., 2000; Charles & Mambi, 2013) and mostly restricted to identification and categorization of constraints with little to no attempts being made to quantitatively analyse the effects of such constraints on innovation and firm performance. Unlike qualitative research results, quantitative research findings can be generalized, replicated on many different populations and used as input for informed policy formulation.

A critical analysis of the current literature on innovation constraints in developing countries revealed limitations similar to those reported by studies conducted in developed countries; that they paid little attention to the strategies employed by innovative firms to overcome innovation constraints. Some researchers (D'Este et al., 2014) are now critical of the tendency for current studies to pay less attention to factors contributing to reduction of the negative effects of constraints on innovation. Empirical evidence suggests that active innovators tend to have strategies in place to overcome the constraints facing them when they engage in innovation activities. The literature suggests that successful innovation entails considerable efforts to overcome diverse innovation constraints (Larsen & Lewis, 2007a). For example, D'Este et al. (2014) point to human capital (employing university graduates) while Rao and Drazin (2002)

argue in favour of recruitment of managers from rival companies as strategies to overcome innovation constraints. These strategies call for addition of resources, but they might not be appropriate in business environments like the Tanzanian food and beverage industry, which is characterized by resource scarcity, higher degrees of uncertainty and predominance of small enterprises. However, there is limited theoretical development and empirical work on how innovative enterprises operating in resource constrained and uncertain environment overcome innovation constraints.

Previous research suggests that application of entrepreneurial bricolage is associated with innovation in uncertain environment (Salunke et al., 2013; Bojica et al., 2014; Senyard et al., 2014a) and the conclusions drawn from these studies point to bricolage as a sole strategy pursued by entrepreneurs to overcome the constraints. So far, a systematic understanding of how bricolage contributes to reduction of the negative impact of innovation constraints on innovation is still lacking. Furthermore, much of the research on entrepreneurial bricolage has been mostly restricted to resource constraints (Desa & Basu, 2013; Senyard et al., 2014a), with little attempts being made to explore the ways in bricolage is applied to overcome non-resource constraints.

1.5 Research questions

The main objective of the study was to investigate the strategies employed by entrepreneurs operating in resource-constrained and uncertain environment to overcome innovation constraints. The study sought to provide answers to the following specific research questions:

1. What is the impact of financial constraints, knowledge constraints, market constraints and regulatory constraints on innovation and firm performance?
2. To what extent does entrepreneurial bricolage reduce the negative impact of innovation constraints on innovation?
3. How do innovative firms operating in resource constrained and uncertain environments overcome innovation constraints?

1.6 Research objectives

The study examined the impact of financial, knowledge, market and regulatory constraints on innovation and firm performance and role of entrepreneurial bricolage in reducing innovation constraints by using quantitative techniques. Qualitative interviews were employed for in-depth exploration of innovation constraints and strategies to overcome them in the Tanzanan food and beverage industry. The study aimed to achieve the following specific research objectives:

1. To analyse the effects of financial, knowledge, market and regulatory constraints on innovation and firm performance
2. To examine the role of entrepreneurial bricolage in reducing the negative effects of innovation constraints on innovation
3. To explore strategies that entrepreneurs employed to overcome innovation constraints

1.7 Relevance of the study

This study distinguishes itself from previous research by integrating two different lines of literature (constraint literature and mitigation literature). Prior studies paid little to attention to investigation of both innovation constraints and mitigation strategies in single studies. Applying integrative approach to the study of innovation constraints has enhanced our knowledge of innovation activities of entrepreneurs operating in resource-constrained and uncertain environment like the Tanzanian food and beverage industry. Employment of a mixed-methods approach made it possible to obtain a more complete picture of innovation constraints: important and specific factors that constrained innovation.

This study made empirical and theoretical contributions in the following ways: First, it contributed to the literature on innovation constraints in developing countries and food and beverage industry in particular, by empirically testing the effects of constraints on innovation and firm performance. Prior studies concentrated on identification and assessment of the importance of different factors in constraining innovation performance by using either qualitative techniques or descriptive statistics (Mpangile et al., 2008; Ruteri & Xu, 2009; Baregheh et al., 2012) with no attempts being made to test their impact on innovation and firm performance. The results of quantitative analysis showed that financial, market and regulatory constraints were important innovation constraints the industry. The relationship of knowledge constraints with innovation was negative but insignificant which suggested that knowledge constraints were perceived as of little importance by food and beverage manufacturers. Qualitative data, however, offered additional insights by identifying specific constraints that entrepreneurs considered important, how they affected their innnovation efforts, what caused them and how they were overcome.

Second, the study complements the theory of entrepreneurial bricolage by demonstrating the mechanisms through which bricolage works in reducing the impact of various innovation constraints on innovation. Previous studies explored the extent to which engagement in bricolage contributed to innovation outcomes and firm performance by testing linear

relationships between bricolage and innovation performance (see Salunke et al., 2013; Senyard et al., 2014) or firm performance (Bojica et al., 2014). However, the literature tells us little about how bricolage reduces the impact of obstacles to innovation. Therefore, this study attempted to show the channels through which bricolage reduced the impact of various constraints on innovation by systematically investigating the moderating effects of bricolage on innovation constraints. Initial findings showed a positive and significant impact of bricolage on innovation, but further quantitative analysis revealed that the role of bricolage in reducing the negative impact of constraints was partial and, in some cases, non-existent. Qualitative data showed areas in which bricolage and conventional strategies were employed. An implication for this is the possibility that bricolage was not a sole strategy but complemented conventional mitigation strategies.

Furthermore, previous analysis and application of bricolage focused on resource constraints. This study made extension to include non-resource constraints (i.e. market and regulatory constraints), and quantitative results confirmed reduction of market constraints and qualitative results provided examples of how bricolage was applied in overcoming the non-resource constraints. Another contribution is the finding in relation to mitigation strategies for innovation constraints. The present study identified entrepreneurs' prior knowledge and experience in the industry, flexibility and network relations as important capabilities demonstrated in developing strategies to overcome innovation constraints in the industry.

From the practical point of view, the current results pointed towards the importance of financial, knowledge, market and regulatory constraints in constraining innovation. Thus, managers/owners of firms in the industry must be aware of those factors and be able to develop appropriate mitigation strategies to deal with the constraints. A reasonable approach to dealing with innovation constraints is to focus on assessment and development of internal skills and capabilities that will be utilized to overcome the constraints.

Several factors emerged as constraints to innovation with financial and regulatory constraints being perceived by managers as of high importance. Targeted interventions aimed at making business environment conducive for innovation should focus on reducing the amount of regulations, eliminating bureaucracy and unnecessary delays in business and product registration, promoting credit guarantee schemes, combating counterfeit trade and raising public awareness of counterfeit and fake products. The government should also look into the possibility of addressing shortage of people with relevant skills, education and experience in the industry by facilitating long and short training within and outside the country.

1.8 Organization of the study

The research is organized into eight chapters. The first chapter presented introduction to the study, research gaps, research objectives, research questions, and empirical and theoretical relevance as well as practical and policy implications of the study. Chapter 2 provides critical reviews of the literature on innovation constraints in general and on food and beverage industry in particular. The chapter two also provides detailed discussion of the theoretical framework that guides the study and hypotheses development. Chapter 3 discusses philosophical issues, methodology and covers issues related to bot quantitative and qualitative data collection procedures, sampling procedures and data analysis. In chapters 4 and 5 present quantitative results while qualitative findings are reported in chapter 6 followed by chapter 7 which discusses the findings. Chapter 8 presents conclusion, and theoretical, practical and policy relevance of the results.

Chapter 2 CRITICAL REVIEW OF RELEVANT LITERATURE

2.1 Introduction

This chapter provides a critical review of existing literature on innovation constraints and strategies to overcome innovation constraints. Issues covered in this chapter include definitions of key concepts (i.e. innovation, innovation constraints, entrepreneurial bricolage), theoretical framework and development of hypotheses. The review of literature covers studies on innovation in food and beverage industry, innovation constraints in general and in food and beverage industry, entrepreneurial bricolage and other mitigation strategies for constraints.

One important issue in relation to literature review needs classification. This review of literature is partly systematic and partly conventional because many prior studies of innovation and innovation constraints in the Tanzanian food and beverage industry are not published in top ranked journals. Many publications on the subject are from government-funded surveys that are available on public websites and or in printed form. Recognizing these limitations in the literature, an alternative option was to conduct a review of literature that incorporates elements of both systematic and conventional methods of literature review.

2.2 Innovation in the food and beverage industry

Continuous changes in behaviours of consumers and competitors are forcing food and beverage manufacturers to part company with traditional production-driven supply chain to market-driven supply chain (Folkerts & Koehorst, 1998; Matthyssens et al., 2008). Moreover, increasing industry risks, constant changing customers' needs and demand for quality and safe food and beverage products require innovative response from the supply side. As these demands become more intense, the need for innovation arises as well (Fortuin & Omta, 2009; Capitanio et al., 2010). Firms tend to turn their attention to innovation strategies to gain competitive advantages and market shares by providing more value to their customers than competitors(Gray et al., 2003; Schiefer et al., 2009; Gunday et al., 2011). Innovation is one of the core competencies that organizations embrace in order to excel in ever-changing business environment (Yeh-Yun Lin & Yi-Ching Chen, 2007; Rosenbusch et al., 2011). The concept of innovation is related to anything new or different from the existing ones (Beckeman et al., 2013).

Innovation is viewed as an activity, an outcome of such activity or both. As an outcome, the OSLO Manual 2018 (OECD/Eurostat, 2018) defines innovation as a new or significantly improved product or process (or a combination of thereof) that significantly differs from the company's existing products or processes and has been made available to the end-users. This definition

views innovation as an output with commercial value resulting from certain input of efforts (Kahn, 2018) (i.e. innovation activities) which are referred to as all developmental, financial and commercial activities carried out by the firm for the purpose of introducing innovation (outcome). Thus, innovation is a multistage process of transforming ideas into something new or improved, be it products/services or ways of doing things with the aim of promoting and sustaining competitive advantage in the marketplace (Baregheh et al., 2009; Baregheh et al., 2012b). Thus, innovation process aims at providing end users with new and unique experience from the new products/services or processes that significantly enhances firm's performance in the marketplace and can be duplicated from customer to customer(Rajapathirana & Hui, 2018; Dziallas & Blind, 2019).

The OSLO manuals 2005 and 2018 and several other researchers (Varis & Littunen, 2010; Dewangan & Godse, 2014; Amara et al., 2016a) associate innovation with developing new or significantly changed products/services or processes where fundamentality of change is considered the main aspect of innovation. This perspective sometimes known as technologically new or invention paradigm (Bhaskaran, 2006) relates innovation to something completely new or radically changed and disregards minor improvements (Varis & Littunen, 2010; Kahn, 2018; OECD/Eurostat, 2018). However, Kahn (2018) challenges this view and argues that innovation is not a binary phenomenon, instead it falls along a continuum ranging from minor incremental improvements to radical or significant changes. He further argues that successful organizations balance innovation efforts by allowing small wins when undertaking big wins. Further evidence suggests that a larger proportion of firms engage in both radical and incremental innovations than those that undertake either radical or incremental innovations only. For example, the study of Yeh-Yun Lin and Yi-Ching Chen (2007) in Taiwan found that 53.5% of companies were engaging in both radical and incremental innovations compared to 21.2% and 5.1% of companies which had implemented incremental and radical innovations only respectively.

Incremental innovation is defined to include continuous modifications to existing innovations(Garriga et al., 2013; Voeten et al., 2016). In the food and beverage industry incremental innovations are inevitable and are more than radical innovations because the legal requirements related to new food products are strigent and the demand for innovative products is sluggish due to either consumer behaviour of resisting radical changes in the food products or reduction of the amount of financial support offered by retailers for new product developments (Martinez & Briz, 2000; Weiss & Wittkopp, 2005; Schiefer et al., 2009; Capitanio et al., 2010; Toselli, 2017).

Innovation outcome is often classified into four major categories of output: product innovation, process innovation, marketing innovation and organizational innovation (OECD/Eurostat, 2005; Yeh-Yun Lin & Yi-Ching Chen, 2007; Karabulut, 2015; Rajapathirana & Hui, 2018). Product innovation include changes in the capabilities of company's product/service offerings. The changes involve creation and development of new or improved products and services or major improvements in existing products to match the market demand (Oke et al., 2007; Capitanio et al., 2010; Taneja et al., 2016). In the context of food manufacturing industry, product innovations involve a wide range of aspects, such as new or improved packaging, changes in product composition and design, finding new ways of product usage and product quality through selected ingredients and raw materials (Kühne et al., 2010; Baregheh et al., 2012b).

Process innovation represents both minor and radical changes in processing and delivery methods, and supporting activities (Oke et al., 2007; Madrid-Guijarro et al., 2009b; Capitanio et al., 2010; Toselli, 2017). Taneja et al. (2016) and Madrid-Guijarro et al. (2009b) define process innovation as changes in methods and purchase of new equipment. In the food and beverage industry, process innovations aim to support the manufacture of new products or improvement/adaptations to the existing products, packaging, and company's marketing and sales efforts (Baregheh et al., 2012b). Both product and process innovations are collectively known as technological innovations (Madrid-Guijarro et al., 2009b; Löfsten, 2014; Bartoloni & Baussola, 2016).

Organizational innovation refers to introduction of new or improvement organizational methods such as changes in business practices within the firm or in relation to external networks. Marketing innovation is concerned with implementation of new marketing methods with the aim of driving demand through creation of product awareness, brand recognition and penetration of new markets (OECD/Eurostat, 2005). They include changes in promotional, selling and pricing methods and finding new markets for new or existing products (Taneja et al., 2016). The firm's attempts to reach online markets and customers, to give free samples to customers and reduce prices of a new product, discounts for bulk purchases or enter regional and international markets are examples of marketing innovations(Baregheh et al., 2012b).

Food and beverage industry views innovation as an important source of value addition that makes agro-products highly marketable, safe, easy to stored and profitable (Mpangile et al., 2008; Capitanio et al., 2010; Beckeman et al., 2013). Innovation creates value to customers manufacturers to reduce production costs and better respond to diverse needs of customers by shortening the supply chain and extending product shelf-life (Mmasa, 2013; Esbjerg et al.,

2016b). With regard to the degree and types of innovation, the industry undertakes mainly incremental product or/and process innovations (Diederen et al., 2003; Baregheh et al., 2012b; Beckeman et al., 2013; Voeten et al., 2016), with more resources and focus being laid on process innovation than other types of innovations.

Process innovations occur as a result of acquisition of new technologies developed by upstream industries (i.e. suppliers of equipment) (Schiefer et al., 2009; Ciliberti et al., 2016) and are implemented by food and beverage manufacturers to facilitate product innovations, cost reductions, and improvement of process control, environmental performance and labour conditions (Diederen et al., 2003; Fortuin & Omta, 2009; Mmasa, 2013). Other types of innovations introduced in the industry are market innovations and organizational innovations, but Baregheh et al. (2012) cautioned that innovation types in the food sector are closely inter-related, with one type of innovation being viewed differently by different firms. Beckeman et al. (2013) pointed out that various types of innovations undertaken by food processing firms are sometimes technical and invisible to customers and involve removal of non-value adding activities in the supply chain.

The definition of innovation adopted in this study takes into the nature of innovations introduced in developing countries and low-tech industries such as the food and beverage industry as the majority of them are incremental in nature (Hadjimanolis, 1999; Baregheh et al., 2012; Beckeman et al., 2013; Voeten et al., 2016). In these contexts, innovation is defined as technological adoption, modifications, or radical and incremental changes that happen in the firm. This definition contains some elements of incrementalism and is in line with definitions of other studies in the industry (Mahemba & Bruijn, 2003; Mpangile et al., 2008; Voeten et al., 2016).

There is a well-established body of research on drivers to innovation in the food and beverage industry (Fortuin & Omta, 2009; Schiefer et al., 2009; Ciliberti et al., 2016; Nandonde, 2018). Factors such as network relations and firm size have been identified as drivers to innovation. The fact that firm's innovation activities can be stagnated by scarcity of both tangible and intangible resources, participation in networks becomes inevitable because it ensures access to such needed resources for innovation(Dickson & Hadjimanolis, 1998; Baregheh et al., 2012b; De Massis et al., 2018). Various studies pointed out that firms which engage in multiple network relations are in a better position to innovate than outsider firms because they can easily develop new skills, abilities, products, processes and services(Tomás Gómez Arias, 1995; Varis & Littunen, 2010). However, past research on network relations with particular focus on innovation in the

food and beverage industry presents mixed findings of the extent to which food processors engage in network relations.

On the one hand, scholars document evidence showing that within the industry there is low level of engaging customers, suppliers and other partners in the innovation process(Fortuin & Omta, 2009; Baregheh et al., 2012b; Beckeman et al., 2013). This implies that the food manufacturers do not involve value chain actors and others in their innovation activities particularly in developing new products/services or processes. The study of Fortuin and Omta (2009) in the Netherlands revealed that a large number of companies in the food processing industry did not involve suppliers and customers in their innovation activities; the problem which made them fail to leverage innovation resources and capabilities.

The reasons for not engaging network partners in innovation activities include low level of trust among partners within and outside the value chain, lack of network competence and entrepreneurial attributes, limited internal capabilities and absence of an open innovation mindset which limits exchange of vital information and skills, and flow of ideas across boundaries (Fortuin & Omta, 2009; Beckeman et al. 2013). According to Csath (2012, pp. 11), 'lack of trust is the consequence of weak social capital within'. Mohannak (2007) notes that trust acts a "stabilizer" of network relationships in conditions of uncertainty, sweeps away organizational differences, brings participants closer and opens doors for information, ideas and skills to move across boundaries.

On the other hand, recent literature shows that food and beverage manufacturers rely, to a greater extent, on external sources (i.e. customers, suppliers, universities and competitors) for new ideas, knowledge and technology which are key inputs for technology-based, organizational and market innovations(Mpangile et al., 2008; Baregheh et al., 2012b; Toselli, 2017). Klomp and Van Leeuwen (2001) argue that information obtained from suppliers, customers and competitors contribute more greatly to introduction of different types of innovations than information from knowledge institutions. To gather new ideas and information from customers and competitors as well as to understand the needs of customers, innovative firms use marketing teams and/or conduct market research. The information they collect is often transmitted to their respective R&D departments (Fortuin & Omta, 2009).

Firm size reflects the amount of innovation effort of the firm which is often expressed in terms of financial and human resources -the input for R&D (Schiefer et al., 2009). It is suggested that large firms spend more on R&D activity and have quality human capital than small firms. Formal

R&D activity in the food manufacturing firms is rare but its presence is more important in the introduction of more product innovations than firms in the high-tech industries (Frick et al., 2019). The results of previous studies indicated that firms with R&D activities have high productivity, large number of and quality employees (Fortuin & Omta, 2009; Schiefer et al., 2009).

2.3 Theoretical framework

Innovation process starts with (new) ideas (see figure 2.1) that are transformed into new or improved innovation output such as product/service or process (Baregheh et al., 2009) through a series of activities (Shiang & Nagaraj, 2011). The new ideas are either generated internally by employees or may come from different external sources such as customers, suppliers and knowledge-institutions (Varis & Littunen, 2010; Rodgers, 2004). Innovation occurs when firms put ideas into practice(Knight, 1967; Shiang & Nagaraj, 2011).

Rodgers (2004) recommends evaluation of each idea in terms of economic and technological sense before they are integrated into firm's processes. However, not all firms with innovative ideas can push them forward into practice. Much of the literature suggests that growth-oriented firms can successfully transform ideas into innovations; but those with no intention to innovate tend to continue with their own routines as they do not see any incentive for engaging in innovation activities (Knight, 1967; Shiang & Nagaraj, 2011). The latter group of firms are known as non-innovators while those in the former group are called potential innovators (Pellegrino & Savona, 2017). Reasons accounting for lack of interest in innovation include absence of markets and demand for innovative products (Blanchard et al., 2013; Pellegrino & Savona, 2017) or the intensities of innovation constraints are too strong for them to handle (Rosenzweig & Grinstein, 2016).

Innovation activity, from its initial stages to final output takes place in environment characterised by resource scarcity, risks and uncertainties in the market (Baker & Nelson, 2005; Shiang & Nagaraj, 2011; Senyard et al., 2014). The presence of constraints (such as shortage or lack of financial and knowledge resources or uncertain markets, and laws and regulations) in the innovation process may act as a catalyst for search of novel solutions that involve either addition of new and standard resources (i.e. conventional strategies) or creative recombination of resources at hand to solve the new problems (Keupp & Gassmann, 2013; Senyard et al., 2014b; Davidsson et al., 2017). Gibbert et al. (2007) and Keupp and Gassmann (2013) argue that individuals' entrepreneurial orientation for search behaviour and creativity for solving

innovation problems increases under conditions of resource scarcity and environmental uncertainties. On the other hand, innovation constraints act as a hindrance to engaging in innovation activities. Lack of action may suggest that the intensities of the constraints are too high to overcome or the firm has ignored the constraints and considers them not threating (Larsen & Lewis, 2007b; Rosenzweig & Grinstein, 2016). In either case, the constraints remain unattended, but if the reason is lack of capabilities to overcome them, the enterprise may eventually fail to put an idea into practice or be forced to prematurely terminate an innovation project or exit the market (Rosenzweig & Grinstein, 2016). It is assumed that repeated failures of innovation attempts experienced by potential innovators discourage them from engaging in future innovation activities due to loss of interest in innovation.

The firm and its managers possess skills and capabilities which are utilized to deal with various challenges encountered in the innovation process (Rosenzweig & Grinstein, 2016). The capabilities to overcome constraints at the management level include managers' experiences in confronting and solving diverse challenges, and personal experiences and characteristics (Rosenzweig & Grinstein, 2016). It is argued that prolonged periods of time of facing challenges help individuals acquire skills that they can use to deal with new problems. Furthermore, people with histories of both successes and failures are better equiped to deal with new problems than individuals with histories of success only. Some personal characteristics such as goal learning orientation, vision, growth mindset, proactivity, resilience and hardeness are associated with indvidual's ability to cope with challenges(Huang et al., 2003; Smith, 2007; Griffin et al., 2014; Smith & Blundel, 2014a; Rosenzweig & Grinstein, 2016). People with such personal attributes share some commonalities: they are risk takers, persistent in their decisions, good learners from failures and do things that others think can not be done (Rosenzweig & Grinstein, 2016).

The managers with such attributes have been assigned different names in the innovation literature depending on the types of innovation activities they are involved in and innovation constraints they deal with. In the context of NPD[4] where incidences of organizational resistance to changes and politics and innovation risks are common these people are called "godfathers" or serial innovators as they play an important role in overcoming some of the constraints to radical innovations (Smith, 2007; Griffin et al., 2014). They are also known as visionary leaders or bricoleurs(Huang et al., 2003; Larsen & Lewis, 2007b; Linna, 2013; Smith & Blundel, 2014a).

[4] NPD = New product development

The visionary leaders and bricoleurs see constraints as opportunities and take actions that transform an opposing force into a promoting one.

Firm's work routines, learning capabilities, teamwork, existing contacts and other resources, culture and norms constitute capabilities at the organizational level (Rosenzweig & Grinstein, 2016). The work routines generate cumulative knowledge that allows easy absorption of new ideas and pursuit of productive opportunities whenever they emerge (Rao & Drazin, 2002a). Superior learning capability enhances firm's adaptability to new situations and ability to overcome new challenges (Rosenzweig & Grinstein, 2016). For example, Si et al. (2018) suggest that continuous learning leads to accumulation of technological capability which in turn fosters firms' engagement in product development.) A relationship exists between experiential learning and exposure to obstacles as innovation path goes through waves of success and failures (D'Este et al., 2012).

The actions to respond to innovation constraints may take the following forms: (1) use conventional strategies to cope with innovation challenges (2) take actions that maximize the intrinsic value of resources at hand (3) both 1 and 2. The first option entails acquisition of standard resources through economic transactions from external sources to address the new challenges (Baker & Nelson, 2005; Crisostomo et al., 2011; Coad et al., 2016). The standard resources possess proven capabilities to serve the intended purpose of closing the gap created by the limitations of existing resources (i.e. they compensate for the limited resources) (Desa & Basu, 2013). Here the entrepreneur incurs more or extra costs to obtain additional/standard resources. For example, lack of routines, external networks or skills can be overcome by recruiting talents from large and well-established rivals, other industries or acquisition of new firms (Rao & Drazin, 2002a; Macher, 2004). Furthermore, bonds and loans from banks, venture capital, business angels etc.(Larsen & Lewis, 2007b; Polzin et al., 2016; De Massis et al., 2018) are suggested strategies to address lack of finance. To deal with regulatory constraints firms follow formal and standard procedures or abide to the rules, routines and norms of the game.

Patenting the idea locally and internationally can address the market constraint like IP [5] infringement issues (i.e. product copying) (Larsen & Lewis, 2006; 2007b; Si et al., 2018) while recruiting an individual with history of creating and commercializing new products repeatedly (i.e. serial innovator) helps to overcome both consumer resistance and organizational politics

[5] IP = Intellectual property

(i.e. employee resistance to change) in new product development settings (Griffin et al., 2014). These strategies aim at compensating for available, limited resources but the additional resources are not free. The literature suggests that compensating strategies can be successfully executed by innovative firms with adequate financial resources as lack of finance is likely to influence all other constraints obstructing innovation (Larsen & Lewis, 2007b).

The second option calls for creative reinvention (Fisher, 2012) where existing resources (which in most cases are scarce) are deployed and combined in value-creating ways to address new challenges and opportunities (Baker & Nelson, 2005; Senyard et al., 2014). Creative reinvention is a continuous creation and utilization of practical knowledge and exploitation of different types of resources (Duymedjian & Rüling, 2010). This option is referred to as entrepreneurial bricolage. Studies have explored innovation behaviour of entrepreneurs with scarcity of resources or operating in resource constrained and uncertain environment from a theoretical perspective of entrepreneurial bricolage (Baker & Nelson, 2005; Bojica et al., 2014; Senyard et al., 2014a; Tasavori et al., 2018). The results of these studies point to the fact that engagement in entrepreneurial bricolage is associated with introduction of different types of innovation.

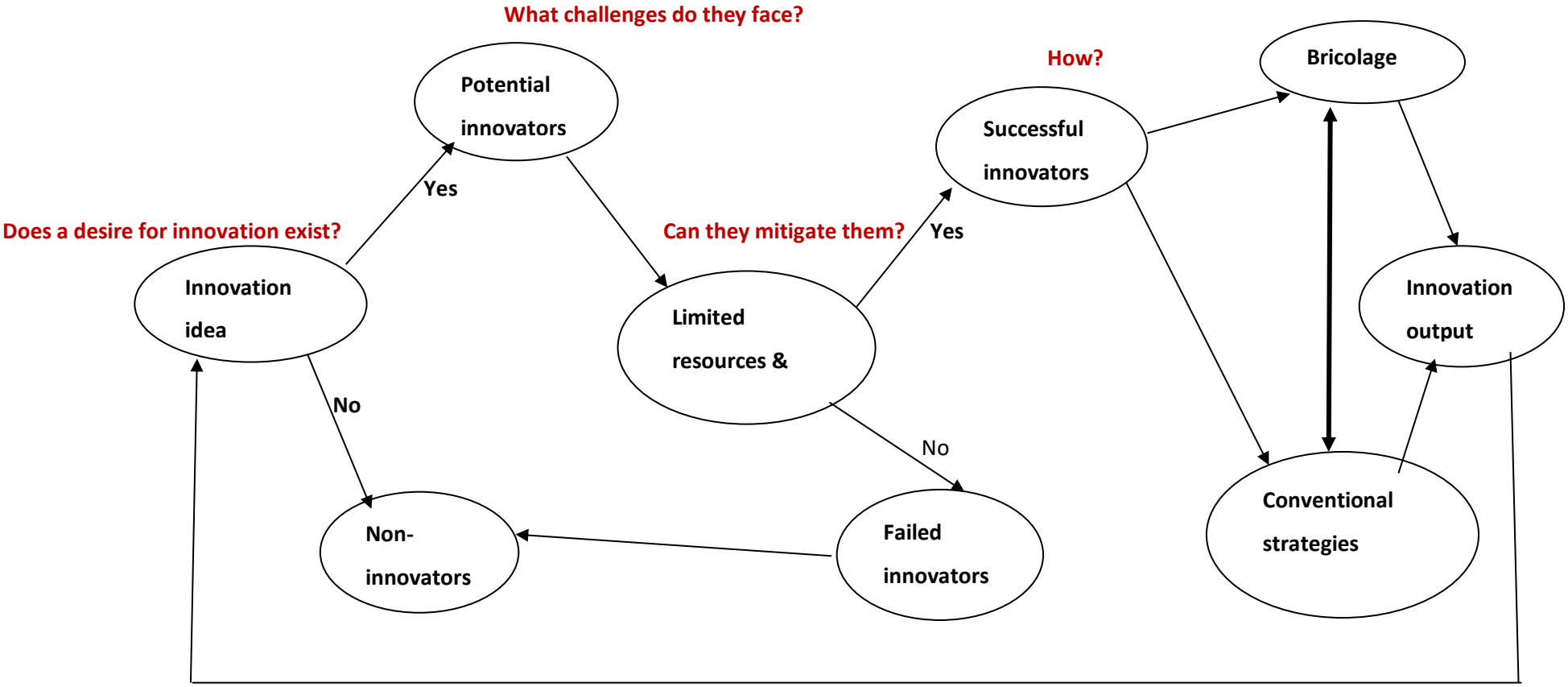


Figure 2. 1 Innovation process model in the context of resource-constrained and uncertain environment

Source: constructed from reviewed literature

2.4 Entrepreneurial bricolage perspective to innovation

An anthropologist Claude Levi-Strauss (1967) was the first to introduce the concept of bricolage in an attempt to explain the behavioural differences between an engineer and bricoleur in how they organize resources to deal with challenges and problems they encounter. The engineer seeks specific resources for a new project while a bricoleur makes do with resources at hand in the pursuit of the same objectives (Ferneley & Bell, 2006; Yang, 2018b). The bricoleurs are often aware of the limitations and unwilling to be discouraged by such conditions (Baker & Nelson, 2005; Gundry et al., 2011; De Klerk, 2015). The term bricolage connotes long-term behaviour of creating "something from nothing" by creatively combining and transforming resources at hand into something new (Baker & Nelson, 2005, p. 33). Widespread applications of bricolage in exploring behaviours of individuals and organizations in different disciplines has resulted into variations in its definition and conceptualization. Recognizing gaps in its definition, Baker and Nelson (2005, p. 33) came up with a well-refined and integrative definition that considers bricolage as "making do by applying combinations of resources at hand to new problems and opportunities". This definition carries three key elements: "*making do*, *recombination of resources for new purposes and resources at hand" (ibid).* Each element is elaborated below.

"Making do", one of the key elements of bricolage implies "bias toward action and active engagement with problems or challenges" without being concerned with whether an outcome from the transformed and manipulated resources at hand will become a workable one (Baker et al., 2003; Baker & Nelson, 2005; Linna, 2013). The second element, recombination of resources for new purposes explains the process undertaken by bricoleurs to recombine resources creatively for new purposes different from what they were originally intended (Baker & Nelson, 2005; Gundry et al., 2011; Kannampuzha & Suoranta, 2016). Creative recombination is a means of discovering innovations, products or services from resources at hand without adding new resources. Firms that engage in bricolage more frequently tend to make do with resources at hand by recombining pre-existing elements rather than starting with new elements.

Last, resources at hand are defined as physical artefacts, pre-existing contact networks, experience, skills or ideas accumulated by an organization and available at its disposal (Baker & Nelson, 2005). According to Gundary et al. (2015), resources at hand include human capital, physical materials, social capital and financial resources. Resources at hand also include cheaply available or free resources that are considered by others useless or worthless(Baker et al., 2003; An et al., 2018b; Tasavori et al., 2018). However, differences exist among enterprises in the extent to which bricolage is used to address challenges when pursuing opportunities. Some

enterprises use bricolage consistently, repeatedly and in every operation while others apply it occasionally and only in some domains, departments or functions (Baker & Nelson, 2005). The latter group of enterprises use bricolage for exploration, development of innovations and opportunities for growth. The question is what makes these variations?

Ferneley and Bell (2006) and Fuglsang and Sørensen (2011) argue that bricolage flourishes in organizations that embrace flexibility and whose management supports and trusts employees' innovative ideas and allows them to freely utilize their current and potential skills. Management support is necessary to optimise effects of bricolage and is reflected in continuous adjustment of inflexible protocol and integration of formal innovation process with informal process (Fuglsang & Sørensen, 2011). For example, Baker and Nelson (2005) found that managers in some of case study firms requested employees to take on new challenges or solve problems using resources at hand. Other studies linked the extent of usage of bricolage with firm age and size and growth orientation. Bricolage is predominantly applied in small and young firms or in firms with no growth ambitions (Baker & Nelson, 2005; An et al., 2018b). However, its use is limited and more integrated with other strategies in growth-oriented firms (Baker & Nelson, 2005). Bricolage is classified as internal or external/network based on whether at-hand resources are residing within the organization or outside the organization. Internal bricolage entails utilization of resources existing inside the organization while network bricolage makes use of resources residing within the firm's networks (Baker et al., 2003; Tasavori et al., 2018). Evidence suggests that external and internal bricolage lead to radical and incremental innovations in product and market scope respectively(Tasavori et al., 2018).

The innovation environments in developing countries are characterised by severe resource constraints and uncertainties. Financial resources are not readily available, or tradable in financial markets and the costs of transactions are very high. Quality raw materials are scarce, infrastructures are inadequate (i.e. physical roads, electricity) and it is difficult to recruit trained labour force, or access technology and business skills (Desa & Basu, 2013). In the context of Tanzanian food and beverage industry where innovation environment is characterised by resource constraints and environmental uncertainties (more details in section 2.6) while most firms are SMEs, entrepreneurial bricolage becomes an appropriate strategy for entrepreneurs to deal with various innovation challenges. It is assumed that potential innovators move forward by playing around with scarce resources to engage in innovation rather than using conventional ways to overcome innovation challenges. The results of many past studies show that engagement in entrepreneurial bricolage is associated with introduction of different types of innovations (Salunke et al., 2013; Bojica et al., 2014; Senyard et al., 2014b). The behaviour

promotes effective utilization of scarce resources and quick adaptation (promptness in action) to gain innovation outcomes in business environments with extreme resource scarcity and uncertainties(Cunha et al., 2014).

2.5 Constraints to innovation

Constraints to innovation are difficulties and challenges encountered by potential innovators when engaging in innovation activities(Freel, 2000b; Shiang & Nagaraj, 2011; Pellegrino, 2018). These difficulties are related to scarcity of resources and environmental uncertainties(Mohnen et al., 2008a; Taneja et al., 2016). For Amara et al. (2016), a constraint to innovation means anything that hampers firm's innovation capabilities. Božić and Rajh (2016) describe innovation constraints as internal and external factors that are responsible for creating unfavourable environment, which in turn curtails innovation efforts. Empirical work indicates that some firms with intention to innovate fail to overcome the constraints and bring their innovative products to them market, instead they decide to continue with their own routines (Mohnen et al., 2008a; D'Este et al., 2012).

Innovation constraints are important factors that determine firms' innovation behaviour, and the decision to engage in innovation is dependent on the intensities and evaluation of potential constraints in the innovation process. The literature suggests that perceptions of the impact constraints differ among firms depending on firm size, innovation intensity and willingness to innovate(Hewitt-Dundas, 2006; Madrid-Guijarro et al., 2009a; Shiang & Nagaraj, 2011; Hölzl & Janger, 2013; 2014; Coad et al., 2016b; Rosenzweig & Grinstein, 2016).

Several prior studies attempted to make comparative analysis of the effects of constraints on innovation success between small and large firms and young and old firms. For example, Hewitt-Dundas (2006) analysed plant-level data from a longitudinal survey in Ireland and found that small firms were less likely to engage in innovation activity because they were facing higher levels of resource and capability constraints than large firms were. Similarly, recent work by Coad et al. (2016) indicates that small firms are more vulnerable to multiplicity of constraints to innovation than large firms are. Consensus exists among these studies that innovation activities and their consequential impact on business performance in small firms are relatively low due to limited resource base, low levels of competencies and ability to reconfigure resources to enhance innovativeness (Hewitt-Dundas, 2006 Madrid-Guijarro et al., 2009a; Coad et al., 2016).

Empirical evidence suggests that innovation intensive firms experience more and higher levels of constraints than less innovative firms or non-innovative firms do (Hölzl & Janger, 2013; Coad et al., 2016). According to Nikolić et al (2015) innovative firms are more concerned with constraints to innovation than non-innovators are because their awareness of the difficulties and challenges associated with innovation increases with experience. However, firms that are not interested in innovation tend to experience no innovation constraints and declare absence of them, while "discouraged firms" rate the importance of constraints to innovation very low in comparison to innovative firms with successful innovations(Blanchard et al., 2013; Hölzl & Janger, 2013).

Review of literature on innovation constraints in developing countries indicates that many studies focus more on assessing firms' perceptions of the importance of constraints to innovation(Mpangile et al., 2008; Xie et al., 2010; Zhu et al., 2012; Charles & Rweikiza, 2015; Pham et al., 2019). This type of studies was predominant in developed countries (Freel, 2000b; Ussman et al., 2001) prior to availability of Community Innovation Surveys (CIS) data which are collected following procedures detailed in the Oslo Manuals (OECD, 1992, 1997, 2005). These studies identify and categorize the constraints into different groups as perceived by innovative firms.

The relative importance of identified factors in constraining innovation is assessed through relative ranking indexes (RRI) where factors scoring highest RRI rankings are considered of critical importance. Xie et al. (2010) employed relative ranking index (RRI) technique to determine importance of different factors in constraining innovation activities in small firms in Shanghai China. Findings indicated that lack of technical expertise was the most important constraint faced by innovative SMEs, followed by lack of financial capital. This technique has been used by Pham et al. (2019) to identify the most significant constraints affecting construction industry in Vietnam and Charles and Rweikiza (2015) to identify regulations with adverse impact on competitiveness of Tanzania's food manufacturers.

The same technique was used in Freel (2000a)'s study in the UK and the findings indicated that financial and knowledge factors were perceived by innovators as the most important factors constraining innovation. The study highlighted reasons for innovators to encounter financial difficulties and pointed to lack of information on availability of funding for innovation activities as well as lack of adequate collateral and assets for bank loans. Regarding knowledge constraints, lack of technical skills were of primary importance, followed by marketing, managerial, financial and exporting skills respectively (Freel, 2000a).

Many current studies (see Criso´stomo et al., 2011; Keupp & Gassmann, 2013; Amara et al., 2016; Coad et al., 2016) on innovation constraints from developed countries focus on examination of the relationships between constraints and innovation and firm performance. However, findings of these studies are inconclusive. One strand of research suggests that constraints to innovation are inhibitors of innovation and firm performance. This research consistently reports negative relationships between constraints and innovation or firm performance (Madrid-Guijarro et al., 2009; Criso´stomo et al., 2011; Coad et al., 2016). Proposed solutions to overcoming innovation constraints and fostering innovation and firm performance point to the market-oriented strategies such as addition of resources or improving availability of resources and environment in which innovation takes place. However, these strategies might not be appropriate for innovative firms operating in resource-constrained and uncertain environment like Tanzania's food industry.

In contrast, other researchers find that constraints are drivers for innovation and that positive relationships exist between the constraints, andinnovation, and subsequent firm performance (Gibbert et al., 2007b; Keupp & Gassmann, 2013; Woschke et al., 2017). Perception of constraints acts as a catalyst for search for novel ways to address innovation constraints by making creative recombination of available resources. Firm's capability to reuse resources and combine them in novel ways is important factor for innovation success (Keupp & Gassmann, 2013; Senyard et al., 2014. Gibbert et al. (2007a) argue that constraints force innovative teams to look for solutions beyond normal ways of solving problems. These studies emphasize the importance of creative combinative capabilities as an important strategy to address innovation challenges.

However, this line of literature is critiqued on the grounds that it fails to deal with selection bias and endogeneity problem of constraints. Selection bias occurs when non-innovative firms are included in the analysis. Prior studies indicate that non-innovative firms are not expected to face any obstacles and are not concerned with any constraints in general(Blanchard et al., 2013; Coad et al., 2016a). Savignac (2008) warns that inclusion of non-innovators in the sample tend to induce positive correlation between constraints and innovation. For, example Blanchard et al (2013)'s study in France, using CIS data found positive relationships between constraints and innovation. However, exclusion of non-innovative firms from the sample produced negative and significant estimation coefficients on constraints. Non-innovative firms that lack a desire for innovation tend to rate constraints to innovation very low and sometime do not rate them at all. Thus, their inclusion spoil estimation results and can mislead interpretations.

Although there is extensive research on innovation constraints, limited studies exist which investigate the impact of constraints on firm performance (see Coad et al., 2016). The term firm performance refers to labour productivity, innovation success (measured in terms of proportion of sales from products newly introduced or (significantly) modified), sales growth, profitability, market share or (Coad et al., 2016). Evidence suggests that financial and knowledge constraints, market constraints and legislative and regulatory constraints that were previously seen to affect innovation are still emerging as critical factors affecting firm performance(Duarte et al., 2017; Maldonado-Guzmán et al., 2017b; Moon-Koo et al., 2018). Coad et al. (2016) note that factors constraining innovation are the same factors responsible for differential performance in firm productivity. Recent studies by Coad et al. (2016) and Madrid-Guijarro et al. (2009) offer probably the most comprehensive empirical analysis of the effects of different innovation constraints on varied levels of productivity. Findings from this work indicate existence of negative relationship of innovation constraints with firm performance.

2.6 Constraints to innovation in the Tanzanian food and beverage industry

Research on constraints to innovation highlights diversity of constraints affecting firm innovation performance in different sectors. In the context of Tanzanian food and beverage industry, several previous studies documented evidence of diverse internal and external constraints to innovation. One of the earliest surveys in the industry (Dietz et al., 2000) found that Tanzania's food and beverage manufacturers lacked capacity to diversify the range of their products they offered in the market; the situation that had put them in a weak position. They also identified lack of technical personnel and people with management and marketing skills, and limited skills in choosing the appropriate technology as internal constraints to innovation. Other constraints were inaccessibility and higher costs of finance from commercial lenders, higher costs of investment in modern technology, limited choice of processing equipment and packaging materials, and stiff competition from imported food products (ibid). Mmasa (2013) reported similar findings and attributed poor innovation performance in the industry to lack of experienced and skilled human resources.

Another survey conducted by Mpangile et al. (2008) in dairy, oilseeds and cassava sub-sectors reported lack of resources and institutional support for research and development (R&D)as the main innovation constraints facing food manufacturers. They further argued that low levels of

R&D were attributed to lack of funding, knowledge and facilities to conduct research, and non-collaboration in financing development and testing of new products, processes or technologies (ibid). Sutton and Olomi (2012)'s survey of Tanzania's industrial sector revealed several challenges facing enterprises in the industry including expensive packaging materials, difficulties in accessing inputs from rural areas as some roads were impassable during rain seasons, shortcomings in power supplies, limited distribution networks especially for young and new firms and lack of government assistance in achieving required standards for food exports.

Several lines of evidence suggest that the Tanzanian food and beverage industry is characterised by a higher degree of informality and counterfeiting which create unfair competition(CTI, 2008; 2017; Nandonde, 2018). Several factors such as economic status of consumers and weakness of regulation have been identified as the main drivers for the thriving counterfeits and informality in the country. Recent evidence suggests that purchasing decisions of food products for the majority of Tanzanians are influenced by income levels and prices of substitutes (Ochieng et al., 2018). Thus, it is difficult for innovative products to be successful in the market when customers are keen on low priced products.

The counterfeits pose a big challenge in Tanzania and are continuing to frustrate food and beverage manufacturers' efforts of engaging in innovations(Nandonde, 2018). According to CTI[6] (2017), from 2010 to 2016, the Fair Competition Commission seized countrfeifet goods worth TZS 2.9 trillion [£1,090,071,274][7]. A prior study conducted by CTI in 2008 estimated that the market value of counterfeited foodstuffs and beverages in the country to amounted to TZS 5.00 billion [£ 2,066,278][8]. The growth of counterfeit trade in the country is driven partly by economic background of consumers and partly by multiplicity of regulations and weakness of legislation. The counterfeits and goods sold by informal suppliers are often lower-priced than genuine and innovative products and are seen as alternative options for the majority of consumers with lower purchasing power or who prefer cheap products.

Similarly, Mmasa (2013) found that poor innovation performance of the industry was a result of weak linkages between the private sector and government, poor marketing strategies and limited exchange of information. Mpangile et al. (2008) observe that firms in the food and

[6] CTI = Confederation of Tanzania Industries
[7] Bank of Tanzania Exchange rate as at 30th December 2016 [£1 = TZS 2,660.38]
[8] Bank of Tanzania Exchange rate as at 1st April 2008 [£1 = TZS 2,419.81]

beverage industry do not see any incentives for collaborations with the public sector. The absence of linkage between firms and government agencies and universities often stagnate firms' efforts to improve their productivity growth through innovation because they are likely to miss out on leveraging important sources of funding and knowledge from those organizations.

Multiplicity of regulations, uncertainty and associated costs of compliance seem to exert significant negative impact on innovation and competitiveness of the Tanzanian food and beverage industry (Mpangile et al., 2008; Charles & Mambi, 2013; Charles & Rweikiza, 2015; Voeten et al., 2016). The industry is one of the most highly regulated industries in the country with 22 laws and 15 regulators overseeing the industry (Charles & Mambi, 2013). Charles and Rweikiza (2015)'s survey to assess the impact of regulations on Tanzania's food manufacturers' competitiveness indicated that food and beverage manufacturers are overburdened by multiplicity of regulations, which leads to high costs of compliance, multiple testing of products and increased product prices.

Charles and Mambi (2013) claim that 40% of total tax contributed by the sector is related to compliance with regulations and the ratio of compliance cost to total cost for the industry is 17%. Recent study by Voeten et al. (2016) in the manufacturing industry found multiplicity of taxes as one of the constraints hampering food manufacturers' innovation efforts. Mpangile et al. (2008) found existence of bureaucracy in relation to compliance with food safety and quality regulations while multiplicity and uncertainty of regulations were critical regulatory impingements in the industry. Annual fees for product certification prevents some entrepreneurs from commercializing new products because they cannot afford it (Nandonde, 2018).

The Tanzanian food and beverage industry represents innovation environment that would be interpreted as hostile settings for innovation activities to take place. The incumbent firms find it difficult to engage in innovation activities due to insurmountable innovation constraints. Constraints to innovation may block potential innovative firms from getting their innovation efforts off the ground; prevent them from engaging in innovation activities in the first place or from effectively utilizing their innovation outputs in unfamiliar markets (D'Este et al., 2014b; Coad et al., 2016b). However, despite facing several challenges still some firms in the industry can innovate and bring to the market innovative products and services, and even penetrate new niche markets by utilizing varied sources of ideas and information. (Mpangile et al., 2008). These firms appear to have strategies to overcome a variety of constraints to create innovation. The critical question is how these firms overcome the constraints to innovation.

2.7 Bricolage as a strategy to overcome innovation constraints

Recent evidence suggests that entrepreneurial bricolage is in the discourse of commercial and social entrepreneurship, where it is explored as firm's capability to use and creatively recombine whatever resources available to find workable solutions to a variety of problems and opportunities (Baker et al., 2003; Senyard et al., 2009; De Klerk, 2015; Davidsson et al., 2017). In commercial entrepreneurship for example, entrepreneurial bricolage is a source of development in organizations (Fuglsang & Sørensen, 2011) and pathway to innovation in both resource-constrained manufacturing and service organizations such as new, young and small and medium enterprises and those firms operating in resource-poor and uncertain business environment (Ferneley & Bell, 2006; Gundry et al., 2011). The findings from these works demonstrate positive association between bricolage and innovation(Salunke et al., 2013; Bojica et al., 2014; Senyard et al., 2014a). Social entrepreneurship research also provided similar evidence of findings (Gundry et al., 2011; Sunley & Pinch, 2012; Kannampuzha & Suoranta, 2016).

Empirical evidence suggests that firms with higher levels of bricolage are more innovative than firms with less engagement in bricolage (Bojica et al., 2014; Senyard et al., 2014a). More insights into how firms use entrepreneurial bricolage is articulated by Baker and Nelson (2005) who argue that firms can create something from nothing if they refuse to regard resources at hand as nothing. This focus provides incentive for them to exercise creative combinatorial capabilities and tolerance for challenges (Baker et al., 2003; Baker & Nelson, 2005; Witell et al., 2017). Salunke et al. (2013) argue that the behaviour of refusing to be constrained by limitations drive entrepreneurs to engage in efficient combination of resources at hand. For innovation to occur in resource-constrained environment, firms must embrace bricolage to address difficulties related to resource scarcity by utilizing currently available resources through recombination in order to pursue successful innovation. It is suggested that innovative firms operating in resource-constrained and uncertain environments rely on both internal and external bricolage to find workable solutions to resource constraints (i.e. material, labour, skills) and non-resource constraints (i.e. market and regulatory constraints) (Baker & Nelson, 2005; Yang, 2018b).

2.8 Employment of entrepreneurial bricolage to overcome shortage of raw materials and lack of financial resources

Previous studies indicate that entrepreneurial bricolage is employed to address shortages of standard physical input or standard materials where cheaply available or scavenged resources discarded by others are used (Baker & Nelson, 2005; Smith & Blundel, 2014b). Thus, bricolage

opens up the eyes of entrepreneurs to see new use value or enact the potentiality contained in the materials that have been rejected or discarded by others (Cunha et al., 2014; Yang, 2018b). For example, the study of Linna (2013) in Kenya found that the innovator-entrepreneurs dealt with lack of raw materials by using cheap and locally available materials: the wind-turbine innovator used old car engines as power generators, fiber glass and wind power while the biogas innovator used tent materials to build the digester and bio waste as source of energy. Many of the physical inputs used by bricoleurs are seen by others as worthless.

Baker and Nelson (2005) examined 29 cases of entrepreneurial firms that were operating in resource-poor environment to see how they were able to provide services. In one case study they found that the company used abandoned coal mines, which were considered dangerous nuisance (i.e. contained toxic methane and caused mammoth sinkholes in fields) to generate electricity which was then sold to the local utility. When the shortage of materials is serious bricoleurs tend to modify or re-use the existing products to suit the customer needs. For example, Smith and Blundel (2014)'s study in the UK music industry during the economic crisis of 1930s found that the sausaphones were built by modifying secondhand helicons.

Long-term network ties with resource providers (i.e. suppliers and local community) are other ways that bricoleurs use to overcome shortages of physical input (Larsen & Lewis, 2007b; De Massis et al., 2018). According to Baker and Nelson (2005), multiplex of ties assists in identification of opportunities and acquisition of physical inputs. Scavenged resources obtained from network members can be utilized to produce goods and services using self-taught skills (Linna, 2013). Innovators with limited financial resources use scarps because new and quality materials are beyond of their reach (Garud & Karnøe, 2003; Cunha et al., 2014). Existing contacts such as business associations or other contact networks can help financially constrained firms access credit finance. The study of Mpangile et al. (2008) in the value chains of cassava, dairy and sunflower sub-sectors reported the use of group lending and joint lobbying as the strategies towards softening conditions and terms regarding collateral for bank loans.

Last, bricoleurs address the shortage of materials through product simplification by reducing the quantity of and changing the type and quality of raw materials used in the manufacture of a product or removal of unnecessary and less important parts of the manufacturing process (Larsen & Lewis, 2007b; Rosenzweig & Grinstein, 2016). Product simplification helps innovative firms overcome lack of finance and lack of demand as it significantly reduces product costs, thus

increasing product affordability for people who would be unable to pay the premium for innovative products.

2.8.1 Employment of bricolage to overcome lack of skilled labour

To address lack of skills and labour challenges, bricoleurs apply their self-taught skills to tasks that would have required an additional employee, participation in solving multiple challenges or use of multiple ties (Linna, 2013; Yang, 2018b). Evidence suggests that lack of formal education by employees is addressed through self-learning, apprenticeship or participation in solving multiple challenges (Baker & Nelson, 2005; Linna, 2013). They use free and easily available sources of information such as the internet and industry magazine to upgrade their knowledge and find solutions to the problems they face. For example, Linna (2013) reported that innovator-entrepreneurs used the internet to conduct research to find out how other people were solving problems similar to theirs. Knowledge gaps can also be addressed through trials and learning by doing where competitors' products are continuously dismantled and assembled (Si et al., 2018). Baker and Nelson (2005) argue that dealing with multiple challenges provides avenue for acquisition and improvement of a wide range of self-taught skills, which in turn enable bricoleurs to broaden their scope of problems and challenges to be dealt with.

Network relationships with local community, customers and friends provide skills, expertise and labour to innovation projects, markets for new products and help to identify neglected opportunities (Murphy, 2002; Larsen & Lewis, 2007b; Linna, 2013; De Massis et al., 2018). For example, linkages with industrial business associations are also very useful in addressing lack of skills and regulatory constraints (Larsen & Lewis, 2007b; Charles & Mambi, 2013). The business associations help innovators share experiences with peers of the constraints they encountered and how they dealt with them (Larsen & Lewis, 2006). Diverse connections facilitate learning and acquisition of knowledge (Salunke et al., 2013). Entrepreneurial bricolage also occurs when people with different skills and knowledge take up an assignment which requires specific skills that the firm lacks. Larsen and Lewis (2007) reported that shortage of technical skills in one study case was overcome when the manufacturer working on a different project agreed to take up tasks related to the research and development.

2.8.2 Employment of bricolage to overcome market constraints

Market constraints may spark a series of bricolaging behaviours aimed at curbing the negative consequences associated with the constraints. Entrepreneurs utilize existing personal contacts as resources at hand (Kannampuzha et al. 2016), make their products simpler to the extent that there is no incentive for others to copy them (Larson and Lewis, 2007) or stimulate demand for

their products through creation of unique markets by producing products that were previously unavailable and by engaging local community in the innovation process (Baker and Nelson 2005; Linna 2013). Community members become potential customers for the new products introduced by local entrepreneurs (Baker and Nelson 2005; De Massis et al. 2018). The customers' word-of mouth can be used for product promotion and spreading the innovator's message as this method is cheap and affordable to firms facing financial resource shortage

2.8.3 Employment of bricolage to overcome regulatory constraints

Regulations may induce entrepreneurs to engage in bricolaging behaviours that seem to be at odd with the law requirements. The refusal to accept limitations imposed by regulations involves continuous exploration of the regulations and the extent to which they represent a real constraint for them. Through repeated deviations and testing the limits of regulations, bricoluers develop deep knowledge of how they can get away from what they consider a regulatory constraint (Baker & Nelson, 2005). The business environments with uncertain, unexpected and abrupt changes in regulations that give no room for adjustment force innovators to abandon deliberate actions requiring planning, instead they improvise.

2.9 Mitigation strategies for innovation constraints

There is a growing literature that focuses on mitigation strategies employed by entrepreneurial firms to overcome innovation constraints (Griffin et al., 2014; Senyard et al., 2014; D'Este et al., 2014). The emergence of this strand of literature is a response to the failure of previous research on innovation constraints to examine how innovative firms address innovation challenges. D'Este et al. (2014) expressed their disappointment at the little attention given to the factors reducing the negative impact of innovation constraints. Review of literature identified two main categories of mitigation strategies: bricolage and conventional approach that involves addition of new resources. Most studies on mitigation strategies in each category are qualitative in nature.

The quantitative research examines the roles of some factors in reducing the negative effects of various constraints while qualitative research identifies the actual constraints and strategies to overcome them. For example, the role of human capital and recruitment of talents from rival companies in lowering the negative effects of constraints on engaging in innovation have been explored quantitatively. The study of D'Este et al. (2014) in Spain found that human capital (employing university graduates) reduced knowledge and market obstacles that prevented firms from engaging in innovation activities. Rao and Drazin (2002)'s study in USA reported that

recruitment of managers from rival companies could help young and poorly connected firms to cope with lack of routines and skills that are necessary resources for undertaking product innovations. Although these studies suggest the importance of acquisition of human resources in small and young firms to cope with various innovation constraints, the main problem with this strategy is that recruiting university graduates and managers from rival companies requires reputation and availability of funds/financial resources, which seems to be a critical problem facing young and small firms.

Marvel and Patel (2018) examined the role of self-leadership in overcoming the time resource constraint in speeding up innovation and commercialization in new ventures which in most cases lack established organizational structure with subordinates. The findings revealed that high levels of self-leadership sped up product development and subsequent launch in the market, but its effectiveness decreased with product radicalness, meaning that self-leadership was more effective in incremental innovation than in radical innovation. However, the key question not answered by this study is how to increase levels of self-leadership to speed up innovation within firms experiencing slow low-speed of commercialization of innovations.

2.9.1 Strategies to overcome financial constraints

Review of literature identified several strategies to overcome financial constraints. Insufficient internal funds is often addressed through bonds and loans from state funded and commercial banks, venture capital, business angels and tax reduction (Larsen & Lewis, 2006; 2007b; De Massis et al., 2018). Bonds, venture capital, business angels are common methods in market-based economies while bank loans are often used in cash-based economies. The use of grants from the government agency and credit guarantee schemes emerged as coping strategies for lack of bank loans (Larsen & Lewis, 2007b; Hansen et al., 2012). However, employment of bricolage in dealing with financial constraints involves product simplification and modification, use of cheaply available resources, building long-term and close ties with suppliers of financial resources, borrowings from friends and family members, joining associations/networks, and adopting customer and niche market focus(Larsen & Lewis, 2007b; Mpangile et al., 2008; Linna, 2013; Smith & Blundel, 2014b; De Massis et al., 2018).

2.9.2 Strategies to overcome knowledge constraints

The review of literature identified two main knowledge constraints that innovative firms coped with: skills gap and staff turnover. Lack of skilled labour may be caused by location, staff turnover or lack of financial resources. Businesses located in rural or peripheral areas find it difficult to

recruit skilled and experienced employees from those areas due to limited skill base available. Dealing with these kinds of challenges, innovative firms adopt strategies that attract people to work with them and remain committed to the company for longer periods (De Massis et al., 2018). The common strategy found in the literature is establishment of superior employee relationship. The relationship is demonstrated in various ways such as provision of trainings and development, well and fair treatment of employees, high involvement of employees in decision-making, flat hierarchy, respect for long-serving employees and efforts to keep them even if the firm faces hard times (Larsen & Lewis, 2007b; De Massis et al., 2018). The same strategy is also used to deal with staff/employee turnover and it helps to prevent loss of valuable expertise and ensures long-term stability and continuity of the business.

Other mitigation strategies proposed to overcome skills gap included recruiting people with proper skills or appropriate complementary skills who can work together as a team (Larsen & Lewis, 2007b; Si et al., 2018), purchase of other companies with well-developed technical capabilities (Macher, 2004) and acquisition of necessary skills through dismantling, resembling and destructive tests of advanced products acquired from international markets and facilitation of short and long trainings within and outside the organization (Baregheh et al., 2012b; Si et al., 2018).

Regarding skills and labour challenges, the employment of entrepreneurial bricolage is demonstrated in several different forms. Evidence suggests that lack of formal education is addressed through self-learning or apprenticeship and participation in solving multiple challenges (Baker & Nelson, 2005; Linna, 2013; Voeten et al., 2016). For example, Linna (2013) reported that innovator-entrepreneurs used the internet to conduct research to find out how other people were solving problems similar to theirs. Knowledge gaps can also be addressed through trials and learning by doing where competitors' products are continuously dismantled and assembled(Si et al., 2018). Baker and Nelson (2005) argue that dealing with multiple challenges provides avenue for acquisition and improvement of a wide range of self-taught skills, which in turn enable bricoleurs to broaden their scope of problems and challenges to be dealt with.

On the other hand, lack of skills could be addressed through network relationships (i.e. network bricolage) with customers and suppliers, knowledge institutions, local community and industrial business associations. Frequent direct interactions with network partners help innovative firms gain technological and non-technological knowledge, and skills (Larsen & Lewis, 2007b; Mpangile et al., 2008; Si et al., 2018). These constant interactions with customers facilitate

learning in matters related to product design, market trends and technical evaluations of the products (Si et al., 2018). The partnerships with knowledge institutions facilitate innovation through R&D collaborations and provision of training to workers (Mpangile et al., 2008; De Massis et al., 2018).

However, there is a well-established belief that conducting R&D in partnership with knowledge institutions such universities and research institutes is problematic because the universities are poor at protecting ideas early on, inefficient in completing the projects on time and tend to publish the results without protecting them first which leads to loss of discoveries (Larsen & Lewis, 2007b). Lastly, industrial business associations provide platforms for innovators to share their experiences with peers of the constraints they encountered and how they dealt with them (Larsen & Lewis, 2006).

2.9.3 Strategies to overcome market constraints

A review of literature identified several strategies employed by innovative firms to overcome product copying, lack of demand for innovative products, consumer resistance and lack of funds for product promotion and advertising.

2.9.3.1 Copyright infringement issues

The strategies for overcoming product coping and imitation vary from making innovative products simpler to patenting the product. The study of Larson and Lewis (2007) in the UK found that while some innovative firms overcame the problem of copying by making their products simpler to the extent that it was not worth of being copied by others, patenting the idea (innovation) locally and internationally others tended to ignore it. In international markets the idea (or innovation) can be protected by either setting up foreign subsidiaries or applying for patents in each country. However, further patents and subsidiaries in foreign countries require extra financial resources, which could be difficult for companies with limited resources. On the other hand innovators protect their product by building close and long-term relationships with existing customers who are considered protective of the resources and core competences underlying innovation (De Massis et al., 2018).

2.9.3.2 Sluggish demand

Innovative firms stimulate sluggish demand for their innovations through creation of their own unique markets which means producing products or services that were previously unavailable or creating markets that did not exist before. This could be achieved by producing products in the shadow and lacunae of institutionalized practice for people who have been side-lined by

conventional markets because of their resources and choices (Baker & Nelson, 2005). For example, Linna (2013) found that innovator-entrepreneurs in Kenya were developing renewable energy solutions (biogas and wind turbine) for poor people. In this way they were creating their own markets with unique products. The other strategy to stimulate demand is to engage local community in the innovation process as members of the community are likely to be potential customers for the new products (Baker & Nelson, 2005; De Massis et al., 2018).

2.9.3.3 Inability to run promotional campaigns

Inability of innovative firms to run advertising and promotion campaigns for their new products using conventional methods is primarily due to lack of financial resources or lack of professional marketing teams. However, the strategies to overcome this constraint are contingent upon the causes. For example, if the cause is lack of financial resources, it would be advisable to adopt strategies that need little or no resources to implement. These strategies include: the use of internet (Larsen & Lewis, 2007b), customer word-of mouth who can spread the innovator's message (Larsen & Lewis, 2007b; Linna, 2013). The main advantage of using the internet feedback that can be obtained directly from customers on various issues such as product design and quality (Larsen & Lewis, 2006). However, the use of internet for advertising and promotion is feared due to high incidences of having the idea being copied by others. On the other hand, if the cause is lack of marketing skills or proper promotional media, the best way to address the constraint is to employ a professional marketing personnel (Larsen & Lewis, 2007b). These are professional people and use their skills to investigate the markets, search for leading products and analyse the market trends (Si et al., 2018).

2.9.3.4 Consumer resistance

Review of literature highlights several strategies to overcome customer resistance to innovation: enhancement of adoption triggers, use of marketing instruments and serial innovators. Consumers resistance varies with the degree of product/innovation novelty which suggests that the chances of rejection are higher for radical innovation than incremental innovations. Knowing how to use (usage constraint) or the functions (functional constraint) and benefits of a radical innovation is much more difficult than of incremental innovations (Griffin et al., 2014). Fear builds up in customers if they do not have enough information about the product/service, especially its usage, benefits or price.

Adoption triggers are enhanced through acquisition of knowledge that enhances understanding of the innovation (Reinhardt et al., 2019). Customers acquire the knowledge by buying and using the new product out of curiosity, and this may lead to full usage of the product and reduction of

subsequent resistance. Similarly, customers can garner information about the product through product trials or from free available sources such as the internet or can be referred to by others or the innovators themselves through targeted marketing campaigns (Huang et al., 2003; Reinhardt et al., 2019). The promotion campaigns equip customers with necessary knowledge for understanding the benefits of and how to use the products, thus transforming opposing forces into promoting ones.

Another way of enhancing adoption triggers is to increase innovation attraction which involves enhancing performance and reducing the price of innovation (Reinhardt et al., 201). Changes in performance that would trigger innovation acceptance are those that raise the perceived utility of customers. These changes are related to enhancement of performance of the core of innovation, additional features of the product or may provide a variety of choices. Reduction of prices and provision of monetary incentives such as special offers, reduced monthly fees and lower initial costs especially when economic risks and other lower-level risks are present may increase customers' perception of the prices (Reinhardt et al., 2019).

Serial innovators are individuals in the organization who personally take steps to create market acceptance by becoming endorsers. They work directly with potential customers, educate them on the product, (create and teach classes) and even sell directly to them. This practice helps to create market acceptance, provide additional information on the potential problems of the innovation (still unsolved for customers), and find other potential opportunities (Griffin et al., 2014).

Marketing instruments are strategies used to overcome both situational and cognitive forms of passive innovation resistance. These instruments are mental simulation and benefit comparison. Situational passive resistance can be overcome by both mental simulation and benefit comparison (i.e. comparison of new and existing products) whereas mental simulation is an effective countermeasure of cognitive passive resistance(Heidenreich & Kraemer, 2016). Mental simulation enhances customers' knowledge about the usage and benefits of the product, thus reducing functional risks and usage-related constraints.

2.9.4 Strategies to overcome regulatory constraints

Entrepreneurial firms deal with regulatory constraints by taking relentless efforts to comply with the rules and regulations by acquiring additional resources needed for innovation(Nijhoff-Savvaki et al., 2012; Charles & Mambi, 2013). Strategies employed to comply with regulatory requirements include: employing a person responsible for compliance issues, engaging a

consultant who can help an enterprise comply with regulatory requirements, negotiations with regulators to get temporary licenses while addressing weakness identified, strengthening quality control departments (Charles & Mambi, 2013). However, these strategies cannot work for small firms due to limited financial and human resources. On the other hand, bricoleurs address regulatory constraints through abrogation of existing practices and protocol in order to offer unique products or services previously unavailable, using nonstandard procedures or tools produced from neglected material (Baker & Nelson, 2005; Fuglsang & Sørensen, 2011).

2.9.5 Strategies to overcome organizational constraints

The common organizational constraints to new product development (NPD) are inter-functional tensions and organizational politics (i.e. resistance to changes). In the new product development process collective actions, ideas and efforts derived from different departments or organizational functions are crucial for the success of the activity. The NPD involves interactions between designers and marketers, but tensions between the two groups are inevitable, as they differ in (differences in thought worlds) their understanding of the activity, thus putting the success of NPD into jeopardy (Huber & Lewis, 2010; Beverland et al., 2016). The literature suggests that the tensions can be resolved through sensemaking that requires people to recognize alternative views and become aware of (reflexive thinking) of the fact that one's view may represent a constraint to others (Maltz & Kohli, 2000).

Beverland et al. (2016)'s study in Australia and New Zealand identified strategies that new product designers and marketers employed to overcome their differences within NPD process. The results showed three practices of sensemaking that had contributed to the improved inter-departmental collaborations for NDP. These included co-opting (i.e. each function to rework on their data ensuring that they reflect their counterparts' assumptions about time and truth), exposing (i.e. communications and interactions that assist in revealing the interpretive schemes of one group to the other) and repurposing (i.e. the ability of the receiver to discover the validity of another's insights through their preferred practices). Whereas the exposition enables functional actors to appreciate the importance of each other's approach, co-optation enhances the credibility of each group's input.

Radical innovation projects obtain input from different functional groups in the organizations, but more often they meet resistance from employees within the organization due to uncertainty surrounding their successes in the market once they are commercialized. Moreover, radical innovations tend to disrupt organization's well-established ways of doing things and skills. Resistance consequently leads to Organizational politics. The literature recognizes senior

executives and serial innovators as the most important figures in organizations to overcome organizational resistance or employees' resistance).

Senior executives are viewed as visionary and credible (alternatively known as godfathers) with the power to ensure that the innovation team gets protection and access to resources (Smith, 2007). Similarly, organizations with serial innovators face less degree of resistance to radical innovations (Griffin et al., 2014). The serial innovators, despite having experience and knowledge, spend extensive time in the fuzzy front end trying to obtain information and data that can reduce the levels of uncertainty about the market, technical and competitive risks to acceptable levels within the firm. They are personally involved in ensuring acceptance of innovation projects into the firm's formal product development pipeline. They use different influencing techniques such as showing the value of project to the company by using data and creating small demonstrations to influence acceptance (Griffin et al., 2014).

2.10 Hypotheses development

Existing literature on innovation constraints is extensive and focuses particularly on (1) the importance of various factors in constraining innovation (Shiang & Nagaraj, 2011; Nikolic et al., 2015) and (2) examining the impact of various constraints on innovation (Crisostomo et al., 2011; Amara et al., 2016a; Efthyvoulou & Vahter, 2016a) or on firm performance (Coad et al., 2016b). The two strands of literature identify knowledge, financial, market and regulatory constraints as the most critical factors constraining innovation and firm performance in both developing and developed countries, and SMEs and large firms.

2.10.1 Entrepreneurial bricolage and innovation

The line of research on bricolage that utilizes quantitative techniques reports findings that suggest a positive association between entrepreneurial bricolage and firm innovativeness on the one hand and decreasing or stagnant firm performance when it is over-relied on the other hand. For example, Senyard et al. (2014)'s study in Australia indicated that nascent and young firms with high levels of engagement in bricolage were more innovative than firms do with less engagement in bricolage. These new and small, were considered resource-constrained and unable to invest in lengthy and expensive development processes.

Similarly, Salunke et al. (2013) found that service innovations introduced by project-oriented service firms were a result of employing bricolage when addressing innovation constraints. Further, the study of Bojica et al. (2014) in Palestine found a positive impact of bricolage on firm

performance but the impact was enhanced by market innovations while product innovations reduced the impact of bricolage. They argued that women entrepreneurs in Palestine faced difficulties in mobilizing resources because they were immersed in political, social and economic conditions, and the only way to sustain growth of their businesses was to engage in bricolage. One key feature of this strand of studies is that the business environments in which studied enterprises operate are favourable for innovation activities to take place and the sources of barriers are mainly internal. In contrast, innovative firms in developing countries operate in settings where both internal and external sources generate larger amounts of barriers. The adequate way for firms to introduce innovations in this context is to embrace bricolage. Therefore, we hypothesize that:

H1: *Entrepreneurial bricolage has a positive effect on innovation*.

2.10.2 Financial constraints

Financial constraints represent financial difficulties facing potential innovative firms and result in underinvestment in innovation projects (Crisostomo et al., 2011; Silva & Carreira, 2012). These difficulties are related to lack of external sources of finance, high costs of financing innovation activity, weak financial position and high financial risks (Galia & Legros, 2004; Madrid-Guijarro et al., 2009a; Paananen, 2012b; Amara et al., 2016b). Financial resources are needed to fund innovation ideas, R&D activity, market launch of innovative products and to use as working capital(Larsen & Lewis, 2007a; Hottenrott & Peters, 2012; Woschke et al., 2017) and can be obtained from either internal source, external sources or both (Efthyvoulou & Vahter, 2016a; Mateut, 2018). External financing may not be easily available when is needed for financing innovation because of a higher degree of information asymmetry as innovation projects are associated with complexity and specificity (Efthyvoulou & Vahter, 2016a). The situation of information asymmetry between managers and lenders is worse in developing countries because the majority of firms are smaller in size and institutions' ability to collect and evaluate information is limited (Amara et al., 2016b). As a result, external financing becomes more expensive and unaffordable for innovation activity than other types of investments. Consequently, firms need to rely heavily on internal funds, but in most cases, it is not adequate.

Financial constraints reduce firm's ability to finance innovation activities and prior studies conclusively indicated that these constraints negatively affected innovation(Crisostomo et al., 2011; Amara et al., 2016a; Efthyvoulou & Vahter, 2016a; Duarte et al., 2017) and firm performance(Coad et al., 2016b) of manufacturing firms and the impact is more pronounced in small firms than in large firms (Madrid-Guijarro et al., 2009a). A financially constrained firm is the one which is unable to carry out its innovation activities/ innovation projects at optimal scale

due to shortage of funding (Czarnitzki & Hottenrott, 2011; Efthyvoulou & Vahter, 2016a). As financing of product, process and market innovations relies more heavily on internal funds than external finance, perception of high financial constraints will lead to substantial drop in innovation (Efthyvoulou & Vahter, 2016a). External finance is not a preferred option to finance innovation due to strict specific conditions, high costs and risks associated with it (Larsen & Lewis, 2007a; Efthyvoulou & Vahter, 2016a). Sometimes, firm managemet and owners are afraid of losing control of their company if they opt for venture capital, for example (Larsen & Lewis, 2007a; De Massis et al., 2018). It is hypothesized that:

H2(a): *Financial constraints are negatively related to innovation*

However, negative effects of financial constraints on innovation can be reduced by entrepreneurial bricolage. The logical thinking is that when firms face financial constraints they make wise decisions in spending the little resources available, focusing more on entrepreneurial innovation strategies. Management as well as innovation team take charge in seeking novel recombination of existing resources or acquisition of cheap external resources from network partners. For example, market focus or customer focus which calls for limited investment requirements while developing superlative expertise and remarkable efficiencies(De Massis et al., 2018), gives resource-constrained firms an opportunity to get rid of complicated processes and product lines, and additional financing needs, thus resulting in highly effective and efficient utilization of available resources.

The employment of bricolage in dealing with financial constraints involves use of cheaply available resources, building long-term and close ties with suppliers of financial resources, borrowings from friends and family members, use of existing associations/networks, and adopting customer and niche market focus(Larsen & Lewis, 2007b; Mpangile et al., 2008; Linna, 2013; Smith & Blundel, 2014b; De Massis et al., 2018). Other forms of bricolage include creating relationships with customers as this relationship would reduce costs by working out problems with customers, use of personal finance, allowing employees to carry out different income generating activities, cutting down costs through product simplification which involves reducing the number of components and changing materials used in product manufacture (cost reduction through designing process) and use of resources neglected by other firms (Baker & Nelson, 2005; Gibbert et al., 2007b; Larsen & Lewis, 2007a; Bhatt & Altinay, 2013). Based on the findings of previous studies, it is hypothesized that:

H2(b): *The negative relationship between financial constraints and innovation is positively moderated by entrepreneurial bricolage.*

2.10.3 Knowledge constraints

Knowledge constraints are among the factors most cited in the literature as inhibitors of innovation. Knowledge constraints are factors that are related to lack of qualified personnel, information on markets and technology, but constrain innovation and business performance (Gibbert et al., 2007b; Paananen, 2012a; Coad et al., 2016b; Botrić & Božić, 2018). Although, innovation in manufacturing firms rely more intensively on internally generated knowledge from R&D, managerial practices and close collaborations between leaders and employees, complementary knowledge from networks with customers, suppliers and knowledge institutions is also important for fostering innovation in continuous changing environment(Varis & Littunen, 2010; Baregheh et al., 2012b; Taneja et al., 2016).

Knowledge resources such as technological experts, marketing experts or visionary leaders are important for combining and transforming other resources into new products, services and processes for the benefits of the firm (Huang et al., 2003; Taneja et al., 2016). What determines innovation is the firm's capability to combine various types of knowledge in new and unique ways(Amara et al., 2016). However, constraints such as lack of qualified personnel, lack of information on markets and technology impede firm's capability to combine different types of knowledge into new and distinct forms of knowledge. It is therefore hypothesized that:

H3(a): *Knowledge constraints are negatively related to innovation*

Despite existence of knowledge constraints, some innovative firms successfully introduce product, process and market innovations by making do with resources available at hand (Senyard et al., 2014b). Research evidence suggests that resource constraints stimulate entrepreneurial strategies that focus on search for solutions through a process called entrepreneurial bricolage. Examples of strategies employed by entrepreneurial bricoleurs to overcome knowledge constraints are: use of already existing network contacts of customers, suppliers and other partners (network bricolage) to work on innovation projects(Baker & Nelson, 2005; Kannampuzha et al., 2016; Si et al., 2018), allowing employees to implement practical ideas on spot whenever they encouter problems and share their solutions and experiences with others through informal meetings(Fuglsang & Sørensen, 2011), allowing employees exercise their multi-skills to accomplish new and different tasks that would have required additional human resources (Fuglsang & Sørensen, 2011). The network relationships with local community,

customers and friends are good providers of skills, expertise and labour to innovation projects (Murphy, 2002; Larsen & Lewis, 2007b; Linna, 2013; De Massis et al., 2018). Broad skills can also be acquired from self-learning or apprenticeship and participation in solving multiple challenges(Baker & Nelson, 2005; Linna, 2013). Therefore, hypothesis H3 is developed as follows:

H3(b): *The negative relationship between knowledgel constraints and innovation is positively moderated by entrepreneurial bricolage*.

2.10.4 Market constraints

Market conditions may influence firms' innovation activities in a negative way. Factors such as consumer resistance, lack of demand for innovative products, product imitations/copying, counterfeits, intensity of competition which is related to factors such as constant entrants of new products, ease of switching by customers to products of competitors, informal competitors etc. are market conditons widely studied in relation to innovation and have been found to significantly hamper firms' innovation activities (Chang et al., 2011; Amara et al., 2016b; Esbjerg et al., 2016a). The business environment with a higher degree of volatility and competition tend to slow down firms' innovative efforts due to high costs, risks and uncertainty of having successful innovations (Chang et al., 2011). Marketing skills is critical in market analysis to understand customers' needs, competition, demand trends and distribution channels(Larsen & Lewis, 2007a).

The demand for innovative products is sluggish in markets with higher degrees of informality, consumer resistance, counterfeiting and copying. In these markets the products supplied by counterfeit traders and informal producers are often lower-priced than genuine and innovative products and are seen as alternative options for the majority of consumers with lower purchasing power or who prefer cheap products(CTI, 2017). On the other hand, consumers' level of knowledge is too low to be able to identify fake products(CTI, 2008; 2017). Furthermore, resistance happens when customers have the fear that the price of a new product is too high for them to afford. Fear builds up in customers if they do not have enough information about the product/service, especially its usage and benefits. Consumers resistance also varies with the degree of novelty of the product/innovation, which suggests that rejection is more likely for radical innovations than incremental innovation(Esbjerg et al., 2016a; Heidenreich & Kraemer, 2016) but in the food manufacturing industry consumer resistance is primarily because of issues of safety and health related to new food products. Therefore, hypothesis H4 is developed that states that:

H4(a): *Market constraints are negatively related to innovation*

However, innovative firms can successfully address market constraints through network bricolage. Network bricolage is a "constraint-shattering" approach that utilizes existing personal contacts as resources at hand (Kannampuzha et al., 2016). Customers are important existing contacts which are normally used as sources of information about competitors' strategies and new markets or as distribution channels. Regarding copying and imitation bricoleurs address the problem by making their products simpler to the extent that it is not worth of being copied by others (Larson and Lewis, 2007). Furthermore, bricoleurs overcome lack of demand for innovative products by stimulating demand through creation of unique markets by producing products or services that were previously unavailable or creating markets that did not exist before (Baker & Nelson, 2005; Linna, 2013).

Bricoleurs prefer to engage local community in the innovation process because members of the community become customers of the newly introduced products (Baker & Nelson, 2005; De Massis et al., 2018). The use of internet and customers' word-of mouth for product promotion, advertising and spreading the innovator's message are forms of bricolage (Larsen & Lewis, 2007b; Linna, 2013) as they are cheap and affordable for many firms facing shortage of financial resources. Therefore, hypothesis H4 is developed to test the influence of market constraints on innovation as well as moderating effects of bricolage on market constraints:

H4(b): *The negative relationship between knowledgel constraints and innovation is positively moderated by entrepreneurial bricolage.*

2.10.5 Regulatory constraints

Research on innovation constraints highlights the importance of regulatory constraints in impeding innovation and firm performance in different settings. Prior research from developed countries tend to exclude regulations in the analysis on the ground that they are irrelevant factors in constraining innovation (Mohnen et al., 2008b), and when they are included they act as drivers to innovation or become insignificant constraints (Demirbas et al., 2011; Coad et al., 2016b). However, studies from developing countries find reverse results (Nyamwanza et al., 2016; Nieuwenhuizen, 2019). In these contexts regulations are very challenging (i.e. too complex and many) and impact heavily on innovation performance because they are likely to consume the little resources available for firms' innovation activities (Dietz et al., 2000; Charles & Mambi, 2013; Charles & Rweikiza, 2015).

Regulatory constraints include multiplicity, complexity and uncertainty of regulations, high costs of compliance, high tax rates, bureucracy and unnecessary delays in getting permits and licences(Nkya, 2003; Charles & Rweikiza, 2015; Nieuwenhuizen, 2019). Previous studies indicated that the Tanzanian food and beverage industry is the most regulated industry in the manufacturing sector with about 22 laws and regulations and more than 15 regulatory bodies whose roles and functions often overlap (Charles & Mambi, 2013).

The effects of over-regulation on both individual firms and the industry are immense and they include wastage of time, increase in operating costs and bureaucracy, and proliferation of informal operators and corruption. Over-regulation increases compliance costs which in turn reduce firms' financial capability and product competitiveness due to increasing product prices. According to Charles and Mambi (2013), the total compliance cost amounts to TZS 100 billion (equivalent to £35,460,992.9)[9] which is equivalent to 40% of the sector's total tax contribution and 17% of total operating costs. The average amount spent on staff dealing with regulations amounted to TZS 2.1 billion (£744,680.85) in 2010. On the other hand, the government loses an equivalent of 30% of tax (TZS 33 billion) (equivalent to £11,702,127.7) every year while the losses suffered by the industry include 5,000 direct jobs and 360,000 indirect jobs in the value chain every year (Charles & Mambi, 2013).

High tax rates and costs of compliance tend to cause substantial reduction of profitability and investment in future innovation acitvities (Nijhoff-Savvaki et al., 2012; Charles & Mambi, 2013; Voeten et al., 2016). In addition, multiplicity and complexity of regulations make entrepreneur spend more time on dealing with issues related to compliance and less time on making strategic plans for the business (Charles & Rweikiza, 2015). Thus, it is proposed that

H5(a): *Regulatory constraints are negatively related to innovation*

Bricoleurs deal with regulatory constraints by refusing to accept the limitations imposed by regulations and continuously exploring the regulations and the extent to which they represent a real constraint for them. Through repeated deviations and testing the limits of regulations, bricoluers develop deep knowledge of how they can get away from what they consider a regulatory constraint (Baker & Nelson, 2005; Fuglsang & Sørensen, 2011). The business environment with uncertain, unexpected and abrupt changes in regulations that give no room for adjustment forces them to abandon deliberate actions requiring planning, instead they exercise flexibility and urgency in actions. Therefore, it is proposed that:

[9] Bank of Tanzania exchange rates for 8th October 2019 [£ = TZ 2,820]

H5(b): *The negative relationship between regulatory constraints and innovation is positively moderated by entrepreneurial bricolage.*

2.10.6 Innovation and firm performance

Firms take relentless efforts to implement various innovations to enhance their market competitiveness and productivity growth (Ruiz-Jime´nez & Fuentes-Fuentes, 2013). Thus, firm innovation and performance are inseparable concepts, as the essence of innovation is to improve firm performance. Georgellis et al. (2000)'s study in the UK found that introduction of innovation is one of the key factors determining successful firm performance. The literature identifies four dimensions of firm performance which are labelled as innovative performance, financial performance, marketing performance and production performance (Gunday et al., 2011). Innovative performance is also conceptualized as innovation success with both financial and non-financial measures being adopted to measure it.

Of the four dimensions of firm performance, it is only innovative performance that seem to be directly influenced by innovation activity and empirical evidence suggests a positive relationship of innovation with performance (Klomp & Van Leeuwen, 2001; Gunday et al., 2011; Rajapathirana & Hui, 2018). However, the direction and significance of this innovation-performance relationship depends on the degree of novelty and types of innovation, and other antecedents of innovation. The literature suggests that introduction of radical innovations and different types of innovation has positive impact on innovative performance, which is sometimes referred to as innovation success (Domínguez-Escrig et al., 2018; Kimario, 2019). For example Domínguez-Escrig et al. (2018) found that radical innovations contributed to attainment of innovative performance while Murat Ar and Baki (2011) provided empirical evidence indicating that product and process innovations fostered firm performance when the performance was measured in terms of sales, profitability and market share. Karabulut (2015) found that product innovation, process innovation, market innovation, organizational innovation exerted positive effects on all measures of innovative performance, with exception to market innovation.

Innovation as a performance enhancing strategy is influenced by factors such as severity of constraints to innovation as well as mitigation strategies for innovation constraints. The severity of innovation constraints has a vital role to play in the success of introduced innovations. Shortage of financial and human resources constrain firm's efforts of product commercialisation. Although, severe innovation constraints might reduce the benefits that innovative firms would

attain from innovation output, innovations introduced by applying bricolage are likely to be successful because they are affordable to most end-users and are also made from cheap, locally available or discarded resources (Linna, 2013). Affordability and low cost of input are important drivers for market success of innovations. Thus, hypothesis H6 is developed to examine the relationship between innovation and firm performance

H6: *Innovation positively influences firm performance*

The analytical model 2.2 below has been developed to test the direct and indirect effects of financial, knowledge, market and regulatory constraints on innovation and firm performance respectively. Bricolage is used as a moderator of the relationship between constraints and innovation.

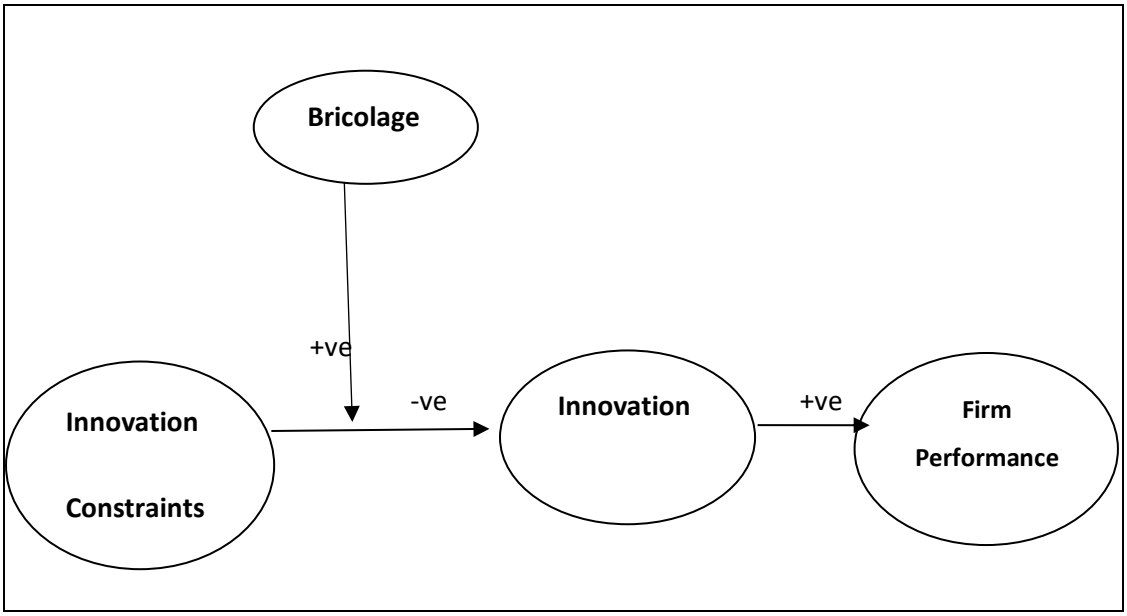


Figure 2. 2 Analytical structural equation model

2.11 Conclusion

The chapter presented a thorough review of literature on innovation in food and beverage industry, innovation constraints and mitigation strategies for innovation constraints. Food and beverage industry as a low-tech industry introduces more incremental innovations than radical ones and product innovations are primarily driven by process innovations. The perceptions of innovation constraints differ between innovating firms and non-innovators. As a firm engages more in innovation activities, its perceptions of the innovation constraints become higher than less innovative or non-innovative firms. The literature categorizes constraints to innovation into four main groups: financial, knowledge, market and regulatory constraints. The research on

entrepreneurial bricolage to date has tended to focus on the use of bricolage to deal with resource constraints with little to no attention being given to non-resource constraints. The findings from studies of bricolage provide a partial picture of the actual constraints facing innovative firms operating in resource constrained and uncertain environment and limited scope of the application of bricolage in addressing both resource and non-resource constraints. Evidence suggests that innovative firms face both resource and non-resource constraints in their innovation process.

The line of research that employed quantitative techniques reported positive relationship of bricolage and innovation. However, the mere association between bricolage and innovation revealed by these studies does not provide clear information on the actual constraints the firms face and how bricolage is employed to overcome them. When a positive relationship of bricolage with innovation is found it is assumed that bricolage is the sole means of addressing innovation constraints employed by firms operating in resource-constrained environment. This line of thinking shuts researchers off from consideration of supplementary and complementary mitigation strategies, which would be uncovered by undertaking further qualitative studies.

Chapter 3 METHODOLOGY

3.1 Introduction

This chapter discusses philosophical assumptions underlying this research, research designs and methods, sample size, sampling procedures and data analysis. The chapter begins with discussion of philosophical assumptions, distinguishing between post-postivism and constructivism. Reseach methods associated with each system of philosophy are explained, compared and constrasted.

3.2 Research philosophy

The current research examined three separate but inter-related research questions that sought to understand the impact of factors constraining innovation efforts, the role of entrepreneurial bricolage in reducing the impact of innocation constraints on innovation and how firms overcome the constraints. A single system of philosophy such as post-positivism or constructivism would have been inadequate in providing insights into the three layers of research questions. Thus, post-positivist and constructionist approaches appropriate for measuring and answering the three layers of questions.

The first and second layers were made up of research questions that required deduction of observable consequences by testing hypothesized relationships among variables. This part explored the impact of financial, knowledge, market and regulatory constraints on innovation and firm performance, and the role of bricolage in reducing the impact of innovation constraints on innovation. The third part focused on in-depth exploration of mitigation strategies for innovation constraints. In view of this, a mix of deductive and inductive reasoning was considered as philosophical paradigm for this study. The former reasoning logic, which mainly drived the study, was used to predict hypothesized relationships among variables. Deductive logic with its roots in positivism attempts to establish relationships among variables (Teddlie, 2009). Positivist approach to social science is focused on prediction and explanation of phenomenon with emphasis on maintaining researchers' independence from the topic under investigation (May, 2011) and it aims at obtaining law-like generalisations.

However, universal generalisation assumptions applicable across contexts are being challenged by post-positivists (an offspiring) who argue that total objectivity cannot be achieved due to researcher's human limitations and the causes of any outcome can be determined with some degree of reliability and validity (Johnson & Onwuegbuzie, 2004; Chilisa & Kawulich, 2012; Creswell, 2014). It is obvious that postivists and post-positivists differ in their views in terms of

the nature of reality (i.e.ontology) and what constitutes acceptable knowledge (i.e. epistemology) and how information is colleced (methodology).

Both positivits and post-positivits believe that reality is external and objective where the knower and known are independent (Teddlie, 2009), and the research results produce what is called covering laws and can be used to make generalizations (Teddlie, 2009; May, 2011). According to Creswell (2014) positivism and post-postivism focus on identifying and investigating causes of outcome, reduction of ideas into small pieces of ideas called variables which consist of hypotheses and generation of knowledge through careful observation and measurement of reality. Whereas positivism assumes existence of apprehendable real reality, post-positivism asserts that reality is not perfectly apprehended (Brand, 2009).

Epistemologically, positivism takes the position which assumes that knowledge generated is true if the knower and the known are separate subjects that cannot influence each other. However, post-positivism focuses mainly on explaining contexts. From methodological position, positivism favours experimentation, manipulation and verification of hypotheses. In constrast, post-positivism uses natural settings and collection of situational information. This means that post-positivism embraces both quantitative and qualitative methods in data collection.

On the other hand, an inductive reasoning with its foundation in constructivism (or interpretivism) which attempts to understand the world through perceptions and experiences of participants, was adopted for in-depth exploration of mitigation strategies for innovation constraints. Proponents of constructivism believe that reality is constructed in people's mind (Ponterotto, 2005) and its construction takes place through individuals' social interaction and is contingent on their varied background, experiences and assumptions(Wahyuni, 2012).

Thus, constructionists understand the world through experiences and subjective meanings attached to it by having interactive dialogue with the participants (Ponterotto, 2005; Wahyuni, 2012; Thanh & Thanh, 2015). In such interactive dialogue, the researcher becomes a primary instrument of data collection (Ponterotto, 2005). Obtaining information on mitigation strategies and how they were used in addressing specific innovation constraints required interactions between a researcher and respondents in their natural settings.

Chilisa and Kawulich (2012) observe that nature of reality and knowledge, theoretical framework, literature, research practice, value sytems and ethical principles are key factors influencing a researcher's philosophical assumptions. Regarding research students, Cresswell (2014) points

out that the views of what constitutes truth and knowledge are driven by their discipline areas and past research experiences. It is interesting to note that the above factors were taken into account when choosing philosophical assumptions for this study. Notably, both post-positivist and constructionist positions and their associated quantitative and qualitative methods respectively predominant in entrepreneurship and innovation management research. Specifically, postpositivist-oriented approaches are dominant in studies investigating the effects constraints on innovation (Demirbas et al., 2011; Joachim et al., 2018; Pellegrino, 2018), whereas research on mitigation strategies embraces constructionist approaches (Smith, 2007; Baker et al., 2013; Griffin et al., 2014). Furthermore, my previous research experience is rooted in post-positivism. Thus, this study opted for a mix of philosophical assumptions that recognizes both objectivist and subjectivist approaches to understanding social phenomena (Wahyuni, 2012). It is an appropriate position because it finds a middle ground between post-positivists and constructivists and brings together the insights from each side into a workable solution (Johnson & Onwuegbuzie, 2004).

Post-postivist and constructionist are associated with specific methodologies (Chilisa & Kawulich, 2012). For example, post-positivits use quantitative techniques to generate acceptable knowledge (Teddlie, 2009) while constructionists favour qualitative approaches to generating data (qualitative data) which are very rich in terms of descriptions of social constructs (Wahyuni, 2012). The quantitative research process begins with a theory or conceptual framework that describes hypotheses about human behaviour, and from which predictions are deduced logically. Data are collected and analysed using standardized methods to test those predictions and the results may confirm or reject hypotheses/theory (Johnson & Onwuegbuzie, 2004; Teddlie, 2009).

Quantitative research offers several advantages compared to qualitative research in terms of time and resources needed to carry it out, precision of data, and credibility and generalization of findings. According to Johnson and Onwuegbuzie (2004), quantitative research is useful for studying a large number of people, the process of colleting data and analysis is not time consuming and the findings are of higher credibility with many people in power and generalizable. Similarly, Castro et al. (2010) point out that quantitative approaches provide accurate operationalization and measurement of concepts/constructs and allow examination of the strengths of relationships among variables of interest.

However, quantitative research suffers from confirmation bias, and is more likely to use categories/variables that are not reflecting local people's understanding and produce too abstract and general knowledge which may not be relevant to specific local contexts (Johnson

& Onwuegbuzie, 2004). In addition, the focus of quantitative research is on outcomes with no to little attention being paid to the mechanisms by which those outcomes are reached or the contexts in which they occur (Brand, 2009).

These weaknesses, however, can be addressed by qualitative research approaches which *"are responsive to local situations, conditions, and stakeholders' needs*" (Johnson & Onwuegbuzie, 2004; pp. 20). Castro et al. (2010) argue that qualitative research uses data collected in naturalistic settings through interactive dialogue. These interactions provide the fullest access to individual's mind and generate "*rich detailed accounts of human experiences (emotions, beliefs, and behaviours)"* (Krauss, 2005; Castro et al., 2010; pg.343). In other words, they allow a researcher to understand individuals' words and meanings of those words as they are understood by them. However, qualitative research has been subjected to considerable criticism. For example, data collection and analysis is said to be time consuming while the results are more likely to be influenced by investigator's personal biases and may not be generalizable to other settings due to inclusion of relatively few participants in the research (Johnson & Onwuegbuzie, 2004; Castro et al., 2010).

Adopting deductive and inductive reasonings supports the views that knowledge is *"being both constructed and based on the reality of the world one experiences and lives in"* (Teddlie and Tashakkori, 2009; pp.74). Teddlie and Tashakkori (1998) note that post-positivist and constructionist positions are not mutually exclusive and neither post-positivism nor constructionism is sufficient enough to predict or explain events (i.e. causal relationships) with 100% accuracy (Ivankova et al., 2006). Similarly, Onwuegbuzi (2000) emphasizes integration of objective and subjective points of perspectives and calls for application of combined quantitative and qualitative techniques (mixed methods) in the research process.

A mixed methods approach maximizes the strengths and reduces problems or weaknesses of quantitative and qualitative approaches in single research studies (Bergman, 2011). Although quantitative techniques produce results (drawing inferences) that can form a basis for generalizations, they do not provide a deeper understanding of the views of participants about the phenomenon being studied (Mackenzie & Knipe, 2006). Johnson and Onwuegbuzie (2004) examined the strengths of mixed methods and stated that the mixed methods research is useful for adding precision to narratives, answering diverse research questions as the researcher is not limited to a single method, overcoming the weaknesses of one method by another method, providing additional insight and understanding that might be missed when a single method is used.

However, the mixed methods approach possesses many challenges in terms of the need for intensive data collection, analysis of a variety of numeric data, audio and text information, but it gives a better understanding of a research problem than a mono-method approach (Creswell, 2014). Other limitations related to mixed methods research include lengthy time and the need for more (financial) resources to collect both types of data (Ivankova et al., 2006). In additon, a broader set of skills (both qualitative and quantitative) are needed to carry it out (Molina-Azorín, 2011).

3.3 Mixed methods research design

This study employed a mixed-methods sequential explanatory design (MMSE) which combined both quantitative and qualitative techniques in data collection and discussion of findings with the former approach facilitating the use of the later techniques (Creswell & Clark, 2007). The MMSE design allows integration of quantitative and qualitative data at some stages of the research process (Ivankova et al., 2006). This mixing of data, according to Creswell and Clark (2007), facilitates a better understand of the research problem than using only one set of data.

The motivation for integrating quantitative and qualitative techniques was primarily determined by the amount of information needed to answer the three research questions. Reliance on either survey questionnaire or qualitative interviews would have not produced enough information to understand a fuller picture of innovation constraints in the food manufacturing industry. Quantitative methods provided data to analyse the relationship of innovation constraints with innovation and firm performance and role of entrepreneurial bricolage in reducing the impact of various constraints. Qualitative interviews method was employed to try to get respondents' perceptions of the actual constraints they were facing, how they affected their innovation activities and how they overcome them. Ivankova et al. (2006) note that quantitative approach gives a general understanding of the research problem while refinement and detailed explanations of the quantitative results is provided by qualitative data where participants' views are explored in-depth. Thus, employing a mixed methods design provides opportunities for in-depth exploration of the quantitative results and when unexpected results of quantitative study are obtained.

The mixed methods approach was also appropriate due to the fact that previous studies exploring innovation constraints through surveys tend to give a partial view of the constraints,

since their analyses are limited to either identification of constraints or investigation of the impact of constraints, with no attempts being made to explore mitigation strategies (Charles & Rweikiza, 2015; Voeten et al., 2016; Woschke et al., 2017; Chwastyk & Kołosowski, 2018). This theme (i.e mitigation strategies) was explored in-depth through follow-up interviews where informants elaborated on their experiences of constraints when undertaking innovation activities and how they were dealing with them.

The research process started with quantitative phase by collecting survey data and analysing them, then a qualitative phase followed. When a mixed methods research design is adopted, it is important to provide a graphical presentation to enhance comprehension of the procedures followed (Ivankova et al., 2006). Therefore, figure 3.1 below illustrates the sequence of activities and shows the points at which integration of the two approaches occured. The priority of the quantitative phase is illustrated by using capital letters. More detailed procedures will be discussed in appropriate sections.

Table 3. 1 Illustration of procedures in a mixed methods sequential explanatory design

Phase	Procedure	Limitations	Outcome
QUANT Data Collection	• Cross-sectional survey (personal delivery of questionnaire); (*n* = 248)	• Intensive and costly exercise	• Numeric data
QUANT Data Analysis	• Data screening • Factor analysis • Hypotheses testing	• Needs knowledge of different types of data analysis software	• Descriptive statistics, Factor loadings, model fit indices & coefficients
Connecting Quant & Qual Phases	• Multiple case studies and selecting participants based on typical responses (4-L; 8-M; 5-S) • Develop interview questions	• Data collection and analysis are time consuming.	• Cases (n = 17) • Interview protocol
Qual Data Collection	• Individual in-depth face-to-face interviews with 17 innovative firms	• Time consuming (transcription and translation) • It is a costly mode of administration	• Text and audio data (recordings, field notes and interview transcripts
Qual Data Analysis	• Coding and thematic analysis • Template analysis	• Analysis of interviews is time consuming, • Researcher's bias may influence results	• Codes and themes • Similar and different themes and categories • Writing up findings
Integration of Quant & Qual Results	• Interpretation and explanation of Quant & Qual results	• Inferences and interpretations may not be consistent with the analysis of obtained data • Multiple conclusions based on the same results may not agree with each other	• Discussion • Implication • Future research

Source: Adapted from Ivankova et al. (2006

3.4 Location of the study

Survey and interviews were conducted involving food and beverage manufacturing firms located in Arusha, Dar es Salaam, Dodoma, Kilimanjaro, Manyara, Mbeya, Ruvuma and Singida regions. The eight regions were selected based on the following criteria: first, these regions not only do have the largest number of entrepreneurs engaging in food and beverage production in the country but also have a higher demand for processed food due to increasing number of middle income earners. Second, raw materials for the manufacture of food and beverages are purchased from local and international markets. These regions are the major sources of raw materials. For example, coffee and edible oil processors rely on local markets for raw coffee and oilseeds respectively. Coffee is mainly grown in Kilimanjaro and Ruvuma, while Dodoma, Singida, Manyara and Mbeya are famous for growing sunflower. The manufacture of beverages also uses more locally sourced raw materials than imported ones. For instance, grapes and bananas – the main raw materials for winemaking are grown in Dodoma (grapes), Kilimanjaro and Arusha (bananas). Dar es Salaam, the principal port in Tanzani, handles about 95% of the country's international trade[10]. For example, in 2013, about 43% of the imported raw materials for manufacturing industries were consumed by food and beverage manufacturers (UNIDO, 2017).

Third, the 2013 Census of Industrial Production shows that about 48% of all manufacturing firms in the country are located in the eight regions. For example, 15% of manufacturing firms are in Dar es salaam, 7% in Ruvuma, 6% in Mbeya, 5% in Manyara, 4% in Dodoma, Arusha and Kilimanjaro and 3% in Singida. Furthermore, more than 51% of large manufacturing firms are found in those regions (NBS & MITI, 2016).

[10] https://dlca.logcluster.org/display/public/DLCA/2.1.1+Tanzania+Port+of+Dar+es+Salaam;jsessionid=C209DCC12198A84AAE65300B7CAA6BD3

Figure 3. 1 Selected regions for data collection. Locations in small letters represent specific areas (districts) of a particular region in which data collection took place.

3.5 Population, sampling methods and sample size

3.5.1 Study population

The sampling frame for this study were entrepreneurs who owned/managed small, medium and large enterprises that were involved in the manufacture of coffee, edible oil and beverages from Arusha, Dar es Salaam, Dodoma, Kilimanjaro, Manyara, Mbeya, Ruvuma and Singida regions in Tanzania. These sub-sectors were chosen due to their economic contribution in terms of export performance, sales turnover and employment creation.

3.5.2 Sampling

Sampling is the procedure of selecting a small number of units from the entire population for inclusion in a study (Bryman & Bell, 2015). Having a proper sampling method is important for increasing reliability, validity and and usefulness of results. However, nature of the study, research objectives, time and resources are critical factors that influence the choice and

selection of a sampling method. The sampling objective was to draw a random sample of 200 or more firms from food and beverage industry for the survey and 17 or more firms for qualitative interviews. Sampling methods employed in this study were informed by the research design. Sequential mixed methods sampling approach was employed to obtain samples and comprised a combination of stratified random sampling (quantitative data) and "intensity" sampling procedures for qulitative data (Teddlie, 2009).

The data were obtained from the Ministry of Industries, Trade and Investment(MITI)'s 2013 Census of Industrial Production database (Tanzania) which contains comprehensive information on firms' location (region, district and ward), main activities, contacts and number of employees. The database has 48,474 manufacturing firms, out of which 19,773 are manufacturers of food products and beverages. The disaggregation of the list of manufacturers of food products and beverages into size classifications resulted into 429 firms with 10 and above employees and 19,344 with 1 to 9 people. However, it is important to note that this study covered only 8 regions, and the list relating to those regions was extracted from that main database and supplemented by other mini lists obtained from Small Industries Development Organization (SIDO) regional offices. SIDO regional offices' lists provided the same information about the firms as MITI's main list, but such information was about SMEs in respective regions.

3.5.3 Sample size and sampling procedures for quantitative phase

Sample size is a critical aspect in statistical significance testing in general and in assessment of model fit statistics in SEM, in particular (Fan , et al., 1999; Kim, 2005). Large sample sizes are required for quantitative research to infer generalizations. Iacobucci (2010) notes that large sample sizes help to improve parametric estimations by partly reducing high intercorrelations among exogeneous constructs and type II error. Bentler and Chou (1987) prescribe ten observations for each estimated parameter as a rule of thumb when determing sample size for studies employing SEM techniques. However, Iacobucci (2010) recommends a minimum of 200 as a prequisite sample size for SEM estimations.

Stratified random sampling procedures were first applied to select responding firms for the survey phase. Firms in the sampling frame were first categorized into size classifications (strata): small firms, medium sized firms and large firms based on the number of employees. The number of sampled firms in each size classification was determined according to the proportion of size classification in the sampling frame. The advantage of stratified random sampling is that generalization of findings from sample to the population is possible. However, it is a complicated approach if representation of various subgroups of the sampling frame is needed.

3.5.4 Selection of coffee, edible oil and beverages production sub-sectors

The sampling frame consisted of food manufacturers drawn from coffee processing, beverages and edible oil production sub-sectors. The three sub-sectors were selected based on their economic performance and contribution to employment. For example, coffee contributes about 25% of total traditional export values (equivalent to GB £646.7 mil per year), while export value of beverages is about GB £1.7 mil per year. Beverage and edible oil production generate sales values of GB£47.3mil and GB£19mil per year respectively. The coffee sub-sector employs about 4 million people while the number of people employed in edible oil production is estimated to be 3 million. Sales turnover of edible oil averages USD 30mil per year (Sutton & Olomi, 2012).

3.6 Data collection methods

3.6.1 Survey for quantitative data

Survey data were collected to answer research questions related to the effects of constraints on innovation and firms' growth performance, and the role of entrepreneurial bricolage in reducing the impact of innovation constraints. The study used self-administered questionnaires to gather information on innovation constraints, entreprenurial bricolage, innovation and firms' performance. A sample of 248 food and beverage manufacturers provided data for this study. The survey design was preferred because it allowed a researcher to gather bulk information within a very short period of time and with less resources involved (Creswell, 2014; Walter, 2015). However, realization of these benefits depends on whether distribution of questionnaires is done by using the internet, mail, telephone or personal delivery.

As it can be seen in figure 3.1, responding firms were scattered across the country, which implies that more time and resources were needed. This was a big challenge for the researcher and practically impossible to distribute the questionnaires and conduct qualitative interviews in all eight regions within a period of four months without assistance. The challenge was addressed by recruiting two research assistants. One research assistant was deployed to southern and south-western parts of the country (i.e. Ruvuma and Mbeya) while the second one was assigned to central region (i.e. Dodoma) and its neighbouring regions (Singida and Manyara). The researcher's portfolio consisted of north western regions of Kilimanjaro and Arusha and the eastern part (i.e. Dar es Salaam). The use of research assistants and personal delivery approach (questionnaire distribution) in data collection were very useful in terms of saving time, minimization of non-response rates and missing data but resulted in increased costs.

Recruitment and training of research assistants took place in mid- April, 2017, one week before conducting a pilot survey and two weeks prior to the main survey. The research assistants were university graduates and had previously involved in collecting survey data of the same nature and in the same areas. A two-day training session was organized to familiarise them with research instrument, research ethics and interview guidelines. Using research assistants comes with challenges that if they are not handled properly they may lead to obtaining less reliable data. When a researcher is absent during data collection it means that research assistants take full control of the activity and this creates pressure on them to produce tangible product(Deane & Stevano, 2016).

The pressure to meet the deadlines and collect as many responses as per agreed targets may result in getting questionnaires with a lot of incomplete and improper information or research assistants having to complete the questionnaires themselves. This was not an issue for this study and as stated earlier, the researcher employed experienced research assistants who had previously taken part in several surveys conducted by different organizations and individuals. The research assistants' experience was a clear evidence that they were trusted and honest individuals and that they could handle data collection process with required academic and ethical standard.

A pilot survey was conducted in the last week of April, 2017 to pre-test the data collection instrument. Research assistants took part in the pilot survey. Engaging research assistants at the pre-testing stage served to train them for the subsequent main field work and assessing whether the resources allocated for data collection were adequate. Instrument pre-testing is a crucial exercise to elimiate weakness, assess reliability and validity of instrument and to test if the data collected actually answers research questions (Walter, 2015). Pre-testing also helps to assess adequacy of instructions, clarity of items in the questionnaire and reasonableness of survey time (Tisimia, 2014; Walter, 2015). The instrument for collection of survey data was pre-tested to 11 randomly selected firms (2 large firms, 3 medium sized firms and 6 small firms) from Dar es Salaam, 1 expert on SMEs, entrepreneurship and private sector from the Ministry of Industries, Trade and Investment and 3 researchers in the field of innovation and entrepreneurship from two local universities. Insights gained from the pre-testing exercise were used to adjust the questionnaire items.

The main fieldwork lasted for about 5 weeks (from 2nd May to 5th June, 2017) and used pre-tested questionnaires. SIDO[11] regional offices played an important role in linking a researcher and research assistants with key informants from SMEs in their respective regions. For large firms, the researcher used his personal networks to get access to key informants from those firms. The study adopted both face-to-face interviews and self-completion questionnaires for collecting the survey data. Conducting interviews in survey studies is costly as it requires more resources, but it is more effective in terms of producing higher response rates and minimizing missing values (Marshall, 2005). The presence of an interviewer when the questionnaire was completed also served to respond to any questions that would have arisen and to ensure that instructions were complied with.

Phone calls were first made to book appointments with responding firms for personal delivery of questionnaires. The majority of key informants who took part in the survey filled in the questionnaires and signed the consent form in presence of researchers and returned them. However, in some cases informants requested researchers to drop the questionnaire at their offices for them to complete it at their own convinient time. The absence of a researcher for self-completion questionnaires leaves no opportunity for help to respondents if they experience difficulty in understanding questions or instructions, which can increase the risk of missing data. Thus, researchers had to make follow–ups to collect completed questionnaires, but not all distributed questionnaires were returned. Two to three phone calls were made as reminders for each company. However, out of 384 questionnaires distributed 279 were completed and returned.

3.6.2 Research instruments

Separate research instruments were developed for survey and qualitative interviews. The survey questionnaire consisted of five sections: (1) firms' general information, (2) firm performance (3) innovation activities, (4) constraints to innovation and (5) entreprenurial bricolage. All items used to develop the measurement scale for the survey were taken from the literature. Sections 2 to 5 of the questionnaire captured information which was used for statistical testing of hypotheses. Development of an interview protocol was directly informed by quantitative findings.

[11] SIDO = Small Industries Development Organization

3.6.3 Research instrument for survey

The scale for measuring innovation consisted of 9 items of innovation activities that reflected three dimensions of innovation: product innovation, process innovation and market innovation. Existing literature and the OSLO manual 2005 (OECD/Eurostat, 2018) recognize four types of innovation outputs; two of which are introduced on the market (i.e. product innovation and marketing innovation) and two in the firm's operation (process innovation and organizational innovation). However, for the food and beverage industry, it is well established from previous research that product, process and marketing innovations are the most crucial types of innovations that drive growth and competitive advantage in the industry (Traill & Meulenberg, 2002; Bhaskaran, 2006; Capitanio et al., 2010; Baregheh et al., 2012b; Iliopoulos et al., 2012; Trott & Simms, 2017).

A considerable number of past studies that investigated the effects of product and process innovations on business performance (see Yeh-Yun Lin & Yi-Ching Chen, 2007; Otero-Neira et al., 2009; Varis and Littunen, 2010) have included market innovation in their analyses. The rationale for including market innovation is that it is often assumed that the success of technology-based innovations resides in the marketplace (Yeh-Yun Lin & Yi-Ching Chen, 2007). This implies that the difficulties facing innovative firms in the markets tend to have adverse effects on the success of product and process innovations. Bartoloni and Baussola (2016) provide empirical evidence that suggests existence of a higher degree of complementarity between marketing innovation and technological innovations in the food and beverage manufacturing industry. Otero-Neira et al. (2009) argue that profitable innovations result from coordinated innovation plans involving product, process and market innovations. Yeh-Yun Lin and Yi-Ching Chen (2007; pp. 116) state that *"devising innovative marketing measures is essential to help organizations transform good ideas and good products into sales revenue and profit".* This means that the introduction of product and process innovations requires a search for new markets or new market segments (Varis and Littunen, 2010).

Selection of indicators to measure innovation was done in such a way that the items reflected the nature, type and degree of novelty of innovations in the food and beverage industry and developing countries. Innovation activities undertaken in the industry are often process-oriented, incremental in nature and rely on new technologies developed by upstream industries (Baregheh et al., 2012b; Beckeman et al., 2013). The incremental nature of innovation is also dictated by consumers who seem to be conservative and averse to new products (Capitanio et al., 2010; Trott & Simms, 2017). Incrementalism of innovations in developing countries stems

since the fact that a larger proportion of firms in these countries are small with limited resources to invest in research and development.

In this light, the survey instrument used a broad concept of innovation to capture both small improvements in products, manufacturing methods and marketing activities and more significant or radical changes such as introduction of new products, acquisition of new equipment, introduction of new manufacturing process, new promotion methods, new pricing methods or entry into new markets, etc. (see appendix 1). Innovation was modeled as a second-order construct and was operationalized using three dimensions: product innovation, process innovation and market innovation. Product innovation was measured by two items which were adopted from Madrid-Guijarro et al. (2009a) and Mahemba and Bruijn (2003). However, the items were modified to reflect the context. Two items measuring process innovation were adopted from Madrid-Guijarro et al. (2009a) and Baregheh et al. (2012b). Market innovation was measured by five items which were taken from Gunday et al. (2011). The survey instrument contained questions that asked respondent to indicate whether their firms had introduced a particular type of innovation during the past five years (yes = 1 and no = 0) and rate the importance of that innovative activity in achieving their objectives on a 5-point Likert scale (1 = very low importance and 5 = very high importance).

Firm performance has been operationalized in different ways. Prior empirical studies utilized either objective or subjective measures of performance. Subjective measurement is based on respondents' self-assessment of performance while objective measures use information from annual accounts. Common categories of subjective measures of firm performance include financial performance, customer performance and retention, market performance, growth performance and production performance and reputation. Several indicators have been used to measure each of the above categories. The objective measures of firm performance identified from the literature include value added (productivity), employment growth and sales growth, return on investment, assets and equity. Previous studies utilized either subjective measures (Gunday et al., 2011; Shaukat et al., 2013; Karabulut, 2015; Rajapathirana & Hui, 2018), objective measures(Klomp & Van Leeuwen, 2001; Mansury & Love, 2008) or both (Moreno & Casillas, 2008).

The fact that many of responding firms in the study's population were SMEs which are known for not keeping proper records of their business operations, the use of objective measures deemed impractical, instead the study used subjective measures. Firm performance consists of four dimensions (innovative performance, financial performance, marketing performance and

production performance), but it is only innovative performance that seem to be directly influenced by innovation activity (Gunday et al., 2011; Rajapathirana & Hui, 2018). Thus, firm performance is conceptualized as innovative performance. Four items based on Grissemann et al. (2013) were used to measure innovation performance and included profitability, sales volume, cash flows and market share. These items were taken from a reliable scale with Cronbach alpha value of 0.91 (Grissemann et al., 2013). Previous research has established that subjective measures of performance produce almost the same results as objective measures(Dess & Robinson Jr, 1984). Respondents were asked to rate on a 5-point Likert scale (1 = Not achieved and 5 = very high achievement) the extent to which their firms had achieved each of the performance objectives from innovations they had introduced.

Much of what is known about the effects of innovation constraints on firm's innovation behavior is based on the analysis of Community Innovation Surveys' (CIS) data. The measurement scale for CIS surveys is based on the OECD OSLO manual (OECD/Eurostat, 2005) which is not comprehensive enough to capture information on innovation constraints prominent in developing countries. For example, constraints such as counterfeits, stiff competition generated by informal sector, multiplicity of regulators, unpredictability of regulations, bureaucratic delays in product registration and high costs of compliance with regulations are of significant importance in constraining innovation efforts in developing countries(Charles & Rweikiza, 2015; Bartels et al., 2016; Egbetokun et al., 2016; CTI, 2017; Nieuwenhuizen, 2019). Thus, the study adopted measurement scales from the literature that reflect the nature of innovation constraints in developing countries.

Four items measuring financial constraints construct were adopted from Madrid-Guijarro et al. (2009a) and Maldonado-Guzmán et al. (2017b). The four items have been validated from prior studies and with Cronbach alpha values ranging from 0.77 to 0.86. Knowledge constraints construct comprised four items taken from Madrid-Guijarro et al. (2009a), Maldonado-Guzmán et al. (2017b) and Galia and Legros (2004). The market constraints construct was measured by four new items, three of which (i.e. competition from large and established firms, uncertain demand for innovative products and stiff competition generated by informal sector) were adopted from Coad et al. (2016b) and and but one item was added (i.e. counterfeits,) and was taken from the literature as a validated scale with this item was not available. Last, regulatory constraints construct was measured by four items which were developed from the literature as a validated scale with items reflecting the nature of regulatory constraints in developing countries was not available. Studies from which the measures were taken are shown in table 3.2. The questionnaire asked respondents to rate the extent to which each of the items was a

constraint to introduction of innovation for the past five years. Responses were rated on a 5 - point Likert scale ranging from 1= not important to 5 = very important.

To measure entrepreneurial bricolage - a moderating factor, the study adopted a scale developed by Senyard et al. (2009). The eight-item scale has been validated and used in previous studies (see Bojica et al., 2014; Senyard et al., 2014) For example, the Cronbach's alphas of 0.82 (Senyard et al., 2014) and 0.84 (Salunke et al., 2013) indicate a high level of internal consistency. Respondents were asked to rate on a 5-point Likert scale (1= Never and 5 = Always) how their firms used various kinds of resources to deal with new challenges. The scale was reduced to four items by creating parcels. The creation of parcels was motivated by the fact that the number of items (i.e. 8 items) was two times bigger than the rest of other constructs.

Creating and using item parcels is not something new in the field of entrepreneurship and innovation (Zampetakis et al., 2009; Arunachalam et al., 2018) and several researchers claim that item parcels are more reliable indicators and have values that are more normally distributed than individual items(Hall et al., 1999; Bandalos, 2002; Matsunaga, 2008). Item parcels also produce less biased estimates of structural parameters and better model fit statistics (i.e. root mean squared root mean squared of approximation (RMSEA)), comparative fit index (CFI) and chi-square test) than individual items(Bandalos, 2002). This is partly related to the fact that fewer indicators per construct (preferably three or four indicators) reduce the potential for cross-loading and shared influences among indicators (Hall et al., 1999). Masunga (2008) supports item parceling in studies that examine structural relationships among latent constructs because it greatly removes theoretically unimportant noises such as measurement and sampling errors that tend to eclipse the latent structure.

This study implemented item parceling by following Matsunaga (2008)'s recommendation of using parcel-building algorithm when multiple parcels are to be created per factor. Little et al. (2002)' procedures were used to form parcels: the first four items with the highest loadings formed the first group and anchored the four parcels. The second group consisted of four items with the next highest loadings which were combined with the first group items (i.e. anchors) in an inverted order. For example, the item with the highest loading from group one was combined with item with the lowest loading from group two. The procedure was repeated for the second, third and fourth parcel.

Table 3. 2 Operational definitions of constructs and sources

Construct	Operational definition	Sources
Entrepreneurial bricolage	The extent to which various kinds of resources were used to deal with financial, knowledge, market and regulatory challenges	(Senyard et al., 2009)
Financial constraints	The importance of (a) interest rates too high (b) lack of appropriate sources of finance (c) innovation costs too high (d) financial risks too high.	(Madrid-Guijarro et al., 2009b; Maldonado-Guzmán et al., 2017b)
Knowledge constraints	The importance of (a) lack of qualified personnel, (b) lack of information on technologies (c) lack of knowledge support from government and research institutes (d) lack of information on markets in constraining innovation.	(Madrid-Guijarro et al., 2009b; Galia and Legros (2004))
Market constraints	The importance of (a) competition from large and established firms (b) uncertain demand for innovative products (c) counterfeits and imitated food products (d) competition from informal sector in constraining innovation.	(Galia & Legros, 2004; Coad et al., 2016b; Demirbas et al., 2011; CTI, 2017)
Regulatory constraints	The importance of (a)multiple regulators (b) unpredictability of regulations (c) bureaucratic delays in product registration (d) high costs of compliance in constraining innovation	(Charles & Mambi, 2013; Charles & Rweikiza, 2015)
Innovation	Illustrated by nine elements that captured small improvements to significant or radical changes in products, manufacturing methods and marketing activities.	(Mahemba & Bruijn, 2003; Madrid-Guijarro et al., 2009a; Baregheh et al., 2012b; Gunday et al., 2011)
Firm performance	The extent to which their firms had achieved each of the following performance objectives from innovations they had introduced: (a) profitability objectives (b) sales objectives (c) market share objectives (d) cash flows objectives	(Chen et al., 2009; Grissemann et al., 2013)

3.7 Quantitative data analysis

Analysis of quantitative data was based on micro-level data collected via survey. This dataset contained information particularly suitable for applying a multivariate structural equation modeling technique (SEM) to test a structural model depicted in figure 3.3. (1) The data provided information on constraints to innovation, innovation activity and firm performance. This information was used to analyse the relationships between constraints and innovation as well as innovation and firm performance. (2) Information on the use of bricolage to deal with innovation challenges was also collected. This information was used to test the role of bricolage in reducing the impact of innovation constraints on innovation.The analysis of quantitative data was done in four steps: (1) descriptive analysis, (2) exploratory factor analysis (EFA) (3) confirmatory factor analysis (CFA) and hypothesis testing (4) testing the moderating role of entrepreneurial bricolage.

3.7.1 Descriptive analysis

Descriptive analysis summarizes data with the purpose of discovering patterns for easy understanding and communication (Teddlie, 2009). The study employed this analysis as an attempt to describe distribution of sampled firms on key characteristics (i.e. firm size, age, sector, skills, innovation activities etc) and the scores of respondents on measurement scale by using frequency tables and means. The results of descriptive analysis provided information on the types and number of innovations introduced by each firm for the past five years, mean scores on each individual constraint, constraints construct and firm performance construct. This information was useful and formed the basis for selection of case study firms for the qualitative phase. The analysis used Statistical Package for Social Sciences (IBM SPSS Statistics) version 22.

3.7.2 Exploratoty factor analysis (EFA)

This analysis aimed at establishing relationships between indicators and constructs and addressing multicolinearity. It is an ideal step when the study is somewhat exploratory in nature where relationships between indicators and measurement model is uncertain to some extent (Yoon, 2002; Hair et al., 2014). Exploratory factor analysis (EFA) is a descriptive technique used to condense a large number of variables into a smaller set of common factors that can be easily interpreted and used to explain correlation among them(Yong & Pearce, 2013; Kline, 2016). EFA helps the researcher to know how observed variables (items) are linked together to form factors as well as the number of factors formed from the observed variables (Ullman, 2006).

EFA serves several purposes in studies of exploratory nature. First, when the pattern of relationships between the common factors and measured variables is somewhat uncertain or unknown, EFA becomes an appropriate technique to establish which measured variables are reasonable indicators of a latent factor (Yong & Pearce, 2013; Kim et al., 2019). Farooq (2016) recommends EFA if the researcher is theoretically uncertain about the relations between observed variables and latent constructs. Second, even if the measurement scale has been subjected to cross-validation, it is also necessary to conduct EFA on it to examine the relationships between observed variables and the latent constructs to confirm unidimensionality of observed variables. Unidimensionality is defined as the extent to which indicators represent one and only one underlying latent variable or construct(Garver & Mentzer, 1999). For example, previous studies (Salunke et al., 2013; Bojica et al., 2014) that used a cross-validated eight-item scale to measure entrepreneurial bricolage (Senyard et al., 2009) still had to perform EFA on it to confirm unidimensionality of items.

Third, a large of number of indicators increases the likelihood of correlations among themselves. EFA is useful in detecting problems of multicollinearity and error variance among observed variables that would affect the results of subsequent confirmatory factor analysis of the measurement models (Yoon, 2002; Kim et al., 2019). Items with double loadings on factors tend to create error covariance of misspecification of parameters in CFA and standard errors. Last, EFA is used to create item parcels in partially disaggregated models. The measurement and structural models with item parcels formed from EFA tend to have the best goodness-of-fit indices of all strategies used in item parceling (Rocha & Chelladurai, 2012).

To assess suitability for factor analysis it is suggested examining Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test of sphericity (Williams et al., 2010; Hair et al., 2019). KMO establishes suitability of data for factor analysis by examining the presence of correlations among variables while Bartlett's test analyses a degree of inter-correlations. To proceed with further factor analysis, it is essential that the KMO measure of sample adequacy values is 0.5 or greater for both overall test and each individual variable. The percentage of total variance explained must exceed 60%; a satisfactory threshold suggested by Hair et al. (2019). For derivation and identification of factors, a latent-root criterion (Eigenvalues) value of above 1.0 and a cut-off of 0.5 for factor loadings were applied (Hair et al., 2019; Yoon, 2002). Hair et al. (2014) suggest showing only factor loadings with values of greater than 0.5 because those factor loadings are necessary for practical significance.

3.7.3 Structural equation modeling

Structural equation modeling (SEM), a multivariate technique that brings together the elements of exploratory factor analysis and multiple regression to simultaneously analyse a series of relationships among observed variables, between observed variables and latent constructs (unobserved variables) and as well as between several latent constructs (Schreiber et al., 2006; Hair et al., 2019). The objective of SEM is to allow researchers to examine the relationships between one or more independent variables (i.e. both observed and unobserved variables) and one or more dependent variables(Ullman, 2006). In SEM, observed variables are known as indicators, items or manifest while unobserved variables are referred to as latent constructs, factors or latent factors (Schreiber et al., 2006; Bowen & Guo, 2012). The latent variables are measured indirectly by indicators.

When SEM techniques are used to examine the relationships of a latent construct with its indicators (i.e. measurement model), the test is called confirmatory factor analysis (CFA) (Bowen & Guo, 2012). The measurement models are concerned with explaining how the latent constructs are being measured by indicators. The relationships between different types of latent constructs form a structural model. The structural models in SEM are like standard regression models, but the difference is that structural models consist of independent and dependent factors which are unobserved factors/latent constructs measured by indicators (Ullman, 2006; Bowen & Guo, 2012). The structural models contain measurement models and their related indicators as well as directional relationshps among latent constructs (See figure 4.1).

Researchers in entrepreneurship and innovation management fields use SEM to test the relationships among latent constructs measured with multiple indicators. For example, Maldonado-Guzmán et al. (2017b) applied SEM techniques to investigate the effects of external environment, financial and human constraints on innovation activities in Mexican service SMEs. The method has also been widely used to study the influence of different types of innovations on firm performance (Gunday et al., 2011; Jiménez-Jiménez & Sanz-Valle, 2011; Grissemann et al., 2013). The use of latent variables instead of actual measures in SEM is considered superior to multiple regressions in terms of statistical estimations of the relationships among concepts. The measurement errors are removed from the latent constructs representing theoretical concepts as they are measured by multiple items (Hair et al., 2019).

CFA serves the purpose of assessing measurement model validity and reliability and its results are used for a subsequent step of hypotheses testing. CFA intends to establish (i) feasibility of estimates (ii) appropriateness of standard errors and (iii) statistical significance of estimates of

individual indictors (Byrne, 2006). Feasibility of parameter estimates is related to viability of their estimated values (i.e. estimates displaying correct sizes and signs). Statistical significance of estimated parameters is measured by critical ratios which are calculated by dividing unstandardized estimates by their respective standard errors. A critical ratio operates like a t-statistic in EQS software and it should be ≥ 1.96 at a 0.05 significant level for an estimated parameter to be statistically significant (Byrne, 2006).

3.7.4 Confirmatory factor analysis (CFA)

Confirmatory factory analysis is an important technique to confirm the factor structure of measurement models (Byrne, 2006; Farooq, 2016) before they are subjected to hypotheses testing (SEM). CFA tests hypothesized relationships between observed variables and the latent constructs as well as the competing theoretical models about the structure (Schreiber et al., 2006; Ullman, 2006). CFA tests hypothesized relationships between observed variables and latent constructs as well as the competing theoretical models about the structure (Ullman, 2006). In conducting CFA, the hypothesized model is used to estimate a population covariance matrix which is compared with the observed covariance matrix (Schreiber et al., 2006). CFA is used to confirm whether the hypothesized item-latent variable relationships (convergent validity) and hypothesized distinction among latent variables (discriminant validity) are reflected in the observed data (Farooq, 2016; Crede & Harms, 2019). This approach evaluates the extent to which the data confirm theoretical underlying constructs. Thus, CFA is used to confirm the reliability and validity of the measurement scales (Maldonado-Guzmán et al., 2017a; Augustyn et al., 2019).

CFA can be conducted in just one stage or two stages. Some researchers (e.g. Yoon, 2002; Farooq, 2016) suggested conducting CFA in two phases if the researcher is somewhat uncertain about the relationships between observed variables and underlying constructs. In phase one CFA is conducted to validate each of the individual latent constructs. Then the researcher moves on to the second phase which entails conducting CFA on the entire measurement model (alternatively known as overall CFA). This is done when the results of CFA on measurement models of individual constructs are generally acceptable. The overall measurement model comprises refined and validated final individual measurement models from the first stage. The second phase CFA tends to produce the best-fitting data to the model. The two-stage CFA helps to pinpoint measurement errors and identification problems which could lead to developing a new scale or modifying the existing one. Researchers who implemented this strategy argue that each final measurement model in phase one is more parsimonious and has a substantive meaning (Yoon, 2002).

The disadvantage of this strategy is that it cannot be implemented on individual latent constructs with two or three indicators because they under-identified or just-identified respectively. According to Byrne (2006), the objective of CFA/SEM is to specify a model that meets the requirements of over-identification. Therefore, estimating an entire model in a single CFA helps to establish the structure of the observed variables in the context of other variables and to ensure distinctiveness of measures used in the study (Domínguez-Escrig et al., 2018). Hair et al. (2019) recommend a single-phase CFA process (full measurement model) which has also been implemented in several previous studies (Tayal et al., 2019; Wang & Lam, 2019). Thus, this study conducted an overall CFA only.

Previous research on SEM recommends paying attention to three important aspects when selecting an estimation method,: sample size, plausibility of normality and independence assumptions (Byrne, 2006; Ullman, 2006). Estimators such as Maximum Likelihood (ML), robust ML and Generalized Least Squares (GLS) are the best choices for medium (> 120) and large sample sizes (Ullman, 2006). However, ML is the most common estimator for dataset with multivariate normality whereas robust ML is ideal for non-normally distributed data or with suspected dependence among latent constructs and errors(Ullman, 2006; Farooq, 2016). The choice of an estimation method was based on sample size and the results of a multivariate normality assumptions test. The best practice guidelines for analysing quantitative data using SEM techniques suggest assessing normality assumptions, reliability and validity of the measurement instrument and the rationale for the procedures. Thus, the three issues will be discussed in detail in following sections.

3.8 Normality assumptions

Normality is the most fundamental assumption in multivariate estimations that need to be maintained all the time. Hair et al. (2014; pp.39) define normality as the "degree to which the distribution of the sample data corresponds to a normal distribution". Data normality is assessed at the level of individual variable (univariate) or aggregate variables (multivariate). The dataset is said to deviate from normal if its distribution lacks symmetry (skewness) and pointiness (kurtosis) but the two statistics assume a zero value when the distribution is perfectly normal. However, Yuan and Bentler (2002) point out that it is rare in practice to obtain datasets with normal distributions and suggest considering normality assumption as a working assumption.

If violation of normal distribution assumptions is sufficiently large and left unresolved, all statistical tests become invalidate (Hair et al., 2014). When non-normal distributed data are used, the values of chi-square are usually inflated while model fit indices and standard errors become underestimated (Brown, 2006; Finney & DiStefano, 2006). Standard errors are key inputs in the computation of statistical significance of parameter estimates in confirmatory factor analysis (CFA) and structural equation modeling (SEM) analyses.

3.8.1 Univariate normality

Skewness and kurtosis are popular methods for testing univariate non-normality. However, there are no clear guidelines on the cut-off points for different levels of univariate non-normality and different researchers have suggested their benchmarks. For example, Curran et al. (1996) and Finch et al. (1997) consider both skewness and kurtosis of 0 normal, skewness of 2.0 and kurtosis of 7.0 to reflect moderate departure while the skewness of 3.0 and kurtosis of 21.0 to represent severe departure of data from normal distributions. Garson (2012) suggested skewness and kurtosis within a range of +2 and -2 for normally distributed data. However, Farooq (2016) recommend values within the range of +3 and -3 as acceptable cut-off points for both skewness and kurtosis. Others suggested conversion of skewness and kurtosis statistics into z-scores by dividing them (statistics) with their standard errors and use those scores to assess normality assumptions (Garson, 2012; Ghasemi & Zahediasl, 2012). Based on z statistics the distribution of data is considered non-normal if either calculated z value is greater than the specified critical value (Nye & Drasgow, 2011; Hair et al., 2014).

However, a cut-off point of z value depends on sample size. According to Ghasemi and Zahediasl (2012) when the sample size is less than 200, a score of greater than 1.96 or less than -1.96 is significant at $p < 0.05$ and provides evidence of non-normality. For the sample size exceeding 200, variables with z-score greater than 2.58 or less than -2.58 and significant at $p < 0.01$ are considered non-normal. But in large samples of more than 500 observations, significance criterion becomes unreliable as very small departures from normality can produce significant skewness and kurtosis coefficients, leading to rejection of normal distribution assumption (Ullman, 2006).

The common measure for multivariate normality is Mardia's Multivariate kurtosis. In large and multivariate normal samples, the Mardia's normalized coefficient becomes unit normal variate (Byrne, 2006). However, large positive values reflect significant positive kurtosis while negative large values represent significant negative kurtosis. According to Bentler (2006), values greater than 5.0 are indicative of non-normally distributed datasets. Several researchers (Ullman, 2006;

Hair et al., 2014; Zygmont & Smith, 2014) recommend testing normality assumptions by examining both univariate and multivariate normality.

3.8.2 Multivariate normality

In SEM estimations, it is recommended to pay attention to multivariate distribution and rather than univariate distribution of data because it is the multivariate normality that determines the method of estimation and degree of trustworthiness of estimates from common methods (Gao et al., 2008; Farooq, 2016). However, several researchers(e.g. Conway et al., 2002; Yoon, 2002) used the rules of thumb based only on univariate skewness and kurtosis tests to draw conclusion that their study samples were normally distributed. However, Thompson (2004) calls this practice a big misconception because a combination of different univariate normal distributions for given means and standard deviations produce a different multivariate normal distribution. It is argued that univariate statistics cannot guarantee multivariate normality.

What should be done when the data lack normal distribution? Different ways have been suggested in the literature to deal with situations of violation of normality assumptions, and they include transformation of the raw data, deletion of outlier cases that significantly contribute to deviation from normality, item parceling and use of robust estimation methods that can account for non-normality in the data. Transformation of data reduces univariate skewness and kurtosis which in turn leads to reduced multivariate skewness and kurtosis (Gao et al., 2008). The advantage of transformation is that it is very helpful in normalizing the data with severe univariate non-normality, but its effect on moderately or slightly non-normal data is minor. The main disadvantage of transformation is related to its distortive effects on linear relationships of one variable with others. It adversely affects slope coefficients and standard errors (Schmidt & Finan, 2018) and changes those linear relationships to curvilinear, thus making it difficult to interpret the coefficients. In SEM analyses, transformed variables are likely to become unidentifiable, resulting in worsened model fit indices. Thus, Schmidt and Finan (2018) discourage transformation of data as a typical solution to departures from normality assumption.

Deletion approach is useful in achieving multivariate normality and is implemented to bring multivariate kurtosis to a desired level. Contrary to transformation, this strategy retains the assumption of linearity. However, deletion causes loss of observations, resulting in negative consequences on information and model power. For example, Gao et al. (2008) found that deletion of some observations for purpose of achieving multivariate normality (critical ratio < 1.96) resulted into some parameter estimates being insignificant. Deletion of observations for practical conformance to multivariate normality (i.e. critical ratio of 1.96) is said to be

detrimental to statistical significance of some parameters. Therefore, they suggested deleting only outliers that significantly increase multivariate kurtosis and univariate skewness and kurtosis or adversely affect parameter estimates, standard errors and chi-square.

Item parceling is used for many purposes including correction for violation of normality assumptions. Item parcels are created by averaging a summation of two or more individual items and using the average scores to replace individual item scores in SEM analysis. This strategy gives item distributions that are continuous and normally distributed for coarsely categorized data or with violated normality assumptions (Hall et al., 1999; Bandalos, 2002; Rocha & Chelladurai, 2012). However, the drawback of item parceling is that different methods used to form item parcels may yield different parameter estimates which in turn, lead to drawing wrong conclusions regarding structural relationships between factors. For example, Rocha and Chelladurai (2012) used a sample of 288 coaches to test the impact of different strategies of parceling items on model fit indices and parameters estimates of structural relationships. The results showed that improvement of model fit measures for both measurement and structural models and the magnitude of path coefficients differed among random, content and EFA strategies.

Last, several researchers (e.g. Brown, 2006; Byrne, 2006; Kline, 2016) suggest correcting for violations of multivariate normality assumptions by using robust estimators. Two estimators which are highly recommended and common in use are robust maximum likelihood (MLM) and weighted least squares (WLS). Of the two methods, MLM has been the most preferred one because it does not require extremely large samples like WLS and it can be used in different levels of non-normality, sample size and model complexity (Brown, 2006). MLM provides coefficients with standard errors and mean-adjusted chi-square test statistic (alternatively known as Satorra-Bentler scaled $_{\chi}2$) that are robust to non-normality (Brown, 2006). This estimator is found in software such as EQS and Mplus. However, if the data exhibit normal distribution and the sample size is large enough, maximum likelihood and generalized least squares (GLS) are useful estimation methods (Yoon, 2002).

3.9 Reliability and validity

Reliability and validity are fundamental issues in any research (Raubenheimer, 2004). Although the two concepts are distinctively separate, they are inter-dependent. According to Frost et al. (2007; pg. 95), “an instrument that is not reliable (internal consistency, test–retest) by definition cannot be valid”. This means that a measurement tool can be highly reliable but fails to reflect

what it is designed to measure (validity). Reliability is concerned with the degree of trustworthiness of findings (Perakyla, 1997). Heale and Twycross (2015) note that a good quality research always provides evidence of how issues related to reliability and validity were addressed. However, ways of assessing reliability and validity differ between quantitative and qualitative research.

3.9.1 Validity in SEM research

Validity in SEM research is a series of procedures taken to ensure that the conclusion derived from a particular research study can be shared with confidence (Garver & Mentzer, 1999). It is the extent to which the measurement tool reflects what it is designed to measure and not anything else (Atkinson & Nevill, 1998; Frost et al., 2007). In structural equation modeling, the measurement model validity is assessed by using two broad approaches: examination of goodness of fit (GOF) indices and evaluation of the construct validity and reliability of the specified measurement model.

3.9.1.1 Goodness-of-fit indices

The GOF indices are measures that assess the extent to which a model fits the data (Kelloway, 2014). They provide a comparison between the theory and reality (Hair et al., 2014; Kline, 2016). Several fit indices are available with different thresholds (i.e. rules of thumb) to determine model fit to the data. Information provided by fit indices helps the researcher assess whether the model fits the data or lacks fit (Bowen & Guo, 2012). The GOF indices used for measurement and structural models in SEM literature are often classified into three major categories: (1) absolute fit indices (2) comparative fit indices and (3) parsimony correction indices (Byrne, 2006; Hair et al., 2014; Kline, 2016). The first two categories will be discussed in detail because they are only indices which are provided by EQS software.

3.9.1.1.1 Absolute fit indices

Absolute fit indices are concerned with evaluating how well the researcher's theoretical model fits the sample data. This category includes chi-square (χ^2), Goodness of Fit Index (GFI), Average Goodness-of-Fit index (AGFI), McDonald Fit Index (MFI) Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residuals (SRMR). The χ^2 is the traditional and most fundamental measure and only test of significance of matrices in SEM. When χ^2 statistic is large relative to its degree of freedom and statistically significant ($p < 0.05$), it implies that the observed and estimated covariance matrices are different. However, a low chi-square value which is statistically insignificant ($p > 0.05$) is desirable as it shows no difference between the theory and reality (Hair et al., 2019).

However, the χ^2 statistic has several limitations. First, it assumes that the data are multivariate normal and violation of the normality assumptions may either lead to rejection of a properly specified model or acceptance of improperly specified model (Hooper et al., 2008; Kline, 2016). Second, the value of χ^2 is dependent on sample size. In mis-specified models, the value of χ^2 tends to go up with increasing sample size. Thus, in large samples, the χ^2 statistic rejects the exact-fit models, while in small samples the statistic is too low to discriminate between good-fitting and poor-fitting models(Kline, 2016). When violations of normality assumptions are detected, it is recommended to use Satorra-Bentler scaled chi-square which is robust to non-normality (Brown, 2006).

The Goodness-of-Fit index (GFI), Adjusted Goodness-of-Fit Index (AGFI) and McDonald Fit Index (MFI) also belong to absolute fit indices category which are often reported in SEM literature and EQS output. However, concerns have been raised over their sensitivity to sample size, inconsistent and insufficient sensitivity to model specification (Hu & Bentler, 1998). The values for the three indices range from 0 to 1.00 but values greater than 0.90 are considered acceptable for a well-fitting model (Byrne, 2006). These limitations and recent development of other fit indices have led to relatively decline in usage (Hair et al., 2019). Increasingly higher values of GFI and AGFI indicate improvement in the goodness of fit.

The root mean squares error of approximation (RMSEA) and root mean square residuals (SRMR) is another group of absolute fit indices and are normally called absolute misfit indices (Byrne, 2006). Unlike GFI and AGFI, the increasing values of RMSR and RMSEA indicate a worsening fit (Kline, 2016). SRMR measures the average difference between the observed and predicted correlations and the values range from 0 to 1.00, where value of 0.05 or less indicates a well-fitting model (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003). When SRMR is zero, the model fit is perfect. The RMSEA is a measure of how well the model fits the population, not just the sample which has been used for estimation (Steiger, 1990; Hooper et al., 2008). One of the greatest advantages of RMSEA is its ability to correct for both model complexity and sample size which are all taken into account when it is computed (Hair et al., 2019). It also allows computation of the confidence intervals around its value, thus building a range of RMSEA values for a given confidence interval. If the RMSEA value is less 0.05 with 90% confidence interval, the lower and upper bounds of the confidence interval must be less than 0.05 and 0.08 respectively and with sample size of less than 250 and less than 30 observed variables (Hu & Bentler, 1999; Hair et al., 2019).

3.9.1.1.2 Comparative fit indices

Comparative fit indices measure relative improvement in model fit of the hypothesized model over that of a reference model. The reference model (i.e. baseline model) consists of mutually uncorrelated observed variables. The common examples of goodness of fit indices under this category are Bentler and Bonett's Normed Fit Index (NFI) and Comparative Fit Index (CFI). The NFI's main limitation is its tendency to underestimate fit in small sample sizes, and because of this Bentler (1990) revised NFI and proposed CFI that takes sample size into account. The values for both NFI and CFI range from 0 to 1.00 which are obtained from comparing the hypothesized model with the baseline model (Byrne, 2006) and recommended cut-off value for a well-fitting model is close to 0.95 (Hu & Bentler, 1999).

The variant for NFI is Non-Normed Fit Index (NNFI) which is known for its ability to take model complexity into account and its values can exceed those reported for the NFI and can also be outside the 0 to 1.0 range. Although, NFI, NNFI and CFI are found in the EQS output, Bentler (1990) recommends CFI as a preferred choice of index. Although there is a plethora of goodness-of-fit indices, this study used only those recommended by Kline (2016) and Byrne (2006) because they are popular in research literature and their performance in Monte Carlo research is superior. They suggested to use: (1) model chi-square with its degree of freedom and p-value (for this study it will be Satorra-Bentler scaled chi-square), (2) Comparative Fit Index, (3) Standardized Root Mean Square Residual and (4) Root Mean Square Error of Approximation.

3.9.1.2 Construct validity

Construct validity is referred to as the extent to which a set of measured variables reflect the latent constructs that they are designed to measure (Brown, 2006; Heale & Twycross, 2015; Hair et al., 2019). So, construct validity seeks to establish the accuracy of measurement scales and its existence provides assurance that item measures from the sample are representative of the actual true score in the population (Hair et al., 2019). Construct validity consists of four components: convergent validity, discriminant validity, nomological validity and face validity.

Convergent validity measures whether items in a scale load together on a single latent variable in a measurement scale (Garver & Mentzer, 1999; Brown, 2006). It is indicated by evidence of high correlations of items of similar constructs. Convergent validity is often measured by factor loadings, average variance extracted and construct reliability. When using factor loadings to measure convergent validity, the magnitude of their sizes is of great importance. Only standardized factor loadings from CFA should be used and their values should be high (i.e. 0.5

or higher, and ideally 0.7 or higher) and statistically significant (Garver & Mentzer, 1999; Hair et al., 2019) to suggest convergent validity.

Discriminant validity measures distinctness of a construct from other constructs. It shows the degree to which a construct is poorly correlated to constructs measuring different phenomena (Heale & Twycross, 2015). When discriminant validity is high, it is evident that the construct is unique in some phenomena that are absent in other measures. Discriminant validity is assessed by comparing average variance extracted (AVE) of a construct with its corresponding squared inter-construct correlation estimates (SIC). The rule of thumb is that the AVE should be greater than SICs. If they are, it is indicative evidence that observed variables do have more in common with the construct they measure than they do with other latent constructs. On the other hand, discriminant validity can be assessed with factor correlations. According to Brown (2006), small or weaker factor correlations provide strong evidence of presence of discriminant validity.

3.9.2 Reliability in SEM research

From a quantitative research perspective, reliability is defined as accuracy of an instrument or the degree to which the instrument is a random-free-error and on repeated trials gives the same results (Heale & Twycross, 2015). It shows the extent to which a measure yields the same score when measuring the same object (Atkinson & Nevill, 1998; Frost et al., 2007; Hair et al., 2014). According to Atkinson and Nevill (1998; pg. 219), reliability is "the amount of measurement error that has been deemed acceptable for the effective practical use of a measurement tool".

3.9.2.1 Internal consistency

The primary method of assessing reliability is internal consistency. Several studies have applied this method to estimate reliability for multi-item scales to provide information on the relationships between different indicators in the scale (Frost et al., 2007; Koç et al., 2016). Internal consistency is often indexed by Cronbach's coefficient alpha (α); the most popular reliability coefficient reported in the literature. The coefficient alpha is estimated using the following formula:

$$\propto_{C} = \frac{n_i \overline{r}_{ij}}{1 + (n_i -)\overline{r_{ij}}}$$

Where n_i is the number of items and $\bar{r}_{ij}$ is the average Pearson correlation between all pairs of items.

The benchmark for adequate coefficient alpha is 0.70 whereas alphas of about 0.80 and 0.90 are considered very good and excellent ones respectively (Frost et al., 2007; Kline, 2016). However,

coefficient alpha has several limitations. According to Garver and Mentzer (1999), alpha coefficient tends to be inaccurate, artificially inflated when the scale has many indicators and its assumption of equivalent item reliability is rarely met. As a result, items with artificially high coefficient alphas are mistakenly selected by researchers.

3.9.2.2 Alternative methods of measuring reliability

Several limitations highlighted above make coefficient alpha an inferior measure. As a result, alternative SEM based approaches to estimating scale and item reliability have been suggested. These methods include: R^2 (i.e. squared multiple correlation) that measures item reliability, construct reliability and average variance extracted (AVE). The R^2 measures the strength of linear relationships between a latent variable and its individual indicators and the latent variable is considered a predictor of indicators. The R^2 is given for each equation in CFA and SEM estimations where the highest R^2 signifies the most reliable indicator and vice-versa (Garver & Mentzer, 1999). These alternative measures of item and scale reliability utilize CFA output in their calculation. Therefore, the reliability for each latent variable in the measurement model was computed manually using EQS output.

The construct reliability formula is as follows:

$$\text{Construct Reliability} = \frac{(Sum\ of\ standardized\ loadings)^2}{(Sum\ of\ standardized\ loadings)^2 + Sum\ of\ indicator\ measurement\ errors}$$

A higher construct reliability value indicates that all items represent the same latent variable. The reliability value of 0.7 or greater is acceptable and desirable (Garver & Mentzer, 1999; Hair et al., 2019).

The average variance extracted is the total amount of variance in the indicators explained by the construct. It is the square of a standardized factor loading representing how much variation in a measurable variable is explained by a construct upon which it loads (Hair et al., 2019). A value of 0.5 or higher is a good rule of thumb and indicates adequate convergence(Bagozzi & Yi, 1988; Hair et al., 2019). An AVE can be computed using standardized loadings:

$$\text{Average variance extracted (AVE)} = \frac{Sum\ of\ squared\ standardized\ factor\ loadings}{Numbe\ of\ item\ indicators\ for\ a\ construct}$$

This method assumes that all individual indicators associated with a construct should measure that same construct, thus be highly and positively correlated (Bollen & Lennox, 1991; Hair et al., 2014).

3.10 Common method bias

The common method bias is a systematic measurement error that causes regular or irregular changes in the means, variances or covariances of observations (MacKenzie & Podsakoff, 2012). Evidence suggests that common method biases affects item reliability and validity as well as parameter estimates of the relationships among latent constructs. Thus, method bias can either inflate or deflate the relationships between indicators and the construct (Chang et al., 2010). The presence of a common method bias creates false correlations among items generated by their construct. Podsakoff et al. (2003) identify four sources of common method biases in the measurement instrument: (1) the use of common rater (i.e. self-reports), (2) item characteristics effects, (3) item context effects (4) measurement context effects (i.e. time, location and media).

3.10.1 Sources of common method bias

The use of the same respondent to assess both the independent and dependant variables in field study can result in biased data (Podsakoff et al., 2003; Cheng & Shiu, 2012). In self-reports, for example, the chance for people to appear consistent and rational in their responses or search for similarities in the questions they are asked by researchers is high. As a result, biased relationships between variables are produced. If, for instance, the same respondents are asked by researchers to assess the importance of innovation constraints and firm performance in the same survey, the respondents in these self-report data have a propensity to provide consistent answers to even unrelated questions. There is also a possibility that some respondents rate items highly due to their social acceptability rather than their actual feelings or agree (disagree) with instrument items without considering their content.

Item characteristics effects refer to biases caused by the influence of respondent's interpretation of specific properties or characteristics of the questionnaire items. Characteristics such as item ambiguity and wording (positive or negative), and scale formats and anchors have a greater influence on how people respond to questionnaire items. Item ambiguity and wording creates difficulty to respondents of comprehending questions, retrieving key and relevant information as well as making judgements (Podsakoff et al., 2003; MacKenzie & Podsakoff, 2012).

The item context effects are interpretations that respondents might have regarding an item because of its relationship with other items on that questionnaire. Common sources of this influence are scale length, grouping or mixing of items on the same instrument. For example, a lengthy scale with many items make respondents lose motivation and they may not be able to recall their responses in previous items when responding to other items, or they may provide

sub-optimal answers. Last, measurement context effects are context-related biases resulting from having predictor and outcome variables measured at the same point in time, in the same location or using the same medium (Podsakoff et al., 2003). Thus, these measures are likely to share systematic covariation because of a higher chance of responses to same place or us method biases are inevitable in studies that the data on predictor and outcome variables are collected from the same person,

3.10.2 Remedies for common method biases

The remedies for common method biases proposed in the research literature fall into two main groups: ex-ante procedural remedies implemented in the research design stage and post-statistical analyses to detect and control the biases (Chang et al., 2010). The former category entails steps that the researcher takes before and during data collection that are thought would eliminate or significantly minimize the method biases. Techniques recommended include obtaining measures of independent and dependent variables from different sources, temporal or methodological separation of measurement, protection of respondent anonymity and improving scale items (Podsakoff et al., 2003; Chang et al., 2010; MacKenzie & Podsakoff, 2012).

3.10.2.1 Procedural remedies

Obtaining data from the same respondent is seen as a major cause of common method variance, Thus, constructing the predictor and outcome variables using information from different source can remove method biases (Chang et al., 2010). The advantage of this method is that it is less likely for the mindset of the respondent to bias the observed relationship between independent and dependent variables. However, linking the data from different sources may require revelation of identities of the original sources, which may compromise their anonymity. Similarly, key information in some organizations particularly small firms can only be accessed from one person (i.e. manager or owner). For example, information on strategic decisions such as investments in innovation projects and other activities in such firms is only available from the manager or owner of the business, thus using multiple sources from one organization would not provide accurate and reliable information.

Temporal or methodological separation of measurement is considered when possibility of obtaining data from different sources is very low. The measurement for predictor variables is separated from the scale of outcome variables by a time lag or by allowing respondents to complete each of the two sets under different conditions/circumstances. One advantage of introducing separation method is that it reduces respondents' ability to use previous responses to answer subsequent questions, thus making it difficult for them to maintain consistency.

However, separation of measurement technique requires more time, resources and effort to implement. When respondents know that their responses are anonymous and that there is no right or wrong answer, they are less likely to edit their answers to be more socially desirable or give responses that they think would please the researcher. However, this method cannot be used in conjunction with previously discussed techniques such as separation of sources or measurement of predictor and outcome variables because the identities of respondents will be needed when linking the data together.

Improved scale items increase respondents' motivation of exerting cognitive efforts to retrieve thorough information and respond to items carefully and purposely (MacKenzie & Podsakoff, 2012). The potential remedies for ambiguity of scale items include developing a short scale with simple questions, clear and concise language, providing clear examples of vague concepts, avoiding double-barrelled questions which make information retrieval task more demanding. Guaranteeing respondents anonymity and telling them that there is no right or wrong answer about issues addressed in the questionnaire minimizes the measurement conditions that produce salient responses(MacKenzie & Podsakoff, 2012).

3.10.2.2 Statistical remedies

Statistical methods, alternatively known as post-data collection techniques, are implemented after collecting the data. The most widely used technique is Harman's single factor test where all items are simultaneously entered into an EFA with no rotation, to determine whether the majority of the variance are accounted for by a single factor (Cheng & Shiu, 2012; Rajapathirana & Hui, 2018). If a common method bias exists in the data, then (1) a single factor will emerge from the analysis or (2) general factor will account for the majority of variance (Podsakoff & Organ, 1986; Podsakoff et al., 2003; Heidenreich & Kraemer, 2016).

Despite of being easy to implement, the method appears to have some inherent limitations. First, it is quite possible that more factors will emerge from EFA when the number of items/variables increases, thus making one factor-test less conservative. Second, the technique does not statistically control common method bias (Podsakoff & Organ, 1986). Third, the method lacks specific guidelines on a cut-off point for variance that could be used to determine a general factor(Podsakoff et al., 2003). For example, some studies recommended a cut-off point of 25% (Rajapathirana & Hui, 2018) or 50% (Heidenreich & Kraemer, 2016) of the total variance to conclude existence of the common method bias. Some researchers complemented the Harman's single factor test method with CFA and the hypothesis is that a single factor can

account for all of the variance in the data (Heidenreich & Kraemer, 2016). GOF indices are used to evaluate plausibility of a single factor(Podsakoff et al., 2003).

In this study, the common method biases were addressed by a combination of procedural remedies as recommended by Podsakoff et al. (2003) and statistical control methods. At the procedural level, procedural remedies recommended by Heidenreich and Kraemer (2016) were followed: short measurement scale with clear and concise items and simple questions. Furthermore, respondents were also told in the instructions written on the cover page that the names of their organizations including contacts would not appear in the report. Although, one person in each responding firm provided answers to items of both independent and dependent factors, these individuals were considered to hold relevant information about innovation activities, innovation constraints and strategies employed to overcome innovation constraints.

3.11 CFA measurement model

The measurement model consisted of two groups of latent constructs: exogenous (antecedent) and endogenous (i.e. dependent) latent factors. The first group comprised five exogenous constructs which included entrepreneurial bricolage, financial constraints, knowledge constraints, market constraints and regulatory constraints. The second group consisted of two endogenous latent factors: innovation and innovative performance. Figure 3.2 below shows measurement scales of each latent construct and their indicators. The measurement scale of entrepreneurial bricolage construct was adopted from Senyard et al. (2009) and consisted of 8 items reflecting firm's capabilities to deal with new challenges by combining resources at hand.

The measurement scale of financial constraints consisted of 4 items reflecting perceived importance of (1) interest rates, (2) lack of appropriate sources of finance, (3) high innovation costs and (4) high financial risks in constraining firms' innovation. The knowledge constraints measurement scale was made up of 4 items: (1) lack of qualified personnel, (2) lack of information on appropriate technologies, (3) lack of information on markets and (4) lack of knowledge support from the government and research institutions. Market constraints are market conditions that influence firms' innovation activities in a negative way. Four items made up a measurement scale and included:(1) competition from established and large firms, (2) uncertain demand for innovative products (3) counterfeits and imitated food products and (4) competition from informal sector. Regulatory constraints construct was measured by 4 items: (1) multiple regulators (2) unpredictability of regulations (3) bureaucratic delays in product registration (4) high costs of compliance in constraining innovation.

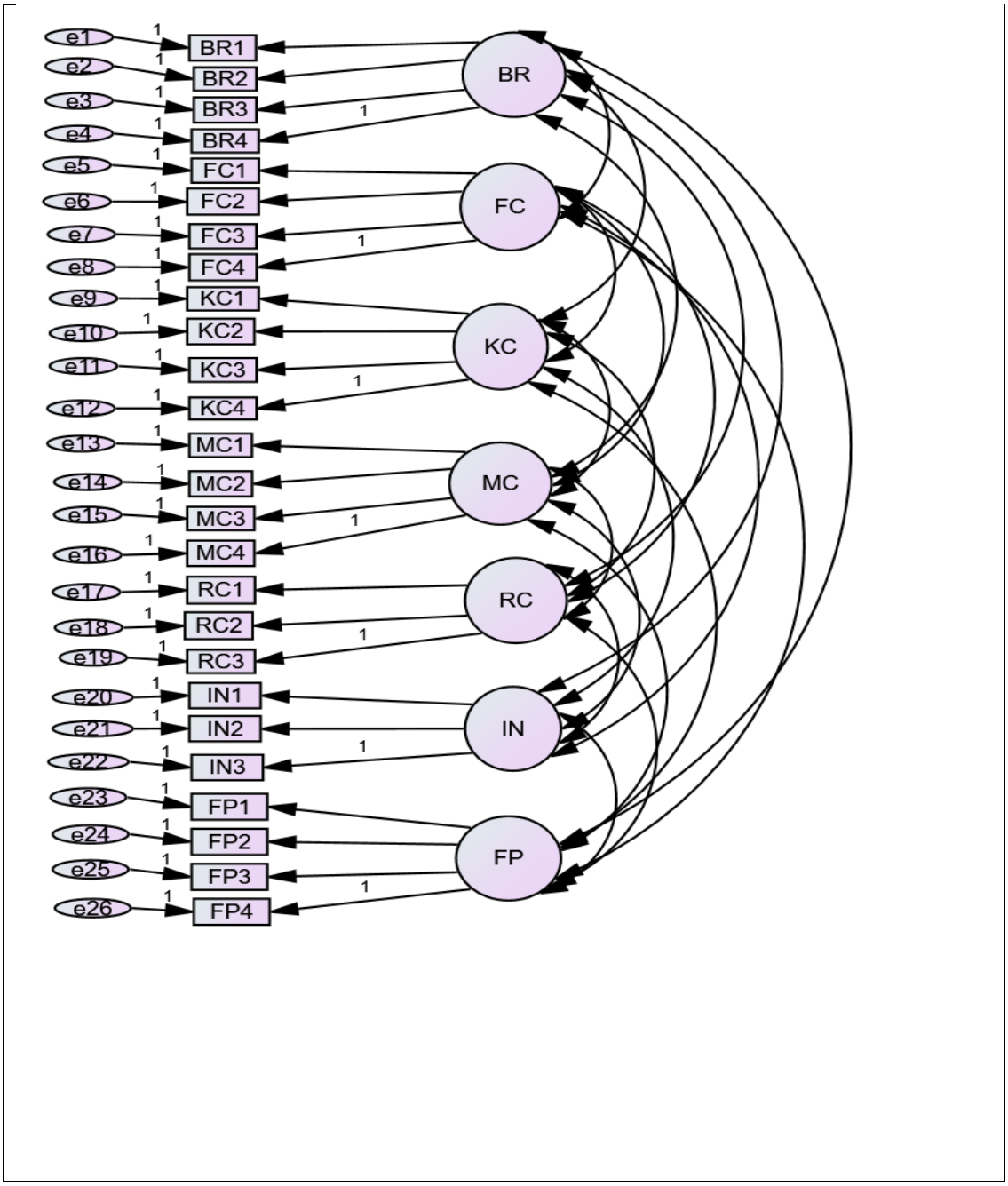


Figure 3. 2 Overall measurement model

Note: BR = Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC = Market constraints; RC = Regulatory constraints; IN = Innovation and FP = Firm performance

3.12 Method of estimation

The study used EQS 6.3 software to conduct CFA on a dataset obtained from the Tanzanian food and beverage industry. The data used in CFA were in the raw matrix form. Brown (2006) recommends using raw data as input when robust maximum likelihood is used as an estimator.

The decision to use robust maximum likelihood as an estimation method was influenced by the sample size (i.e. 248 observations) and violations of multivariate normality assumptions in the dataset which was evidenced by both univariate normality and multivariate normality test results reported along with CFA results. Following Hair et al. (2019)'s recommendation and previous research (Tayal et al., 2019; Wang & Lam, 2019), a single-phase CFA process (full measurement model) was implemented that involved estimation of the entire measurement model (see figure 3.2). Estimating an entire model in a single CFA helps to establish the structure of the observed variables in the context of other variables and to ensure distinctiveness of measures used in the study (Domínguez-Escrig et al., 2018).

3.13 SEM structural model: testing hypotheses

SEM allows to test hypotheses posed at the level of a construct and models with multiple independent and dependent variables at one time (Ullman, 2006). SEM seeks to establish the proportion of variance accounted for in the endogenous constructs (dependent variables) by using the CFA measurement model (Schreiber et al., 2006). SEM testing was split into two parts. The first part of SEM testing was performed to address the first research question which sought to analyse effects of knowledge constraints, financial constraints, market constraints and regulatory constraints and entrepreneurial bricolage on innovation as well as the relationship between innovation and firm performance.

The structural equation model of this part (i.e. baseline model) comprised of five exogenous constructs and two endogenous constructs. Thus, entrepreneurial bricolage, knowledge, financial, market and regulatory constraints were exogenous constructs while innovation and firm performance constituted endogenous constructs. Figure 3.3 provides graphical presentation of the structural equation model.

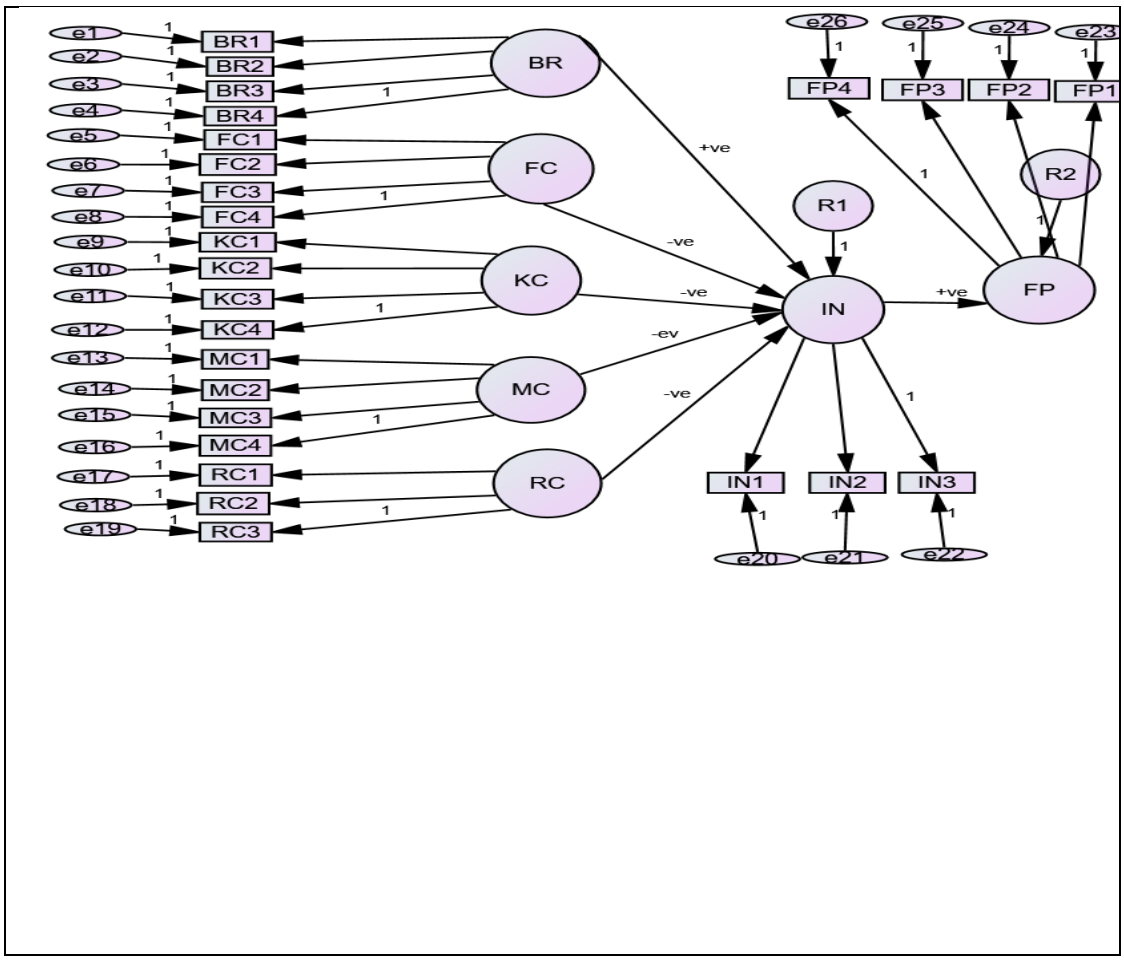


Figure 3. 3 Structural equation model comprising of five exogenous and two endogenous constructs

Note: BR = Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC = Market constraints; RC = Regulatory constraints; IN = Innovation and FP = Firm performance

The second part of the SEM testing addressed the second research question that examined the moderating role of entrepreneurial bricolage in the relationships between innovation constraints and innovation. In this case interaction effects were created and introduced into the estimation process.

3.14 Testing moderating role of entrepreneurial bricolage

3.14.1 Introduction

The second research question sought to examine the moderating role of entrepreneurial bricolage in reducing the impact of various constraints on firms' innovation. Entrepreneurial bricolage was considered an important strategy that entrepreneurial firms in the food and beverage industry would use to cope with knowledge, financial, market and regulatory

constraints. Thus, entrepreneurial bricolage is likely to foster innovative performance by reducing the negative effects of innovation constraints on innovation. To analyse the moderating effect of entrepreneurial bricolage, a structural equation model was constructed comprising nine exogenous constructs and two endogenous constructs. Three of the exogenous constructs were latent product constructs (interaction terms) formed from the interactions of entrepreneurial bricolage with other three innovation constraints. Three out of four hypotheses were tested using a sample of 248 enterprises from the Tanzanian food and beverage industry.

3.14.2 Estimation approaches to interaction effects in SEM

A moderator is factor that changes the relationship between two related latent constructs and it can be either categorical or continuous variable.(Hair et al., 2014). The moderator influences explanatory variables with which it interacts by increasing or decreasing the magnitude of their effects on dependent variables or even change the direction of the relationships (from positive to negative and vice-verse) (Lindley & Walker, 1993; Kim et al., 2001). A variable formed from combining a moderator and another explanatory variable is termed as an interaction term or product variable (Kim et al., 2001). Methods of estimation of interaction effects in SEM fall into two broad categories: multi-group analysis and latent interaction modeling (LIM) (Hair et al., 2010).

3.14.2.1 Multigroup analysis

The multi-group analysis relies on splitting the sample into two groups based on the underlying theory or established criteria. The multi-group analysis tests moderating effects in categorical moderators or in continuous moderators that have been transformed into sensible categorical variables. Splitting the sample into sub-categories often requires theoretical foundation or empirically established values. The analysis involves establishment of measurement invariance followed by assessing structural equation models for moderation by comparing group models.

Hair et al. (2010) demonstrated three stages of implementing this method. In the first stage, hypothesized parameters are estimated freely for each group. The estimated structural model is termed as an unconstrained model. The second estimation is carried out with hypothesized relationships considered to be moderated and are being constrained to be equal in all groups (constrained model). Lastly, $_{\chi}^2$ difference between the models (unconstrained vs constrained) is computed and used to evaluate whether moderating effects exist or not. Existence of a moderating effect is demonstrated by a statistically significant $_{\chi}^2$ difference.

Previous studies (Punjaisri & Wilson, 2011; Cadogan et al., 2012; Watchravesringkan et al., 2013; Chahal & Rani, 2017) relied on total mean scores to create groups. For a latent construct, a single mean index is created by averaging all indicators of the moderating latent construct and cases are grouped based on whether their average scores are above or below the overall mean index. Application of multi-group analysis to this study proved difficult because there was no theoretical justification or established criterion to categorize cases into high or low users of bricolage for innovation purposes. Because of its simplicity, the multi-group analysis has become a popular method of interaction effects in SEM among applied researchers (Punjaisri & Wilson, 2011; Cadogan et al., 2012; Lin et al., 2017).

Although multi-group analysis is an easy and simple method to implement, it is associated with some drawbacks. First, the method requires a larger sample to form sub-groups and each sub-group requires a large sample to obtain reasonable SEM estimations. Second, because of the need for theoretical foundation or established criterion in the formation of groups, it is difficult to come up with logical groups when a theory does not exist, or the moderating factor is either a continuous variable or measured by multiple indicators. There is no theoretical guidance on how to split entrepreneurial bricolage into two groups based on the extent of its use by innovative firms.

3.14.2.2 Latent interaction modeling

Latent interaction modelling (LIM) entails creation of latent constructs (interaction terms) measured by multiple product indicators formed from either centred indicators, residuals of regressions or both. However, there are several challenges associated with LIM especially in finding the most appropriate strategies of forming product indicators, selecting optimal number of product indicators of a latent construct and approaches to analysing interaction terms. These difficulties limit empirical application of LIM approaches by social science researchers.

The latent interaction modeling approaches test moderating effects using latent product constructs created by multiplying the indicators of the moderating latent factor with indicators of other exogenous constructs (Steinmetz et al., 2011). LIM has many techniques that differ in application complexity and ways of creating indicators to measure the latent product constructs. Several approaches exist but the major ones fall into three categories: mean centering, residual centering and double centering approaches.

3.14.2.2.1 Mean-centering approaches

The mean-centering approaches use mean-centred indicators to create indicators that represent the latent product construct. Indicators of the first-order constructs (moderating factor and other constructs) are first mean-centred, then multiplied to create indicators of the latent product construct. There are two main approaches that use latent factors measured by mean-centred product indicators to estimate interaction effects in structural equation models. First, the mean centred constrained approach which was proposed by Kenny and Judd (1984) and improved by Algina & Moulder (2001) imposes nonlinear constraints to the factor loadings and error variances associated with the interaction term (Marsh et al., 2004; Wu et al., 2013).

These constrained parameters are not freely estimated and are defined in terms of the parameters of the measurement models of the first-order effect constructs (Steinmetz et al., 2011). The constraints are imposed because the latent product constructs are assumed to be not normally distributed (Marsh et al., 2004). Many researchers (e.g. Marsh et al., 2004; Steinmetz et al., 2010) criticised the constrained approach on the ground that it is too complicated for an applied researcher to implement due to difficulties in specifying nonlinear constraints. Marsh et al. (2004) emphasized that estimates resulting from constraining parameters based on assumptions of normality are not robust to violation of the normality assumption. Jackman et al. (2011) noted that complexity of the constrained approach has adversely affected its empirical use in applied studies.

In contrast, the mean centred unconstrained approach proposed by Marsh et al. (2004, 2007) does not require imposition of any nonlinear constraints that specify the relationships between the product indicators and latent product construct. The factor loadings and variances of the product indicators are freely estimated. It is a simpler approach to implement and more robust to violation of normality assumptions than the constrained approaches (Marsh et al., 2004; Steinmetz et al., 2010; Wu et al., 2013). However, the unconstrained approach has several limitations including requirement for a large sample of 500 or more and using cumbersome analyses based on mean structures that might be difficult for applied researchers to implement (Lin et al., 2010).

The common problem with mean-centering approaches is that the use of mean-centred product variables is associated with high correlations between product indicators and indicators of the first-order constructs or between latent product constructs and other first-order constructs. Steinmetz et al. (2010) used real data to compare three approaches to analysing latent interaction effects, but two of them used mean-centred product indicators. They found that

product indicators formed from mean-centred indicators were highly correlated with indicators of the first-order factors. Because of high correlations and associated multicollinearity problem, they were unable to detect some first-order effects. Multicollinearity becomes a serious problem especially when product indicators are formed from non-normal indicators of the first-order constructs (Steinmetz et al., 2010).

3.14.2.2.2 Residual centering approach

The residual centering approach is another unconstrained method and was first proposed by Little et al. (2006) and it uses centred residuals formed from regressing product indicators on indicators of constituent constructs. The residuals are then used as indicators to represent a latent product construct. The residual centering approach has two distinct steps. The first step entails multiplication of an uncentred indicator of the moderating factor by uncentred indicator of another constructs. The resulting product is regressed onto all indicators of the two constituent constructs. The residuals of the regression analyses are saved and used as indicators of the latent product construct when an interaction effect is analysed. The analysis of interaction effects using a residual centering approach is based on Marsh et al. (2004)'s unconstrained approach which ignores all nonlinear constraints. Little et al. (2006), Steinmetz et al. (2010) and Geldhof et al. (2013) provided illustrative demonstrations of how to apply the residual centering approach in the context of structural equation modeling.

Little et al. (2006) provide reasons as to why residual centering approach is superior over other approaches and stated that orthogonalized terms are stable. This means that estimation results such as regression coefficients and standard errors of the first-order effects remain unchanged even when interaction terms are introduced in the estimation process. Moreover, significance of the product term remains unbiased by the orthogonalizing process. Similarly, Geldhof et al. (2013) argued that residual centred approach is an appropriate method that provides complete elimination of collinearity between interaction terms and their constituent first-order constructs as well as collinear variability from individual constructs. There are zero correlations between product indicators (residuals) and the first-order factor indicators (Steinmetz et al., 2010).

However, a few drawbacks have been identified in relation to the residual centering approach. According to Geldhof et al. (2013), performance of the residual centering approach depends on meeting normality assumptions and a slight degree of nonnormality in the data creates problems. Another drawback is that it tends to produce biased model fit indices including inflated degrees of freedom. These biased estimates need to be corrected using formulae that

may seem too complicated to implement for an applied researcher who is unlikely to possess a solid statistical background.

3.14.2.2.3 Double-mean centering approach

The double-mean centering approach, first proposed by Geldhof et al. (2013) addresses multicollinearity and complexity issues associated with both mean-centering and residual centering approaches. This approach combines the aspects of mean- centering and residual centering approaches. The approach is implemented in two inter-related steps: mean-centering and orthogonalizing. In the first step, all observed variables of the first order constructs are mean-centred. The mean-centred indicators of a moderating latent construct are then multiplied by mean-centred indicators of other exogenous constructs to form product indicators. Residuals are created in second step by regressing product terms on constituent mean-centred indicators (orthogonalizing). The residuals are then used as indicators of the latent product constructs. The orthogonalizing process differs between matched-pairs and all-possible pairs strategies. The regression of the product term is done on its two-constituent mean-centred indicators if the matched-pairs strategy is adopted and, on all mean-centred indicators of the two constituent constructs for the all-possible pairs' strategy. In addition to existence of competing interaction estimation approaches, two more areas seem to create ambiguity to applied researchers. These issues are related to the type and number of product indicators used to represent the latent product construct.

3.14.2.2.4 Selection of indicators when constructs are represented by large and unequal number

Another consideration in LIM approaches is how to select indicators to use in the construction of product indicators when exogenous constructs are represented by large and unequal numbers of indicators. To address this dilemma, Marsh et al. (2004) proposed two types of strategies for formation of product indicators. The first strategy uses item parcelling where indicators of the larger scale are parceled in a way that they match in numbers with indicators of the smaller scale. The parceled items are treated as individual indicators of the latent construct which are then used to form product indicators in a matched-pair strategy or all-possible cross product strategy (Wu et al., 2010). However, Marsh et al. (2004) suggested using parcels only for construction of product indicators and that individual indicators of the first-order constructs must be maintained to avoid more problems associated with parceling. Foldnes and Hagtvet (2014) noted that parceling strategy is a remedy to model complexity when sample size-to-parameter ratio is low.

The second strategy is to select the most reliable indicators from a larger scale to match with those indicators in the factor with fewer items (the best items matching). Wu et al. (2010) defined reliability of indicators in terms of standardized factor loadings. After selecting a required number of items from a larger scale, items with relatively low reliabilities are discarded. Using the most reliable indicators is also a recommended strategy for combining items of two constructs in the construction of product indicators in the matched-pair strategy where items are matched according to reliability. Several researchers (e.g. Marsh et al., 2004, 2007; Wu et al., 2010) recommended the matched-pair strategy for formation of product indicators by using the best items with the highest reliability.

3.14.2.2.5 Strategies for construction of product indicators

Marsh et al. (2004) proposed a matched-pair strategy while Little et al. (2006) recommended an all-possible pairs strategy for the construction of product indicators. According to Marsh et al. (2004), the matched-pair strategy entails using all indicators of the first order constructs, but each indicator is used only once to construct product indicators. This strategy is based on two guidelines: (1) Use all information. This means all multiple indicators of the first-order constructs are used in the construction of indicators for the latent product variable. This guideline can be applied when the number of indicators is small. (2) Do not reuse any information. This means that indicators of the first-order construct should be used only once in the construction of indicators of the latent product factor. Using indicators once prevents artificially correlated uniqueness resulting from using the same indicator more than once to create product indicators (Marsh et al., 2007). However, this second guideline assumes that all first-order constructs have equal number of indicators, something which is unrealistic in practice. Generally, the authors did not provide any guidance on how to select the indicators from the first-order latent constructs if the number of indicators is unequal among constructs. Neither did they suggest how to combine first-order indicators to form product indicators when first-order factors have equal of number of indicators.

In construction of product indicators in the matched-pairs strategy, items can be combined in random ways or based on their reliabilities. Previous studies indicated that methods of combining items in a matched-pairs strategy significantly affect estimated interaction effects. Foldness and Hagtvet (2014) conducted three post hoc studies using real-world data to investigate how randomly combined items in 3-matched pairs and 4-matched pairs influenced interaction effects. The findings indicated variations in terms of estimated interaction effects, values and statistical significance within and across matched pairs. In some pairs (both 3-matched and 4-matched combinations) the interaction effect was statistically insignificant.

However, Marsh et al. (2004) simulation studies showed that interaction terms whose product indicators were formed from the most reliable indicators (highest factor loadings) of the first-order constructs exhibited more precise estimates of the interaction effect than interaction terms with different combinations.

The all-possible pairs strategy makes use of all possible pairs of indicators to form product indicators. An indicator from a moderating construct is combined with each indicator of an exogenous construct to form product indicators (see Little et al., 2006; Steinmetz et al., 2010). The process is repeated until all indicators of the first exogenous construct are used. This strategy allows one indicator to be used more than once to create multiple product indicators. For example, from two constructs with two or three indicators each, four (2x2) or nine (3x3) possible product indicators can be created respectively. Although this strategy supports the idea of using all the information as per first guideline suggested by Marsh et al. (2004), it is at odds with the second guideline of not re-using the same information.

Foldness and Hagtvet (2014)'s study indicated superior performance of all-possible pairs' strategy over the matched-pairs strategies in terms of convergence rate, standard error bias, type I error control and power. Convergence rate increased as the number of product indicators increased, contrary to results obtained by Marsh et al. (2004). Based on these findings, they recommended the all-possible pairs strategy over matched-pair strategy in the construction of product indicators. However, they cautioned the possibility of having unacceptable performance in terms of standard error bias and Type I error due to many free parameters relative to sample size. Because of this they suggested to consider the ratio of sample size to free parameters when choosing an all-possible cross product.

However, one potentially important limitation with this strategy is an increasing number of product indicators and free parameters which may lead to other problems such as nonconvergence and other model estimation problems (Marsh et al., 2004). Model complexity increases with increasing number of indicators (Marsh et al., 2007). As models become complex with larger numbers of parameters relative to sample size, the possibility of standard error bias and Type I error is high (Foldnes & Hagtvet, 2014). The fact that one indicator is used several times to construct multiple product indicators, it is necessary to incorporate a network of correlated uniqueness to compensate for artificial correlations among product indicators (Marsh et al., 2007).

The literature suggests that superior performance of one strategy over other strategies hinges on how items are combined in the construction of product indicators and the number of indicators used. If item combination is based on reliabilities (using the best items in matching) the matched-pair strategy exhibits better performance than the all-possible pairs strategy (Marsh et al., 2004; Wu et al., 2010). But random combinations of items in the creation of product indicators in the matched-pair strategies produces poor results compared to the all-possible strategy (Foldness & Hagtvet, 2014).

3.14.2.2.6 Choosing an optimal number of product indicators

Another critical issue in modeling interaction effects is choosing an optimal number of indictors to represent a latent product factor. Different suggestions have been provided ranging from the use of a single indicator to more than three product indicators to measure latent product factors. Previous studies (Marsh et al., 2004; Wu et al., 2010) seemed to favour three product indicators and described them as a reasonable minimum number that would help to avoid model complexity resulting from a relatively larger number of indicators. Steinmetz et al. (2010) offered similar suggestions of using three or four indicators for a latent product construct because such number of indicators makes it possible to control for different types of random and non-random measurement errors. On the other hand, fewer product indicators than three leads to partial control for the measurement errors that may cause larger observed standard deviations and estimated standard errors (Marsh et al., 2004; Steinmetz et al., 2010).

In situations where the number of indicators in exogeneous constructs is more than three, Wu et al. (2010) suggested three product indicators that can be constructed by selecting the best three indicators with the highest reliability from each of the two constituent constructs. For simplicity and parsimony, they suggested using a three-product indicators design (i.e. 3-match) because more and exhaustive product indicators for the interaction terms add no advantage. Several methodological studies (e.g. Little et al., 2006; Lin et al., 2010; Marsh et al., 2004; Wu et al., 2013) used factors defined by three indicators to create three product indicators in their demonstration for the application of different approaches to estimating interaction effects or strategies of combining indicators of first-order factors to form product indicators.

Thus, based on review of existing LIM literature, this study applied a double-mean centering approach for testing the moderating role of entrepreneurial bricolage in reducing the impact of innovation constraints on innovation due to its ability to address issues of multicollinearity and model complexity which are more common in other techniques. Three product indicators represented each product latent construct and were constructed by matching the best items as

evidence suggests that three indicators to represent a latent product construct is an optimal number.

3.15 Qualitative research methods

3.15.1 Interview guide for qualitative phase

An interview guide is a structured list of areas, issues or questions that will be asked in a semi structured interview (Bryman & Bell, 2015). The use of an interview guide provides a consistent patway in data collection and analysis and helps to improve reliability in qualitative research (Alam, 2005). Bryman and Bell (2015) outlined basic elements to take into account when designing an interview guide: (1) the order of interview questions should follow the order of issues to be covered, allowing the possibility of altering the order during fieldwork, (2) avoiding formulation and asking lead and specific questions and (3) Using comprehensible and relevant language to interviewees. Ivankova et al. (2006) offer further practical guidelines for designing mixed methods sequential explanatory design and these guidelines were followed when designing an interview guide for this study. The interview guide was directly informed by the findings of quantitative phase and literature on factors constraining innovation and mitigation strategies for innovation constraints.

The purpose of collecting qualitative data was to help explain and elaborate quantitative findings. More importantly was to produce a whole lot of responses about how innovative firms dealt with specific innovation constraints in their innovation process. The interview protocol consisted of open-ended questions that gave respondents freedom in their answers and to elicit unexpected, but important responses. The interview protocol was designed in such a way that it would generate the data that can help explain quantitative findings. For example, the quantitative results showed that financial, market and regulatory constraints were significant innovation constraints while knowledge constraints were of less significance. The influence of entrepreneurial bricolage on reducing the impact of innovation constraints was partial. Explanation for these findings was expected to come from qualitative data.

The interview guide was divided into four main areas of inquiry: (1) respondent's and firm background questions (2) innovation activities and sources of ideas (3) constraints to innovation and (4) other issues. Questions about mitigation strategies for innovation constraints were asked as follow-up questions if the respondent's response indicated experience of an innovation constraint. As it can be seen from appendix 4 the interview guide had questions that required respondents to tell the story about their own experience in the industry and managerial

responsibilities, company's main products, innovation activities and sources of innovative ideas, constraints to innovation and mitigation strategies for the constraints in their organizations. The questions were not specific because they allowed alternative avenues for probing questions about the constraints mentioned in the story, their impact on innovation, and how they were dealt with.

3.15.2 Sample size and Sampling procedures for qualitative phase

There is no consensus among researchers on adequate sample sizes needed and sample size determination approaches in qualitative research. According to Bryman and Bell (2015), it is impossible to determine an appropriate qualitative sample size (i.e. point of saturation) in advance if sample selection is guided by theory. Although different approaches have been proposed and adopted in the literature, notable differences in acceptable sample sizes exist within and across various approaches (see Korstjens & Moser, 2018; Sim et al., 2018 for review of approaches and guidelines). Patton (2002) (as cited by Teddlie, 2009) argues against establishment of rules for sample size in qualitative research. Teddlie (2009) noted that recommendations for minimum sample sizes proposed by various qualitative research methodologists are based on their own research experiences and sample sizes reported in journals and various research reports. The type of research design, purpose of the study, availability of research funds and researcher's time and circumstances arising during field work etc. are important factors influencing sample size in qualitative research (Teddlie, 2009; Bryman & Bell, 2015).

Theoretical saturation is often employed as a principle to assess adequacy of sample size (Bryman & Bell, 2015) in purposeful sampling procedures, but the criteria for establishing achievement of saturation are generally absent (Guest et al., 2006). Saturation is point at which interviews no longer generate new information. In mixed methods research studies, qualitative sample size is determined by the design of the study and degree of dominance of the two strands of research. Teddlie (2009; pp.184) proposes a simple rule for determination of sample size which emphasizes "*representativeness/saturation trade-off: As more emphasis is placed on the representativeness of the QUAN sample, less emphasis can be placed on the saturation of the QUAL sample and vice versa".* Given the fact that the dominant component of this research was a quantitative strand and that reseracher's time (about three weeks of fieldwork) and resources were limited, a sample size of 17 managers/owners of innovative firms was considered adequate. The qualitative research aimed to provide additional insights into the quantitative findings. This number of firms was selected from innovative small firms, medium sized firms and large firms which had also experienced higher levels of innovation constraints.

Interviews were conducted with managers/owners of firms from four regions (i.e. Arusha, Dar es Salaam, Dodoma and Kilimanjaro). The selection of four regions was based on the number of respondents from the three sub-sectors. For example, Dodoma and Kilimanjaro recorded the largest number of respondents from edible oil and coffee processing sub-sectors respectively, but also some firms producing beverages. Dar es Salaam and Arusha had the largest number of producers of beverages (almost equal number) in the sample. A considerable number of edible oil processors was also recorded in Arusha region. The choice of four regions resulted into a new sampling frame of 162 firms which was equivalent to 65.3% of the total survey sample. The selection of responding firms followed intensity sampling procedures(Teddlie, 2009) which were based on quantitative results. The approach entails selection of sample units based on values/numbers obtained from quantitative findings. The selection criteria for a final sample were innovation intensity (i.e. number of innovation introduced) and intensities of constraints (measured as an index on a Likert scale of the importance of constraints in constraining innovation with the range of 1 to 5).

In oder to have a sample that reflects a population in terms of firm size, the new sampling frame was organized into three size categories: small firms (93 firms), medium sized firms (56) and large firms (13 firms). Two pieces of information were used to select firms for the interviews: number of innovation activities and mean scores which computed using respondents' ratings (on five-point Likert scales) of the importance of constraints to innovation in constraining innovation activities. These criteria were developed based on empirical evidence that suggests that more innovative firms experience more constraints than less innovative firms and that the introduction of innovations is an indication of existence of diverse mitigation strategies for innovation constraints (Larsen & Lewis, 2007a; Madrid-Guijarro et al., 2009a; Coad et al., 2016b). Applying the number of innovation activities criterion, only firms that had undertaken at least three innovation activities were selected. Using the mean score criterion, only firms with aggregate score on each of the four constraint constructs above the construct's mean score qualified for inclusion in the sample. The final sample comprised of 42 firms, of which 17 were small firms, 18 medium sized firms and 7 large firms. Figure 3.5 below illustrates selection procedures for qualitative sample.

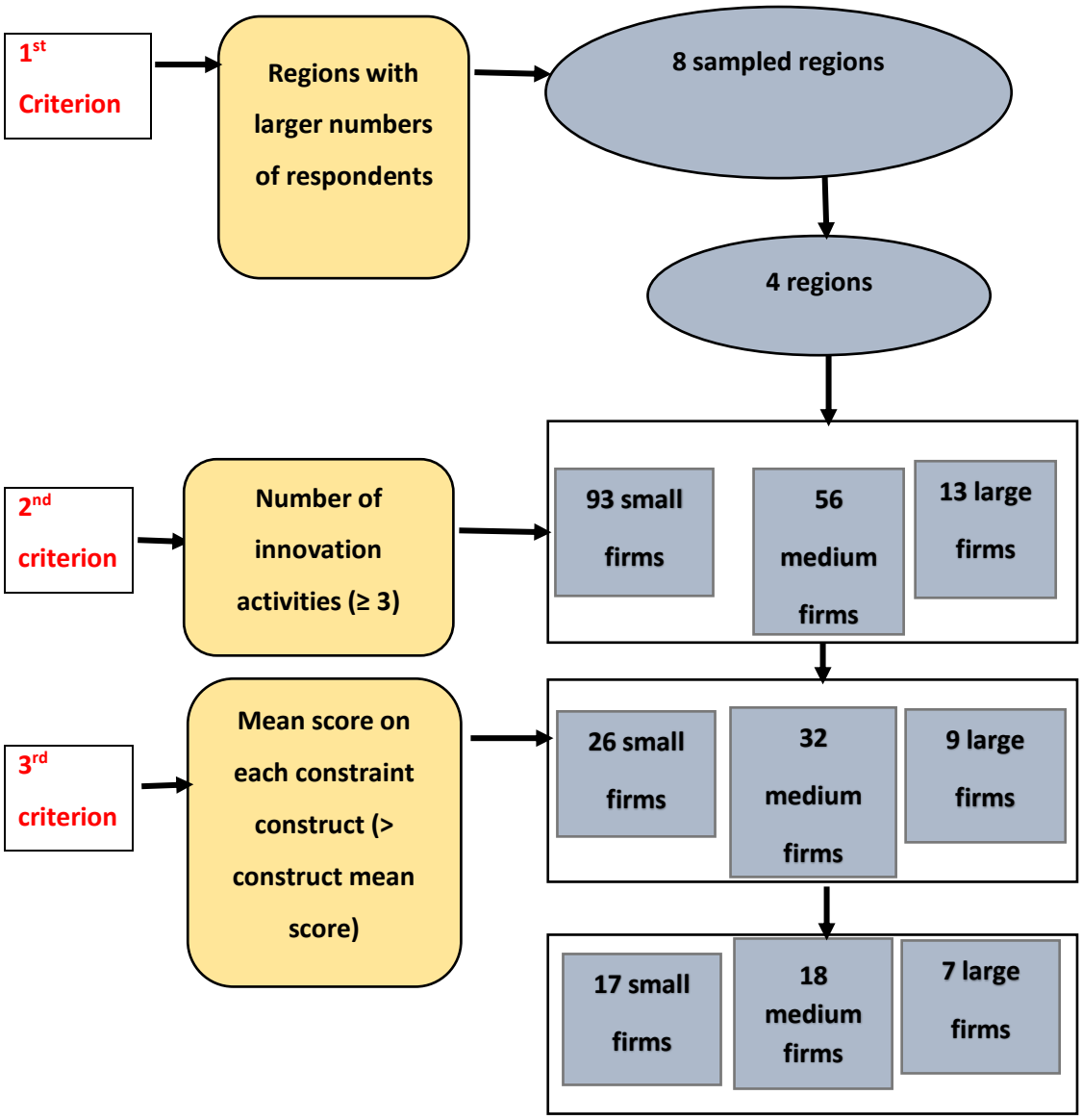


Figure 3. 4 Selection procedures for qualitative sample based on quantitative findings

3.15.3 Semi-structured interviews

The second phase of sequential design (semi-structured interviews) started immediately after collecting and analysing the quantitative data. This phase sought to gain more insights into firms' innovation constraints and their root causes, effects on innovation activities and how they were mitigated. The sample of 17 firms drawn from the quantitative sampling frame (population of 248 firms) included 4 small firms, 8 medium sized firms and 5 large firms from beverages, edible oil and coffee sub-sectors.

This strand of the study employed semi-structure interviews with open-ended questions. The semi-structured approach was chosen because it allows the interviewer to maintain consitency

over concepts that are to be covered in each interview (Corbin & Strauss, 2016) and is useful when there is no direct observation of participants (Creswell, 2014). Interviews with open-ended questions offer the reseracher an opportunity to get in-depth information by further probing (Creswell, 2014; Walter, 2015). Although in-depth face-to-face interviews is expensive method in terms of financial resources and time, it is of great value because it provides a room for visual aids and observations as supplemental methods of data collection (Walter, 2015). The face-face interviews is the most common approach in qualitative studies in exploration of mitigation strategies for innovation constraints (Baker & Nelson, 2005; Larsen & Lewis, 2007b; De Massis et al., 2018).

The first interview took place on 26th June, 2017 and the last one on 18th July, 2017 (see table 3.3 below for interview schedule). A draft interview guide was first pilot-tested to two managers/owners of known to the researcher from Kilimanjaro region. The two firms were medium sized coffee processors. The results of pilot-testing led to minor changes, for example, a question that asked interviewees to give a description of the main company products was added. Most of contact details of all selected firms for interviews were obtained from survey questionnaires.

Table 3. 3 Interview schedule

Date	**Location**	**Type of data collected**
21st - 23rd June, 2017	Dar es Salaam	Pre-testing interview protocol
26th – 29th June, 2017	Moshi - Kilimanjaro	Interviews
3rd - 6th July, 2017	Arusha	Interviews
10th – 14th July, 2017	Dodoma	Interviews
17th - 21st July, 2017	Dar es Salaam	Interviews

The researcher first made telephone calls to seek informants' verbal consent and book appointment for interviews. Those who accepted the request for being interviewed were also asked to indicate convenient date and time for interviews. Most of the interviews took place at key informants' premises, with exception of three respondents who opted to be interviewed outside their offices and after working hours. All 42 firms in the selected sample were contacted to ask if they would take part in the interview, but 15 refused and 27 agreed to participate. The main reason for refusal was lack of time, but three managers declined to be interviewed because

they thought that the researcher was a government official who was trying to investigate their business affairs. Although 27 firms agreed to participate, 10 of them could not be interviewed due to the fact that they proposed interview dates which were not suitable for the researcher.

All interviews were conducted by the researcher himself and followed a protocol which consisted of questions relating to manager/owner's and business history, innovation activities and sources of innovative ideas, constraints to innovation and mitigation strategies for the constraints with opportunities for follow-up probes (see appendix 4 for actual interview guide). Undertaking all interviews by the same researcher prevents the possibility of any inter-interviewer variability (Hardman et al., 2017). Before the start of any interviews consent was sought from interviewees to use a digital recorder to record interviews, but only two respondents declined.

The interviews first explored the firms' current and previous products, innovation activities and sources of information for innovative ideas and other issues related to their background. These questions allowed an understanding of the firms' historical background, main products and innovation activities. Respondents were then asked to reflect on what constraints they had faced when innovating and how they dealt with them. The respondents were probed for further information on the nature of constraints, their causes and impact on innovation and business operations in general. The duration of interviews varied from 38 to 65 minutes. The interviews were conducted in either Swahili or English language depending on the respondent's preference. Those interwiews in Swahili language were translated into English during transcription.

3.15.4 Qualitative data analysis

Qualitative analysis expanded on initial understanding gained from quantitative analysis. Thus, this study's data analysis followed a sequential mixed data analysis strategy (Teddlie & Tashakkori, 2009), where quantitative data analysis preceeded qualitative analysis. A critical aspect in qualitative data analysis is how to make meaning from the data answering how and why questions (Wills, 2015). The main objective of qualitative phase was to obtain in-depth understanding of innovative firms' experiences of innovation constraints. They were asked to provide descriptions of (1) the nature of innovation constraints they identified as severe in the quantitative analysis, (2) how they affected innovation activities and (3) how they were overcome.

The qualitative interviews were then analysed using template analysis- a style of thematic analysis whose analytical goal is to summarize major themes into levels (template) that the

researcher had first identified as important ones. The themes are often identified by the researcher from either existing literature or textual data (King, 2004). Template analysis is a flexible form of thematic analysis which allows introduction of a priori themes, organization of themes in levels or to construct relationships among themes (Brooks et al., 2015; Hesse-Biber, 2018). These distinctive features of template analysis make it become an analytical method applicable to a range of epistemological positions (King et al., 2013). Unlike other thematic approaches to data coding, template analysis does not dictate a set sequence of coding levels (Brooks et al., 2015).

Template analysis begins with creation of an initial template based on a set of question areas; probes covered in the interview guide. The template normally consists of highest-order codes which can be sub-divided into one or more levels of lower-order codes. Often, the main questions from the interview guides serve as the higher-order codes while probes and subsidiary questions form lower-order codes (see King, 2004 for illustration of template analysis). Template analysis is a particularly useful method in explanatory sequential designs since several a priori themes are derived from the findings of the quantitative phase. For example, Hesse-Bibe (2018) employed template analysis and used findings of the quantitative phase as a starting point for construction of themes when analysing qualitative data. As it can be seen from appendix 6, there were five highest-order codes which were divided into several sub-divisions ranging from one to seven.

Examples of a priori themes identified from previous studies and quantitative findings of this study included sources of ideas (i.e. customers, suppliers, competitors, business association etc), types of innovations (product, process, market and organizational innovation), financial constraints (i.e. lack of finance, high interest rates etc), knowledge constraints (lack of skills), market constraints (sluggish demand, counterfeits, intense competition, regulatory constraints (multiplicity of regulators, uncertainty of regulations and high tax rates. Themes such as shortage of raw materials, lack of government support, lack of emotional support etc) were derived from textual data. Similarly, themes related to root causes, consequences and mitigation strategies were derived from qualitative data and centred around innovation constraints.

The qualitative data (both in audio format or field notes) were first organized into transcripts and the analysis began with a set of pre-defined broad codes (e.g. respondent's and firm background, types of innovation introduced, sources of ideas and innovation constraints). These were the first level codes. The second level themes for each of the first level theme were

developed from quantitative research findings and through reading transcripts.The first level-one code was “informant’s background” which comprised three level-two codes: respondent’s managerial position in the firm, level of education and years of experience in the industry. Level-two codes helped to identify some managers/owners’ characteristics which were important in the introduction of innovation and overcoming innovation constraints. The second, third and fourth level-one codes were firm chacteristics, types of innovations introdued and sources of ideas respectively.

The fifth level-one code was related to “innovation constraints” and comprised five level-two codes which were derived from quantitative research findings and interview data. The five level-two codes were financial constraints, knowledge constraints, market constraints, regulatory constraints and other constraints. Further sub-divisions could be made to the five codes and they generated individual constraints to innovation. For example, three constraints were identified under “financial constraints” level-two code and seven constraints emerged as level-three codes under “other constraints” level-two code (see appedix 6). All themes (i.e. level four codes) related to root causes, consequences and coping strategies were developed around each second level theme categories of innovation constraints and the coding followed a bottom-up approach. The bottom-up approach to adding new themes uses *“a priori themes far more tentatively, if at all, in the development of their template”* (Brooks et al., 2015; pp.9).

Template analysis uses a mix of top-down and bottom-up coding approaches where the former is applied to analysis of text segments which are related to the pre-defined codes they best reflect. For segments of texts which do not fit the pre-defined categories are coded to a temporary theme category and then elevated to a full theme if more data fitting that category are available. This kind of procedure is referred to as bottom-up approach (Brooks et al., 2015). The analysis of qualitative data involves creating structure and bringing order and meaning to tex-based data where coding process is vital (Hilal & Alabri, 2013). Nvivo is one of the types of sofware which offers unique features that allow qualitative researchers to accomplish the coding process systematically and with flexibility in creation of codes.

The study used Nvivo software versions 11 and 12 to analyse the qualitative data. All interview transcripts were imported into Nvivo in a word-format. The nodes were first created to represent different level-one and two codes (i.e. themes). The nodes for level-three and consequent codes were derived from imported data.

3.15.5 Validity and reliability issues in qualitative research

Validity and reliability are important aspects that should be maintained to ensure trustworthiness of qualitative research (Sharts-Hopko, 2002). Reliability in qualitative research is defined as the degree to which the findings are trustworthy (Noble & Smith, 2015) while validity is conceptualized as truth in presentation of participant' experiences with clear outline of researcher's personal experiences and viewpoints that may have resulted in methodological bias (Noble & Smith, 2015). Unlike quantitative researchers who apply statistical methods to test reliability and validity, qualitative researchers take actions that ensure accuracy and inclusiveness of findings as tests of trustworthiness (Perakyla, 1997; Noble & Smith, 2015).

Sharts-Hopko (2002) suggests three measures of reliability in qualitative research: (1) credibility (2) transferability and (3) confirmability. Credibility is indicated by the amount of time the researcher spends with the research participants. Long and Johnson (2000) argue that prolonged time the researcher spends with research participants in their natural settings increases the chances of obtaining accurate results because it is possible to share those results with participants (i.e. member check). Member check allows respondents to offer comments and clarifications of some issues that arose during data collection. Extended time in the field also gives researchers an opportunity to assess creditability of their findings by comparing with what is currently known (Sharts-Hopko, 2002).

Transferability refers to adequate description of participants' experiences (data) to allow comparison or other people to evaluate the extent to which the findings apply to their situations (Krefting, 1991; Sharts-Hopko, 2002). The last aspect is confirmability which refers to detailed documentation of procedures starting from initial outline through development of methods, data analysis and reporting and interpretation of findings. It is entails comprehensive description of data collection process, sources, data analysis including the software used (if any) and requests received in relation to the conduct of the study and findings from various interest groups (Sharts-Hopko, 2002).

Several researchers have prescribed different procedures to follow as evidence of demonstrating reliability and validity in qualitative research. For example, Silverman (2000) argues that validity and reliability are contingent on the degree to which the researcher shows their audience the procedures used in the study. Long and Johnson (2000) call for use of multiple sources of data, investigators and data collection methods (triangulation) in order to deal with research bias. Hayashi Jr et al. (2019) insist on demonstrating actions at every stage of a research process as a means of achieving validity and reliability in qualitative research. Steps taken to

verify reliability and validity at the end of the study run the risk of missing serious threats occurring during the study that could be difficult to correct (Morse et al., 2002). They, therefore, challenge the idea of using post-hoc evaluation measures by suggesting that rigour is embedded in the research process itself. Hayashi Jr et al. (2019)'s suggestion of observing issues that enhance reliability and validity at every stage of the research process were implemented in this study. The measures taken at various stages are outlined in the table below.

Table 3. 4 Measures to improve validity and reliability in qualitative research

Research stage	Recommended actions	Importance of action	Actions taken/not taken
Before data collection	Previous involvement in the field	Helps the researcher to better know the object (participants), the context and peculiarities of the studied phenomenon. It also makes data collection and analysis more appropriate and fruitful.	The researcher had two years of experience in the industry as a trainer prior to conducting this research.
	Pilot testing	Instrument refinement following pilot testing results are crucial to ensure achievement of validity and reliability	The supervisor and one expert in the field of entrepreneurship and innovation reviewed the interview protocol. It was also pilot tested to two firms before the fieldwork. Their input was used to refine it.
During data collection	Prolonged time with research participants	Gives the researcher(s) an opportunity to invite participants to comment on the research findings and themes	The time (about one month) spent in the field was not enough for participants to comment on the findings. A large part of data analysis was done after field work. However, there was extensive exposure of the researcher in the field with 17 in-depth interviews

	Recording audio interviews	Allows repeated revisiting of the data to check emerging themes and remain true to participants' accounts	The audio recorder was used to record interviews to support data analysis.
	Data triangulation	Using different methods may produce a more comprehensive set of findings	Cross-group analysis was done to compare innovation activities and source of ideas between SMEs and large enterprises. Comparison was also made between the findings and the literature.
	Member check: feedback with informants and experts	Helps to clarify hypothetical situations	Four brief follow-up telephone interviews were conducted with participants to clarify on some issues (themes) that emerged from the analysis. Supervisors have checked and commented on the findings.
Data analysis and writing up of findings	Rich detailed description of participants' experiences		Detailed descriptions of constraints and ways of dealing with them are found in the findings chapter

	Discussion of emerging themes with people with qualitative research expertise	Helps in challenging assumptions, reaching consensus and reducing research bias	Comments have been solicited from supervisors.
	Use of rich and thick verbatim extracts from informants	Assists the reader to make judgements whether the final themes are true to participant's accounts	Extracts from interview transcripts were used support arguments in the findings section
	Rich detail of context, settings including participants	Facilitates evaluation of study conclusion and transferability of findings to other settings	The context and settings have been described in detail in the preceding sections of this chapter
	Transparent and clear description of the research process from initial outline through development of methods and reporting of findings including maintaining a diary	Procedures can be followed and applied to other settings (auditability)	This has been described fully in preceding sections of this chapter and in the findings chapter

	documenting challenges and issues assisted		
	Saturation	Results in more in-depth data	A complete set of a priori themes were represented in the data
After data analysis	Peer review	Reviewers help to build good practice that encourages more valid results	Not yet implemented, but the plan is to publish each of the three findings chapters in different peer reviewed journals
	Presentation of findings to conferences	Feedback received from conference participation serves to refine discussion of the results	Not yet taken, but I expect to attend at least two conferences to present my research findings before final submission.

Source: Adapted from Noble and Smith (2015) and Hayashi Jr et al. (2019).

3.16 Ethical consideration

As research in social science discipline involves human interactions (Teddlie & Tashakkori, 2009) ethics consideration becomes a critical aspect and its observance should start from proposal writing to dissemination of research findings (Walter, 2015). Creswell (2014) notes that in addition to observance of ethical issues in data collection, analysis and interpretation, research problem and questions should reflect elements of ethics. Key issues in ethics are confidentiality, right to privacy and informed consent that should be observed to protect participants from being harmed. This research was carefully planned by following ethics procedures of the University of Hull, which included obtaining ethical approval before embarking on data collection (see appendix 1). In addition, ethical approval was obtained from the Open University of Tanzania. The Open University of Tanzania like other higher learning institutions in the country grants research clearance to its members (both students and academic staff) on behalf of Tanzania Commission for Science and Technology (COSTECH) which is the country's research clearing house (see appendix 2).

All participants were assured of preservation of their anonymity and strict confidentiality of information obtained from them. Anonymity can be achieved by allocating unique numbers to questionnaires, instead of using company names or instructing respondents not to reveal their identity. Informed consent was sought from key informants before completing the questionnaires and engaging in interviews. This was completed by developing an informed consent form which they signed to indicate their willingness to take part in the study.

Chapter 4 QUANTITATIVE FINDINGS PART 1

4.1 Introduction

The samples for this study were drawn from manufacturing firms in the Tanzanian food and beverage industry. The list and contacts of firms in the sample were obtained from the databases maintained by the Ministry of Industries, Trade and Investment's (MITI) and National Small Industries Organization (SIDO). The MITI's database is a collection of all registered businesses in the country, whereas, SIDO's database contains information on SMEs. The two databases provide comprehensive and update information on registered businesses (information about firm's location, main activity, contacts and number of employees) in the country. Access to such information is available upon request. The MITI's database contains 48,474 manufacturing firms, out of which 19,773 are manufacturers of food products and beverages. The disaggregation of the list of food and beverage manufacturers into size classifications resulted into 429 firms with 10 and above employees and 19,726 firms with 1 to 9 employees.

The survey instrument consisted of two parts. The first part comprised questions about firm characteristics such as firm size (number of employees and capital investment), firm age, skilled labour (% of university graduate employees) and sub-sectors. The second part of the survey instrument contained questions about innovation activity, firm performance, innovation constraints and entrepreneurial bricolage. Descriptive statistics presented in section 4.2 provide summaries of responding firms' characteristics and measurement scales of the six constructs.

4.2 Descriptive statistics

4.2.1 Description of sampled firms

Table 4.1 below provides information on size distribution of firms in the sample according to the number of permanent employees and capital investment in machinery. These are the main criteria officially used by the Government of Tanzania to classify firms into different sizes (URT, 2002) (see table 1.1). Based on the number of permanent employees, the sample consisted of 82 (33.1%) micro firms, 100 (40.3%) small firms, 57 (23.0%) medium sized firms and 9 (3.6%) large firms. The second criterion, capital investment in machinery provided three size groups consisting of 124 (50%) small firms, 105 (42.3%) medium sized firms and 19 (7.7%) large firms.

What was interesting about firm size classification based on investment in machinery criterion is that micro-firms disappeared from the sample. Medium sized firms and large firms increased by 19.36% and 4.03% respectively. Using permanent employees to classify firms may be

misleading because this criterion does not consider seasonal workers who account for a larger share of workforce in many food and beverage industry. The number of temporary employees tends to increase and decrease during peak (harvesting seasons particularly for edible oil and coffee sub-sectors) and off-peak seasons respectively.

Table 4. 1 Distribution of firms by size

	Firm size based on number of employees (old classification)		Firm size based on capital investment in machinery (old classification)	
	Frequency	Percentage	Frequency	Percentage
Micro firms	82	33.1	-	-
Small firms	100	40.3	124	50.00
Medium-sized firms	57	23.0	105	42.3
Large firms	9	3.6	19	7.7
Total	248	100	248	100

Table 4.2 below shows distribution of firms by sub-sector and age. The sample was drawn from three sub-sectors to represent food and beverage industry. As it can be seen from the table, 126 (50.8%) firms were edible oil manufacturers while 86 (34.7%) and 36 (14.5%) firms were beverage and coffee manufacturers respectively. Furthermore, the surveyed sample consisted of more than 50% of firms which were started in less than 4 years with a small proportion of them (11.7%) being established more than 10 years ago.

Table 4. 2 Distribution of firms by sub-sectors and age

Sub-sector		Frequency	Percentage
	Beverage	86	34.7
	Edible oil	126	50.8
	Coffee	36	14.5
	Total	**248**	**100**
Firm age	Less than 4 years	141	56.7
	4 to 10 years	78	31.6
	More than 10 years	29	11.7
	Total	**248**	**100**

Distribution of enterprises according to sub-sector and age is presented in table 4.3 below. Small firms (54.0%) and medium sized firms (49.5%) were more represented in the edible oil sub-sector while large firms dominated the beverages sub-sector (52.6 %). About firm age, a larger percentage of small firms were in the age group of less than 4 years (78.2%) while about half of medium sized firms (49.5%) and more than half of large firms (52.6%) belonged to more than 10 years age group.

Table 4. 3 Distribution of firm sizes (based on capital investment in machinery) by sub-sector and age

		Small firms (%)	Medium sized firms (%)	Large firms (%)	Total (%)
Sectors	Beverage	32.3	34.3	52.6	34.7
	Edible oil	54.0	49.5	36.8	50.8
	Coffee	13.7	16.2	10.6	14.5
	Total	**100**	**100**	**100**	**100**
Firm age	Less than 4 years	78.2	36.2	31.6	56.9
	4 to 10 years	18.6	49.5	15.8	31.4
	More than 10 years	3.2	14.3	52.6	11.7
	Total	**100**	**100**	**100**	**100**

Table 4.4 below shows distribution of firms according to skilled labour. Skilled labour is defined to represent a percentage of permanent employees within the firm who are university graduates (D'Este et al., 2014a). It is interesting to note that beverage sub-sector employed more graduates than other two sub-sectors (about 44% and 7% of the firms employed %1-3% and

above 6% university graduates respectively). Overall, the percentages of employees who were not university graduates in the three sub-sectors were substantially high. This finding reflects those of Andreoni (2017) who found that unskilled workers were highly concentrated in the food industry.

Table 4. 4 Sectoral distribution of firms according to skilled labour

% of employees with university degree	Sub-sectors		
	Beverage (%)	Edible oil (%)	Coffee (%)
0%	46.5	62.7	50.0
1% - 3%	44.2	31.7	36.1
4% - 6%	2.3	5.6	8.3
Above 6%	7.0	0	5.6
Total	**100%**	**100%**	**100%**

Distribution of firms according to possession of a recognized quality certification is presented in table 4.5 below. The sub-sector with the largest number of firms with recognized quality certification was beverage (54.6%) followed by edible oil sub-sector (39.7%) and coffee sub-sector (38.9%).

Table 4. 5 Sectoral Distribution of firms according to possession of quality certification

Sectors	Firms with quality certification (%)	Firms without quality certification (%)	Total
Beverage	54.6	45.4	100%
Edible oil	39.7	60.3	100%
Coffee	38.9	61.1	100%

Table 4.6 presents distribution of firms according to innovation frequency. 50.5% of medium sized enterprises had introduced 4 to 6 different types of innovations for the past 5 years compared to 42.1% of large enterprises and 34.7% of small enterprises. Of the three firm size groups, most small firms (51.6%) exhibited considerably fewer innovation activities than do their counterparts.

Table 4. 6 Distribution of firms according to innovation intensity

Firm size	Number of innovations			
	1 - 3	**4 - 6**	**7 - 9**	**Total (%)**
Small firms (%)	51.6	34.7	13.7	**100**
Medium-sized firms (%)	37.1	50.5	12.4	**100**
Large firms (%)	42.1	42.1	15.8	**100**

4.2.2 Descriptive statistics for innovation measurement scale

The scale to measure innovation consisted of 9 items that reflected three innovation dimensions - product innovation, process innovation and market innovation. Product and process innovation dimensions were measured by two items each while five items represented market innovation. The items for each dimension of innovation are presented in table 4.7 below. The survey instrument contained questions that asked each respondent to indicate whether their firm had introduced any innovation(s) for the past five years (yes = 1 and no = 0) and to rate the importance of each type of innovation on a 5-point Likert scale (1 = not important and 5 = very important).

If the firm indicated that they had introduced innovation, then the value of innovation equalled the respondent's ranking of the level of importance of that innovation. If the respondent's answer was "No", then the value of innovation was equal to zero (Madrid-Guijarro et al., 2009a), meaning that the firm had not introduced any changes in that innovation type. Then, the mean score of each firm on the three dimensions of innovation was computed by summing up the values of items of each dimension and dividing the total score by the number of indicators. This process is referred to as "item parcelling" which involves averaging the summation of two or more item scores (Bandalos, 2002) to create averaged items that serve as indicators. Therefore, product innovation, process innovation and market innovation dimensions became indicators of innovation measurement scale in subsequent analyses.

Table 4. 7 Descriptive statistics for measurement scale of innovation

	Innovation items	Mean (M)	Standard deviation
	Product innovation	2.78	1.07
1	Changes in products	2.72	1.66
2	Changes in product packaging	3.00	1.66
	Process innovation	3.28	1.17
1	Changes in ways of operating	3.18	1.43
2	Changes in manufacturing methods	3.14	1.35
	Market innovation	3.29	1.07
1	Branding	3.19	1.59
2	Changes in distribution channels	3.12	1.62
3	Entry into new markets	3.07	1.65
4	Changes in pricing methods	2.99	1.70
5	Changes in advertising and promotion methods	3.05	1.75

4.2.3 Measurement scale of innovation constraints

The measurement scale of innovation constraints consisted of four latent constructs with a total of 16 items. The scale for each construct is shown in table 4.7. All latent constructs were measured by 4 items each. The measurement scale for financial constraints consisted of 4 items reflecting perceived importance of high interest rates, lack of appropriate sources of finance, high innovation costs and high financial risks in constraining firms' innovation. Four items measured knowledge constraints and included lack of qualified personnel, lack of information on appropriate technologies, lack of information on markets and lack of knowledge support from the government and research institutions. Regulatory constraints construct was also represented by 4 items: multiple regulators, unpredictability of regulations, bureaucratic delays in product registration and high costs of compliance. The questionnaire asked respondents to rate the extent to which each item was a constraint to the introduction of innovation for the past five years. Responses were rated on a 5 -point Likert scale ranging from 1= not important to 5 = very important.

The results in table 4.8 below show that the mean scores ranged from 3.52 to 3.63 for financial constraints; 2.68 to 2.83 for knowledge constraints; 2.01 to 2.13 for market constraints and 2.60

to 3.30 for regulatory constraints. Financial and regulatory constraints were the two top constraints with interest rates too high (M = 3.63; SD = 1.057) and unpredictability of regulations (M=3.30; SD= 1.170) appearing the most highly perceived obstacles by innovative firms. Market factors were the least perceived as obstacles to innovation by innovative firms. These results seem to be consistent with other research (Santiago et al., 2017) which found that financial and regulatory constraints were the leading obstacles in the manufacturing sector.

Table 4. 8 Descriptive statistics for innovation constraints measurement scale

	Constraints to innovation items	**codes**	**Mean (M)**	**Standard deviation (SD)**
	Financial construct items			
1	Interest rates too high	FO1	3.63	1.057
2	Lack of appropriate source of finance	FO2	3.59	1.138
3	Innovation costs too high	FO3	3.52	1.095
4	Financial risks too high	FO4	3.60	1.173
	Knowledge constraint items			
1	Lack of qualified personnel	KO1	2.69	0.837
2	Lack of information on technologies	KO2	2.69	0.916
3	Lack of knowledge support from government and research institutes	KO3	2.83	0.930
4	Lack of information on markets	KO4	2.68	0.881
	Market constraint items			
1	Competition from established and large firms	MO1	2.01	1.022
2	Uncertain demand for innovative products	MO2	2.13	1.030
3	Counterfeit food products	MO3	2.06	0.971
4	Competition from informal sector	MO4	2.04	1.058
	Regulatory constraints			
1	Multiple regulators	RO1	3.18	1.122
2	Unpredictability of regulations	RO2	3.30	1.170
3	Bureaucratic delays in product registration	RO3	3.28	1.121
4	High costs of compliance with regulations	RO4	2.60	0.916

Note: Measurement scale: 1 = not important and 5 = very important.

4.2.4 Descriptive statistics for the measurement scale of entrepreneurial bricolage

Descriptive statistics for entrepreneurial bricolage measurement scale are presented in table 4.9 below. The scale consisted of 8 items reflecting combination of resources at hand for new purposes. Respondents were asked to rate on a 5-point Likert scale (1= Never and 5 = Always) how their firms were using various kinds of resources to deal with new challenges. The mean scores of all items were above 3.0, which suggests a higher level of involvement in entrepreneurial bricolage. The item with the highest score was "we combine resources to accomplish new challenges that the resources were not originally intended to accomplish" (M = 3.56; SD = 1.25) while the item with lowest score was "by combining our existing resources, we take on a surprising variety of new challenges" (M = 3.35; SD = 1.19). Overall, food manufacturers were more likely to use bricolage in response to new problems or opportunities.

Table 4. 9 Descriptive statistics for entrepreneurial bricolage items

S/N	Items	Bricolage items	Mean (M)	Standard deviation
1	We find workable solutions to new challenges by using our existing resources	BR1	3.54	1.15
2	We gladly take on a broader range of challenges with our resources would be able to	BR2	3.52	1.24
3	We use any existing resource that seems useful to responding to a new problem or opportunity	BR3	3.50	1.14
4	We deal with new challenges by applying a combination of our existing resources and other resources inexpensively available to us	BR4	3.54	1.14
5	When dealing with new problems or opportunities, we act by assuming that we will find a workable solution	BR5	3.53	1.12
6	By combining our existing resources, we take on a surprising variety of new challenges	BR6	3.35	1.19
7	When we face new challenges, we put together workable solutions from our existing resources	BR7	3.37	1.17
8	We combine resources to accomplish new challenges that the resources were not originally intended to accomplish	BR8	3.56	1.25

Note: Measurement scale: 1 = Never and 5 = Always

4.2.5 Descriptive statistics for firm performance measurement scale

Firm performance was measured by 4 items reflecting the extent to which firms had achieved profitability, sales volume and market, cash flow and share growth objectives. Respondents were asked to rate on a 5-point Likert scale (1 = Not achieved and 5 = very high achievement) the extent to which their firms had achieved each of the above performance objectives as a result of introducing innovations. The results in table 4.10 indicate entrepreneurial firms' satisfaction with the achievement of cash flows (M = 3.40; SD = 1.13), sales volume (M = 3.39; SD = 1.17), market share (M = 3.37; SD = 1.20). Although the degree of achievement of sales objectives was high, the level of achievement of profitability objective remained relatively low (M = 2.83) which implied high operating and other costs. This is indicative of an over-regulation which increases compliance and innovation costs which in turn raise operating costs (Charles & Mambi, 2013).

Table 4. 10 Descriptive statistics for innovation performance items

	Innovation performance items		Mean (M)	Standard deviation
1	Profitability	FP1	2.85	1.12
2	Sales	FP2	3.39	1.17
4	Cash flows	PF4	3.40	1.13
3	Market share	FP3	3.37	1.20

Note: Measurement scale: 1 = not achieved and 5 = very high achievement

4.3 Exploratory factor analysis (EFA)

The main objectives of exploratory factor analysis were to summarize the data into fewer factors by establishing the pattern of relationships between observed variables and latent constructs and to identify potential issues of multicollinearity that would have created problems in subsequent CFA and SEM analyses. EFA was an appropriate technique to start with because three out of the seven measurement scales of this study were modified from their original versions to consider the contextual aspects. The measurement scales of market and regulatory constraints were modified by adding or deleting items or changing their wording. Therefore, it was necessary to carry out EFA to determine the underlying structures as the ultimate goal of the study was to test structural relationships between the derived factors(Kim et al., 2019).

As one of the objectives of the EFA was to identify latent variables that predict observed variables, common factor analysis with principal axis factoring (PAF) and oblique rotation for extraction of factors was used. PAF was chosen because it was believed that the observed variables were linked together by their underlying structures (constructs). PAF is also recommended as an initial extraction method in EFA because it is does not require normally distributed data (Hair et al., 2019; Beavers et al., 2013). At this point it was not clear whether the dataset for this study was multivariate normal because the normality assumptions at multivariate level were tested using CFA output.

An oblique rotation (Oblimin) was applied because it generates correlations between factors, in addition to determining the relationships between observed variables and factors. Beavers et al. (2013) noted that oblique rotations are appropriate in social science research when factors are related. According to Tabachnick and Fiddell (2007) (as quoted in Corner, 2009), presence of correlations among factors of 0.3 or above is enough evidence to warrant oblique rotation. EFA was first run on items depicting independent factors and then on items reflecting dependent factors. Hair et al. (2019) argue against combining independent and dependent variables in EFA as it is an inappropriate practice. The absolute value of factor loadings was set at ± 0.5; the limit considered to be meaningful for interpretation of structure for sample sizes of 200+ respondents (Hair et al., 2019).

Initial results of EFA showed item RC4 (i.e. high costs of compliance with regulations) loading on the same factor with items depicting knowledge constraints. This item was deleted and EFA was re-run on the remaining observed variables. Bartlett's test with a significant p-value ($p \leq 0.001$) and chi-square of 2482.90 (df = 171) provided evidence that the correlation matrix was not an identity matrix. Furthermore, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of 0.791 was meritorious by Hair et al. (2019)'s standards. The KMO index of 0.5 is considered suitable for EFA (Williams et al., 2010). Combing the two initial evaluation criteria together led to the conclusion that the requirements for proceeding with further factor analysis were sufficiently met.

Table 4.11 presents EFA results of scales for independent factors. With common factor analysis and latent criterion of factor extraction and retention, five preconceived factors were extracted and retained. A conceptual basis for factors to be extracted is important when using EFA as a data summarization technique (Hair et al., 2019). Factors with eigenvalues greater than 1 need to be retained (Hayton et al., 2004). The results showed that there were seven factors with eigenvalues greater than 1. The first factor extracted was termed as "market constraints" and

accounted for 25.54% of variance with eigenvalue of 4.853. The item with the highest factor loading was “competition from informal sector” (MC4 = 0.874), followed by “uncertain demand for innovative products (MC2 = 0.828)”. The lowest loading item was “competition from established firms” (MC1 = 0.593).

The second extracted factor was termed as “Entrepreneurial bricolage” with all its factor loadings exceeding the minimum threshold of 0.70. This factor explained 13.187% of variance with an eigenvalue of 2.506. Two items had the highest loadings BR1 (factor loading = 0.956) and BR4 (factor loading = 0.905). The lowest loading was of item BR3 (factor loading = 0.856). The third factor (called knowledge constraints) explained 12.626% of variance and its eigenvalue was 2.399. Items on this factor measured knowledge constraints and item with the highest loading (0.864) was “lack of knowledge support from government and research institutes” (KC3) followed by “lack of information on technologies” (KC2 = 0.689). The lowest loading item was “lack of qualified personnel” (KC1 = 0.597).

Financial constraints emerged as the fourth factor and explained 11.07% of the variance with an eigenvalue of 2.103. On this factor the highest loading item was “direct innovation costs too high” (FC3 = 0.742) while “interest rates too high” was the second highest loading item (FC1 = 0.706). The item with lowest loading was “lack of appropriate source of finance” (FC2 = 0.607). The last factor, which explained 8.30% of variance with eigenvalue of 1.577 was termed as regulatory constraints”. The highest loading item was “unpredictability of regulations” (RC2 = 0.925) followed by “multiple regulators” (RC1 = 0.778) whereas “bureaucratic delays in obtaining license and permits item was the lowest one (RC3 = 0.729). As explained earlier one item (RC4) was deleted as it loaded on an unintended latent construct.

Table 4. 11 The results of EFA for measurement scales of independent factors

Construct	Code	Factor loadings
Market constraints	MC1	-0.593
	MC2	-0.828
	MC3	-0.628
	MC4	-0.874
	Eigenvalue	4.853
	Explained variance (%)	25.540
Entrepreneurial bricolage	BR1	0.956
	BR2	0.874
	BR3	0.856
	BR4	0.905
	Eigenvalue	2.506
	Explained variance (%)	13.187
Knowledge constraints	KO1	0.597
	KO2	0.689
	KO3	0.864
	KO4	0.663
	Eigenvalue	2.399
	Explained variance (%)	12.626
Financial constraints	FC1	0.707
	FC2	0.607
	FC3	0.742
	FC4	0.661
	Eigenvalue	2.103
	Explained variance (%)	11.070
Regulatory constraints	RC1	0.779
	RC2	0.922
	RC3	0.731
	Eigenvalue	1.577
	Explained variance (%)	8.300
Total explained variance (%)		70.723

4.4 EFA results of measurement scales of dependent factors

Table 4.12 below presents EFA results of the scales for dependent variables. The analysis employed a common factor analysis method for factor extraction and latent criterion value for factor retention. As it can be seen from the table, two factors were extracted and retained. The Bartlett's test with Chi-square of 1125.11 (df = 21) was significant at the 0.000 level. The two factors extracted had eigenvalues greater than 1.0. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy of 0.78 was above acceptable threshold of 0.5 (Williams et al., 2010). The two criteria provided evidence suggesting that further factor analysis was possible.

The first extracted factor was named "firm performance" and it consisted of all four items. The factor explained 43.35% of the variance with an eigenvalue of 3.03. Of the four items, the loading of market share was the highest one (FP3 = 0.93) followed by "cash flows (0.92) and "sales volume" (FP2 = 0.91). The item with the lowest loading was "profitability" (FP1 = 0.62). The

second factor that emerged was “innovation” and explained 26.08% of the variance with eigenvalue of 1.83. Items with highest loadings were “market innovation (IN3)” (0.90) and “process innovation (IN2)” (0.88) while “product innovation (IN1)” recorded the lowest loading (0.59).

Table 4. 12 The results of EFA for measurement scales of dependent factors

Latent constructs	Item ID	Factor loadings
Firm performance	FP1	0.62
	FP2	0.91
	FP3	0.93
	PF4	0.92
	Eigenvalue	3.03
	Explained variance (%)	43.35
Innovation	IN1	0.59
	IN2	0.88
	IN3	0.90
	Eigenvalue	1.83
	Explained variance (%)	26.08
Total explained variance		69.43

4.5 Results of tests for normality assumptions

The distributions of items for the measurement scale were checked for normality. This study tested both univariate and multivariate normality assumptions of the data using SPSS 20.0 and EQS 6.3 software respectively. SPSS provided results of univariate tests (i.e. skewness and kurtosis) while EQS gave both univariate and Mardia’s multivariate normality test statistics. The Mardia’s multivariate statistic is an output of CFA, so it will be reported along with CFA results (see table 4.16). The results of univariate normality tests (skewness and kurtosis together with their respective z-scores) are reported in table 4.13 below.

The values of skewness and kurtosis for all items in the scale were significantly different from 0 - acceptable value for normally distributed dataset. Any item with z-score greater than +2.58 or less than -2.58 violates univariate normality assumption (Ghasemi & Zahediasl, 2012). Examination of the results in table 4.13 reveals that the calculated z-values (Z-skewness) of 14 items exceeded acceptable thresholds. Again, the z-scores (Z-kurtosis) of 7 items exceeded recommended cut-off point. Moreover, both Z-skewness and Z-kurtosis values of all four items

measuring financial constraints (FC1 to FC4) were greater than +2.58 or less than -2.58. The results of tests for univariate normality assumptions suggested non-normal distribution of the data. Generally, violations of normality assumptions at the univariate level provides evidence for multivariate non-normality (Nye & Drasgow, 2011).

Table 4. 13 Univariate skewness and kurtosis for observed variables

Item ID	Skewness	Z-skewness	Kurtosis	Z-kurtosis
BR1	.00	-.02	-1.09	-3.54
BR2	-.19	-1.21	-1.04	-3.38
BR3	.06	.37	-1.18	-3.83
BR4	-.08	-.55	-1.08	-3.50
FC1	-.74	-4.76	-.11	-.36
FC2	-.72	-4.65	-.31	-1.02
FC3	-.63	-4.07	-.36	-1.18
FC4	-.63	-4.07	-.51	-1.65
KC1	1.10	7.09	.73	2.38
KC2	.94	6.10	.39	1.27
KC3	.75	4.84	-.06	-.19
KC4	.81	5.26	.31	1.02
MC1	.89	5.74	.16	.52
MC2	.84	5.42	.21	.69
MC3	.83	5.38	.15	.49
MC4	1.01	6.51	.36	1.17
RC1	-.43	-2.80	-.70	-2.26
RC2	-.31	-2.00	-.86	-2.79
RC3	-.47	-3.04	-.69	-2.25
PDI	-.25	-1.61	-.50	-1.62
PRI	-.06	-.42	-.80	-2.60
MKI	-.16	-1.02	-.50	-1.64
FP1	-.18	-1.19	-.65	-2.12
FP2	-.12	-.79	-.79	-2.56
FP3	-.20	-1.29	-.82	-2.65
FP4	-.22	-1.42	-.66	-2.14

Note: Standard error of skew = 0.15 and standard error of kurtosis is 0.30. $p < 0.01$

4.6 Reliability tests

The study used SPSS 20.0 to perform Cronbach alpha test on each measurement scale and the results are reported in table 4.14 below. As it can be seen from the table, alpha coefficients ranged from 0.77 to 0.94. These were unusually good reliabilities compared to 0.70 benchmark proposed by Kline (2016) and suggested internal consistency of the scales.

Table 4. 14 Reliability Analysis

Construct	Number of items	Coefficient alpha (α)
Entrepreneurial bricolage (BR)	4	0.94
Financial constraints (FC)	4	0.77
Knowledge constraints (KC)	4	0.79
Market constraints (MC)	4	0.83
Regulatory constraints (RC)	3	0.85
Innovation (IN)	3	0.82
Firm performance (FP)	4	0.90

However, some researchers argue that the alpha coefficient suffers from underestimation of true reliability (Garver & Mentzer, 1999; Peterson and Kim, 2014). Therefore, they suggest using additional approaches that would supplement it. The most common supplementary approaches are construct reliability and average variance extracted (AVE). These measures are computed using standardized factor loadings derived from confirmatory factor analysis. So, they will be reported along with CFA results.

4.7 Non-response bias

Non-response bias was tested following Armstrong and Overton (1977)'s approach which assumes that non-respondents are more like late respondents than early respondents. The sample was divided into two groups: early respondents and late respondents according to the date and time of survey completion. As it can been seen from appendix 5, 118 and 130 were early and late respondents respectively. The differences in terms of the means of innovation constraints constructs were tested using *t*-test. The results presented in appendix 5 show that there were no significant differences that could suggest the effects of non-response bias on the findings of this study.

4.8 Common method bias

This study used Harman's single factor test and confirmatory factor analysis to check the common method bias. An exploratory factor analysis using principal axis factoring was performed with all indicators of both independent and dependent factors being included. Seven factors emerged with the first factor accounting for 18.52% of the total variance, which was below the common thresholds of 50% or 25% as recommended by Heidenreich and Kraemer (2016) and Rajapathirana and Hui (2018) respectively. These results provided assurance that the common method bias was not a problem at all. The goodness-fit indices in table 4.15 indicated a poor fit for the single factor model, conclusive evidence that the common method bias will not affect subsequent estimation results. The results of the two tests confirmed that common method bias was not a problem in the data, hence the CFA and SEM testing results would not be biased.

Table 4. 15 CFA results of common method bias

Sattora-Bentler Scaled Chi-square (S-B_{χ}^2)	2821.858(df = 324; p < 0.001)
Comparative Fit Indices (CFI)	0.290
Standardized root-mean square residual (SRMR)*	0.179
Root Mean Square Error of Approximation (RMSEA)	0.177 (90% C.I. 0.170, 0.182)

4.9 Confirmatory factor analysis on measurement model

Confirmatory factory analysis is an important technique to confirm the factor structure of measurement models. CFA tests the hypothesized relationships between observed variables and the latent constructs as well as the competing theoretical models about the structure (Schreiber et al., 2006; Ullman, 2006). The approach evaluates the extent to which the data confirm theoretical underlying constructs. Thus, CFA confirms reliability and validity of the measurement scales (Maldonado-Guzmán et al., 2017a; Augustyn et al., 2019).

The theoretical model aimed to test empirically the relationships between five exogenous constructs (i.e. entrepreneurial bricolage, financial constraints, knowledge constraints, market constraints and regulatory constraints) and one mediate endogenous construct (i.e. innovation) and one ultimate endogenous latent variable (i.e. firm performance). The measurement model depicted in figure 4.1 with seven constructs was subjected to CFA. Following Hair et al. (2019)'s recommendations and previous research (see Tayal et al., 2019; Wang & Lam, 2019), a single-phase CFA process (full measurement model) was implemented that involved estimation of the entire measurement model. Estimating the entire model in a single CFA helps to establish the

structure of the observed variables in the context of other variables and to ensure distinctiveness of measures used in the study (Domínguez-Escrig et al., 2018).

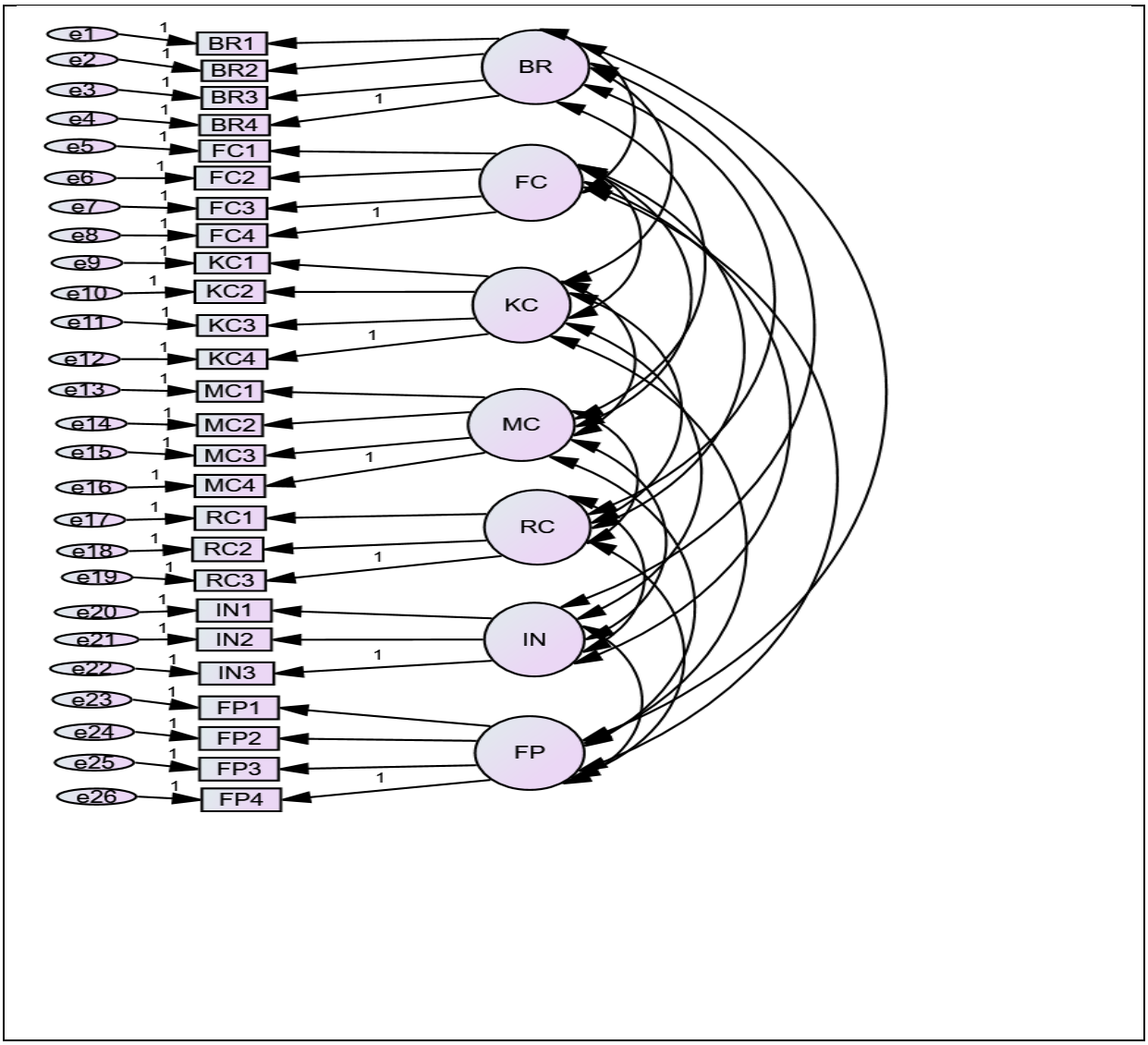


Figure 4. 1 Overall measurement model

Note: Note: FC = Financial constraints; KC = Knowledge constraints; MC= Market constraints; RC= Regulatory constraints; IP= Innovation and IP= Firm performance

4.10 Results of multivariate normality test

CFA was first performed with maximum likelihood estimation method to assess multivariate distribution of the data. The CFA results showed Z-statistic of 11.924 (see table 4.16) which exceeds a cut-point of 5.0 suggested by Bentler (2005). This confirms presence of multivariate non-normality in the sample. Further steps were taken to assess multivariate outliers by looking at five cases identified as the main contributors to the normalized multivariate kurtosis estimate. The case is judged to be an outlier if its estimate is distinctively different from the estimates of other four cases. The observation of the five cases (see table 4.17 below) indicated that their

estimates approximately fell within the same range of values, hence there was no evidence of an outlying case. The results of univariate tests for normality in section 4.5 signalled violation of normality assumptions at the multivariate level.

Table 4. 16 Multivariate kurtosis

Measurement	Estimate
Mardia's coefficient	57.784
Normalized estimate	11.924

Table 4. 17 Case numbers with largest contribution to normalized multivariate kurtosis

Case number	14	79	130	133	198
Estimate	421.236	415.761	538.874	425.377	377.335

4.11 Results of CFA

As seen from the preceding section the data for this study were non-normal at both univariate and multivariate levels. The study corrected for violations of multivariate normality assumptions by using a robust maximum likelihood estimator as recommended by Byrne (2006) and Kline (2016). Brown (2006) suggests using raw data as input when robust maximum likelihood is used as an estimator. The CFA results are presented in tables 4.18 and 4.19 below. Table 4.18 displays model fit statistics while table 4.19 presents results related to standardized loadings and unstandardized loadings together with their respective standard errors. Critical values and R-squares (R^2) are also reported. Following recommendations proposed by Kline (2016) and practice (Maroufizadeh et al., 2018), the goodness-of-fit indices for assessing the adequacy of model fit were limited to χ^2 value, comparative fit index (CFI), root mean-square error of approximation (RMSEA) with its related 90% confidence interval and standardized root mean residual (SRMR).

As shown in table 4.18, the corrected chi-square (S-$B\chi^2$) statistic of 394.804 (df = 278; $p < 0.05$) indicated a poor fit of the model to the data as it was statistically significant at $p < 0.05$. It is suggested that the χ^2 statistic should not be heavily relied on in the evaluation of model fit because it is adversely affected by sample size, violation of normality assumptions and model complexity (Brown, 2006; Nye and Drasgow, 2011). The robust RMSEA value of 0.041 (90% C.I. 0.031, 0.050) and SRMR value of 0.043 were below the recommended threshold of 0.06 for a good fit (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003). The comparative fit index (CFI = 0.965) indicates a very good fit and is exceeding the cut-off point of 0.95 suggested by Hu and

Bentler (1999) for adequate model fit for continuous outcomes. Overall, the model fit indices (except $_{x}2$) shown in table 4.16 exhibited acceptable levels of fit for the research model.

Table 4. 18 Goodness-of-fit Statistics

Sattora-Bentler Scaled Chi-square (S-B_{x}^{2})	394.803(df = 278; p < 0.05)
Comparative Fit Indices (CFI)	0.965
Standardized root-mean square residual (SRMR)*	0.043
Root Mean Square Error of Approximation (RMSEA)	0.041 (90% C.I. 0.031, 0.050)

*Note: SRMR is from ML output not Robust ML.

4.12 Measures of reliability from CFA output

It was stated in chapter 4 that construct reliability (CR) and average variance extracted (AVE) are additional measures of reliability of measurement scales. These measures are computed from CFA output as they are not directly provided by EQS software. The results in table 4.19 indicate that construct reliability values of 0.784 for entrepreneurial bricolage scale, 0.711 for financial constraints scale, 0.745 for knowledge constraints scale, 0.749 for market constraints scale, 0.730 for the regulatory constraints scale, 0.703 for innovation scale and 0.771 for the firm performance scale exceeded the benchmark of 0.7 recommended by Hair et al. (2019). For AVE, values of 0.5 or higher demonstrate evidence of internal consistency (Bagozzi & Yi, 1988). The AVE for all constructs in the model exceeded recommended cut-off level of 0.5 with exception to regulatory constraints whose AVE was 0.464. Overall, the results demonstrated that reliability of each measurement scale was of a higher degree as all measures exceeded recommended thresholds.

4.13 Validity of measurement scales

CFA was also used to assess construct validity of measurement scales. Following Hair et al. (2019)'s guidelines, construct validity was assessed by convergent validity and discriminant validity. Convergent validity measures convergence of observed variables of the same latent construct and three criteria were applied: standardized factor loadings, construct liabilities and AVE. First, the guidelines are that factor loading estimates should be at least 0.5 and preferably 0.7 or higher to provide evidence that individual variables are truly indicators of the underlying latent construct. As it can be seen from table 4.19, all standardized factor loadings were significant at 0.5 level ($p < 0.05$) and exhibited correct sizes and signs (Byrne, 2006; Kline, 2016). The lowest standardized loading was 0.564 (FC2) and the highest one was 0.933 (FP3). Second, construct reliability and AVE estimates were high and exceeded recommended thresholds of 0.7

for construct reliability and 0.5 for AVE, with exception to financial constraints construct (AVE = 0.464).

Table 4. 19 CFA results of an overall measurement model

Construct	Indicators	Unstandardized loadings	Standardized loadings	SE	CR	R^2	Construct Reliability	Average Variance Explained
Entrepreneurial bricolage	BR1	1.000	0.933	0.000	0.00	0.870	0.784	0.812
	BR2	0.957	0.896	0.037	25.69	0.803		
	BR3	0.929	0.869	0.035	26.45	0.755		
	BR4	0.946	0.922	0.034	27.78	0.850		
Financial constraints	FC1	1.000	0.701	0.000	0.000	0.492	0.703	0.464
	FC2	0.866	0.564	0.151	5.74	0.319		
	FC3	1.151	0.780	0.152	7.59	0.608		
	FC4	1.048	0.663	0.146	7.20	0.440		
Knowledge constraints	KC1	1.000	0.601	0.000	0.00	0.361	0.745	0.502
	KC2	1.249	0.686	0.198	6.31	0.471		
	KC3	1.589	0.860	0.224	7.11	0.739		
	KC4	1.160	0.662	0.199	5.81	0.438		
Market constraints	MC1	1.000	0.620	0.000	0.00	0.384	0.749	0.564
	MC2	1.331	0.820	0.146	9.12	0.673		
	MC3	1.068	0.697	0.147	7.25	0.486		
	MC4	1.409	0.845	0.159	8.89	0.714		
Regulatory constraints	RC1	1.000	0.775	0.000	0.00	0.601	0.711	0.673
	RC2	1.212	0.901	0.104	11.64	0.812		
	RC3	1.005	0.779	0.089	11.34	0.608		
Innovation	PDI	1.000	0.586	0.000	0.00	0.344	0.703	0.646
	PRI	1.600	0.861	0.177	9.04	0.741		
	MKI	1.598	0.924	0.170	9.42	0.855		
Firm performance	FP1	1.000	0.619	0.000	0.00	0.384	0.771	0.728
	FP2	1.549	0.921	0.129	12.02	0.849		
	FP3	1.604	0.926	0.136	11.82	0.857		
	FP4	1.485	0.907	0.126	11.83	0.822		

Note: SE = Standard errors; CR= Critical ratios

Discriminant validity measures the degree to which a construct is truly distinct from other constructs and is often assessed by both inter-construct correlations (factor correlations) and squared inter-construct correlations. Factor correlation values are considered satisfactory if they do not exceed ±0.80 or ±0.85(Brown, 2006). The results of correlation analysis in table 4.20 show factor correlations that are smaller and less than the recommended cut- point, thus confirming discriminant validity.

Table 4. 20 Inter-construct correlations

Constructs	**BR**	**FC**	**KC**	**MC**	**RC**	**IN**	**FP**
BR	**1.00**						
FC	-0.113	1.00					
KC	0.031	0.005	1.00				
MC	0.372	-0.132	0.001	1.00			
RC	0.282	-0.204	0.004	-0.40	1.00		
IN	0.290	-0.218	-0.099	-0.133	-0.278	1.00	
FP	0.170	0.155	-0.044	-0.112	-0.127	0.132	1.00

Note: BR = Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC= Market constraints; RC= Regulatory constraints; IN= Innovation and FP= Firm performance

The AVE of each factor was compared with squared inter-construct correlations associated with that factor and the results are reported in table 4.21 below. All average variance extracted estimates were larger than their corresponding squared inter-construct correlations. This indicates that the model demonstrated discriminant validity.

Table 4. 21 AVE and SIC for discriminant validity assessment

Construct	AVE	Squared inter-construct correlations (SIC)						
		BR	FC	KC	MC	RC	IP	FP
BR	0.812	-						
FC	0.673	0.013	-					
KC	0.502	0.001	0.00	-				
MC	0.564	0.138	0.017	0.000	-			
RC	0.464	0.080	0.042	0.000	0.160	-		
IN	0.646	0.084	0.048	0.010	0.018	0.077	-	
FP	0.728	0.029	0.024	0.002	0.013	0.016	0.017	-

Note: BR= Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC= Market constraints; RC= Regulatory constraints; IN= Innovation and IP= Firm performance

Conclusively, the fit statistics provided evidence suggesting that the estimated model was a good fit to the sample data. Further evidence of construct validity as demonstrated by both convergent and discriminant validities provided additional validation of the measurement model. With a valid measurement model, it was certain that SEM could be applied to test hypothesized relationships among latent constructs. According to Byrne (2010), a psychometrically sound measurement model of each latent construct is required for valid assessment of hypothesized relationships.

4.14 Structural equation modeling

Evidence from CFA results was good enough to justify SEM analysis on a structural model whose graphical presentation is depicted in figure 4.2 below. The model hypothesized relationships of entrepreneurial bricolage and innovation constraints with innovation as well as between innovation and firm performance. The SEM analysis was performed using EQS 6.3 software and robust maximum likelihood estimator. The decision to choose robust maximum likelihood estimator over other estimators stemmed from the fact that the study's sample size was medium and the dataset was multivariate non-normal. The structural model assessment focused on two aspects: model fit indices and statistical significance of model paths. Table 4.22 presents model fit indices while results related to model path estimates are reported in table 4.23.

SEM model fit evaluation uses the same fit indices as CFA analysis and they include Bentler chi-square ($S\text{-}B_{\chi}^{2}$), comparative fit index (CFI), standardized mean-square residual (SRMR) and root

mean square error of approximation and its corresponding confidence interval (RMSEA. Significance of the relationships between constructs (model paths) was examined based on *t*-values associated with path estimates between latent constructs. The *t*-value greater than a certain critical value (i.e. $p < 0.05$; *t*-value = 1.96) supports hypothesized relationship while *t*-value less than 1.96 indicates absence of hypothesized relationship between constructs (i.e. associated estimated parameter = 0).

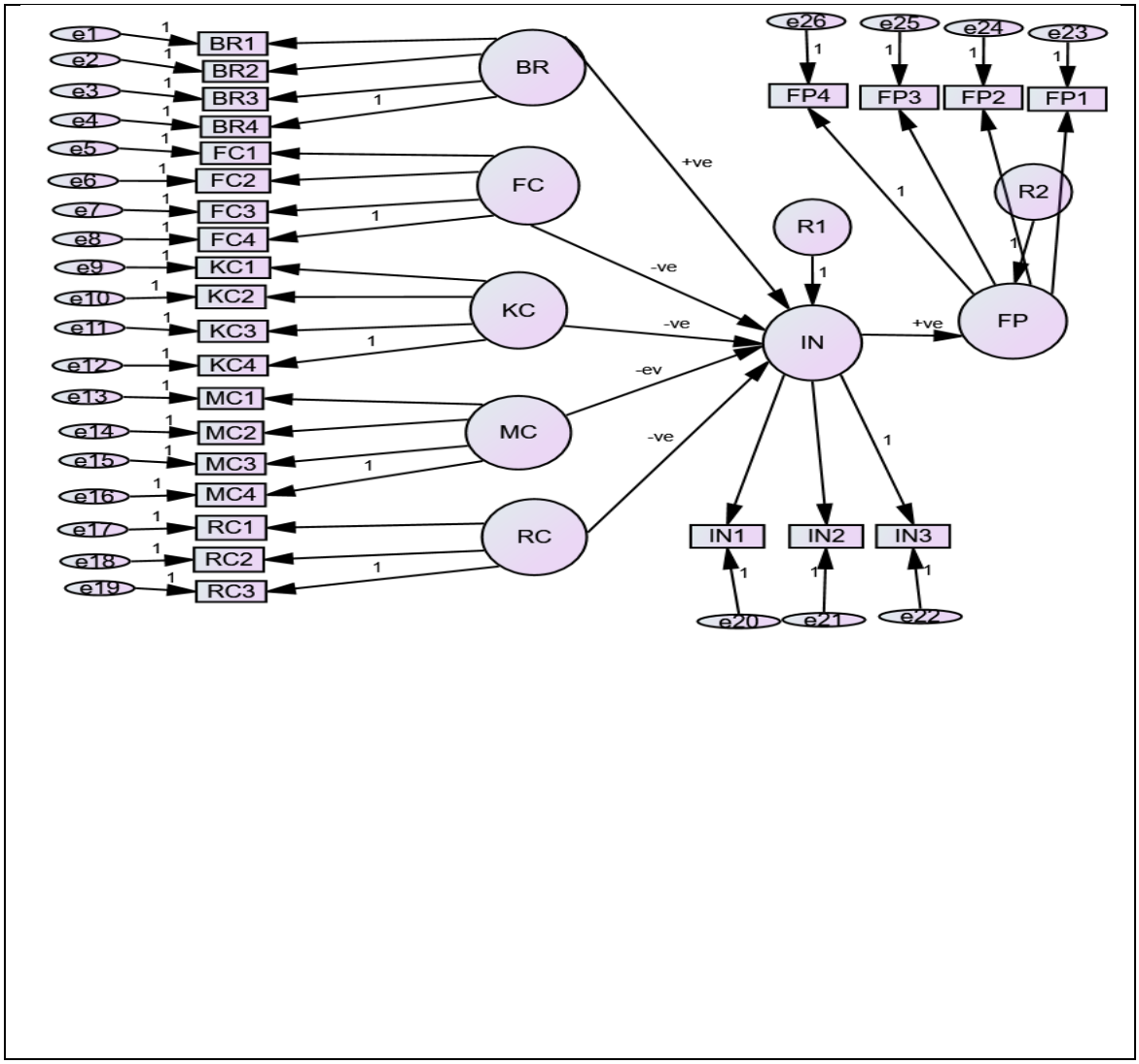


Figure 4. 2 Structural equation model with five exogenous and two endogenous constructs

Note: BR = Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC = Market constraints; RC = Regulatory constraints; IN = Innovation and FP = Firm performance

The model fit indices in table 4.22 show a significant corrected chi-square ($S\text{-}B_{\chi}^{2}$) statistic of 412.268 (df = 283; $p < 0.05$), which suggests inadequacy of the model to fit the data. However, other model fit indices were within acceptable cut-off points for an adequate model. For

example, comparative fit index (CFI) value of 0.961 indicates a good fit and exceeds the cut-off value of close to 0.95 suggested by Hu and Bentler (1999). The values of root mean square error of approximation (RMSEA = 0.043; 90% C.I. 0.034, 0.052) and standardized mean-square residual (SRMR = 0.056) were lower than recommended cut-point of 0.06. The overall model fit statistics indicated an adequate fit of the structural model. An adequately fitting structural model provides sufficient evidence that suggested appropriateness of interpretation or assessment of the significance of model path estimates (Murat Ar & Baki, 2011).

Table 4. 22 Model fit statistics

Sattora-Bentler Scaled Chi-square (S-B_χ^2)	412.268 (df = 283; p < 0.05)
Comparative Fit Index (CFI)	0.961
Standardized Mean-square Residual (SRMR)**	0.056
Root Mean Square Error of Approximation (RMSEA)	0.043 (90% C.I. 0.034, 0.052)

Note: SRMR is an output from ML estimator

4.15 Hypotheses testing results

Considering these results, it was clear that financial, market and regulatory constraints were the main factors constraining food and beverage manufacturers' efforts to introduce different types of innovations. These findings support previous studies in developed countries (Crisostomo et al., 2011; Amara et al., 2016a; Pellegrino & Savona, 2017) and developing countries (Maldonado-Guzmán et al., 2017b; Wadho & Chaudhry, 2018) that found that innovative firms perceiving financial, market and regulatory factors as constraints were less likely to introduce innovations. Contrary to expectation, the SEM results failed to demonstrate that knowledge constraints had a significant negative impact on innovation. This also accords with previous studies which showed that knowledge constraints are of less concern for low-technology industries like food and beverage industry (Tourigny & Le, 2004; Bartels et al., 2016). Innovations undertaken in the food industry are incremental in nature that require less specialized knowledge.

Hypothesis H6 investigated the relationship between innovation and firm performance. As expected, SEM results indicated that innovation had a positive and significant influence on firm performance (t-value = 1.97; p < 0.05). Thus, hypothesis *H*6 was supported. This finding suggested that innovative firms in the food and beverage industry still believed to have achieved performance objectives despite experiencing higher levels of obstacles in their innovation process. It is possible that the positive and significant impact of innovation on innovative performance was induced by the positive influence of entrepreneurial bricolage on innovation which in this case, counteracted the indirect negative impact of innovation constraints on firm

performance. Prior studies have noted the importance of bricolage in enhancing firm performance in the context of extreme resource and non-resource constraints (Desa, 2012; Bojica et al., 2014).

Table 4. 23 Standard estimation of the structural model

Hypothesis	Hypothesized path	Standardized Estimates	Unstandardized estimates	Std errors	t-value	Results
H1	BR to IN	0.363	0.224	0.046	4.89*	Supported
H2a	FC to IN	-0.419	-0.296	0.060	-4.95*	Supported
H3a	KC to IN	-0.109	-0.134	0.073	-1.84	Not supported
H4a	MC to IN	-0.194	-0.190	0.088	-2.15*	Supported
H5a	RC to IN	-0.196	-0.163	0.063	-2.39*	Supported
H6	IN to FP	0.141	0.158	0.080	1.97*	Supported

Note: * $p < 0.05$ (1.96)

BR = Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC = Market constraints; RC = Regulatory constraints; IN = Innovation; FP = Firm performance; Std = standard errors

Empirical evidence and current findings suggest that firms operating in resource-constrained and uncertain environment tend to deal with innovation challenges by engaging in bricolage (Linna, 2013; Bojica et al., 2014; Smith & Blundel, 2014b). Introduction of different types of innovations in these settings is an outcome of different efforts to overcome various constraints encountered in the course of undertaking innovation activities. While previous studies indicate that entrepreneurial bricolage is mainly used to cope with constraints to innovation in resource scarce environment, empirical evidence provides little to no insights into the mechanisms through which entrepreneurial bricolage fosters innovation. Therefore, further investigation was undertaken to understand how entrepreneurial bricolage moderates the impact of various constraints to innovation on innovation. The findings of this analysis have been reported in chapter 5.

The current findings provide a general picture of which factors constrain innovations, but it would be rather interesting to employ qualitative approaches to understand respondents' descriptions and perceptions of the constraints, the root causes and the way constraints affected their innovation activities. There is a growing body of literature that recognises the importance of corroborating findings across approaches. The mixing of results would expand the

understanding of the important constraints affecting food and beverage manufacturers' innovative efforts and how they are dealt with. Therefore, a follow-up qualitative research was carried out and the results are reported in chapter 6.

Chapter 5 QUANTITATIVE FINDINGS PART 2

5.1 Introduction

The second research question sought to analyse moderating role of entrepreneurial bricolage in reducing the effects of innovation constraints. The study adopted a double-mean centering (DMC) approach - a SEM technique to investigating the hypothesized relationships among the constructs. The DMC approach uses regression residuals as indicators to represent latent product constructs. Based on findings from chapter 4, it is assumed that entrepreneurial bricolage is a means to reduce the negative impact of innovation constraints.

To analyse the moderating effect of entrepreneurial bricolage, a structural equation model was constructed comprising seven exogenous constructs and two endogenous constructs (see figure 5.1). Three of the exogenous constructs were latent product constructs (BRFC, BRMC and BRRC) formed from interacting entrepreneurial bricolage with financial, market and regulatory constraints. The construct related to knowledge constraints was removed from this analysis because it was statistically insignificant in the SEM testing of the structural equation model in chapter 4. The other four exogenous constructs were entrepreneurial bricolage, financial, market and regulatory constraints. Based on the review of existing literature (see chapter 3 section 3.14) on estimation of interaction effects in structural equation modeling, this study applied double-mean centering approach to analysing the interaction effects. The double-mean centering approach was chosen due to its simplicity in implementation and superior performance in removing collinearity between first order observed variables and product indicators.

5.2 Selection of indicators for construction of product constructs

The construction of product indicators was done by using best indicators which were selected from each of the four exogenous constructs. To select the best indicators for creation of product indicators, the CFA output (i.e. standardized loadings) from chapter 4 was used. Three indicators from each exogenous construct were selected for construction of product indicators using matched-pairs strategy. Four exogenous constructs were represented by four indicators and one construct was measured by three indicators. However, three indicators from each construct were selected for the formation of product indicators and one remaining item was ignored.

The selection of items was based on Wu et al. (2010)'s recommendations of choosing the best items according to reliability criterion of each of the first-order constructs. Marsh et al. (2004) suggested using standardized factor loadings as a selection criterion when picking items for

creation of product indicators. Table 5.1 below provides information on standardized loadings and how the selection of best indicators was done. Column 4 of the table shows all indicators that were selected while in column 5 are rankings of indicators selected by using the size of their standardized factor loadings.

Table 5. 1 Selection of the most reliable first-order indicators for construction of product indicators

Construct	Indicators	Standardized loadings	Three most reliable indicators from each construct	Ranking (Based on reliability)
Entrepreneurial bricolage (BR)	BR1	0.933	BR1	1
	BR2	0.896	BR2	3
	BR3	0.869		
	BR4	0.922	BR4	2
Financial constraints (FC)	FC1	0.701	RC1	2
	FC2	0.564		
	FC3	0.780	RC3	1
	FC4	0.663	RC4	3
Market constraints (MC)	MC1	0.620		
	MC2	0.820	MC2	2
	MC3	0.697	MC3	3
	MC4	0.845	MC4	1
Regulatory constraints (RC)	RC1	0.775	RC1	3
	RC2	0.901	RC2	1
	RC3	0.779	RC3	2

All selected indicators were combined to form product indicators using Marsh et al. (2004)'s matched-pairs strategy of matching items according to reliability. For example, the first best indicator of entrepreneurial bricolage construct (BR1) was matched with best indicator of each other exogenous constructs. The same process was performed on the second and third best indicators. In other words, the first (BR1), second (BR4) and third (BR2) most reliable indicators of the construct entrepreneurial bricolage were matched with the first, second and third most reliable indicators of other exogenous constructs respectively. Table 5.2 below indicates how matching of indicators based on reliability was done.

Table 5. 2 Matching of selected items on the basis of reliability

Latent product constructs (Interaction term)	Matching first-order indicators
Bricolage x Financial constraints (BR x FC)	BR1*FC3
	BR4*FC1
	BR2*FC4
Bricolage x Market constraints (BR x MC)	BR1*MC4
	BR4*MC2
	BR2*MC3
Bricolage x Regulatory constraints (BR x RC)	BR1*RC2
	BR4*RC3
	BR2*RC1

The double-mean centering approach proposed by Geldhof et al. (2013) was used to create residuals that served as indicators of the latent product constructs. The double-mean centering approach was performed in two distinct steps. In the first step, the three most reliable indicators of entrepreneurial bricolage were mean-centred and then multiplied by the three best indicators (also mean-centred indicators) of each of the three constructs as shown in the table above. Each resultant product indicator (sometimes known as mean-centred product indicators) was regressed onto all indicators of the two constituent constructs. For example, BR1*FC3 mean-centred product indicator was regressed onto mean-centred BR1, BR2, BR3, BR4, FC1, FC3, FC4 product indicators. The residuals of the regression analyses were saved and used as indicators of the interaction constructs in the analysis of interaction effects. The new dataset was then subjected to both descriptive analyses to assess normality assumptions and correlations as well as CFA to confirm adequacy of the model fit and to determine the estimation method.

5.3 Descriptive statistics

Descriptive analyses were performed following Steinmetz et al. (2011)'s procedures on a new data set to determine univariate normality and correlations between first-order and product indicators. The results are presented in appendices 7 and 8. The appendices show means, standard deviations, skewness and kurtosis of the product indicators created from double-mean centering approach. Most of the indicators especially product indicators were not normally distributed because showed substantial high values of kurtosis. Product indicators tend to be non-normal even if they are formed from normally distributed first-order indicators. The

correlations of indicators belonging to the same construct were statistically significant ($p < 0.01$) and higher than correlations of indicators belonging to different theoretical constructs. Furthermore, the correlations between product indicators and their constituent indicators (first-order indicators) were zero, which suggested absence of common variances between first order and product indicators. Thus, the double-mean centering approach completely removed collinearity between the first-order indicators and product variables. This finding is in line with the study of Steinmetz et al. (2011) who found zero correlations between first order and product indicators.

5.4 Exploratory factor analysis

EFA was performed on a new measurement scale consisting of product indicators to determine the underlying structure of scale items. This EFA was carried out applying the same procedures as in chapter 4. The EFA results showed KMO index of 0.757 which was higher than 0.5 and was considered suitable for EFA (Williams et al., 2010). The Bartlett's test with a significant *p*-value less than 0.001 ($p \leq 0.001$) and chi-square of 3017.280 (df = 276) conclusively suggested that correlation matrix was not an identity matrix. Other results of EFA are presented in table 5.3 below. As shown in the table, the EFA generated seven factors with eigenvalues greater than one, three of which were interaction constructs. The factor loadings of product indicators were above acceptable threshold of 0.5 for meaningful interpretation of the structure(Hair et al., 2019).

Table 5. 3 The results of EFA for the measurement scales of independent factors

Construct	Code	Factor loadings
Entrepreneurial bricolage	BR1	0.956
	BR2	0.880
	BR3	0.861
	BR4	0.906
	Eigenvalue	4.848
	Explained variance (%)	20.199
Entrepreneurial bricolage x Market constraints	BRMC1	-0.814
	BRMC2	-0.904
	BRMC3	-0.710
	Eigenvalue	3.301
	Explained variance (%)	13.753
Market constraints	MC1	0.601
	MC2	0.821
	MC3	0.623
	MC4	0.869
	Eigenvalue	2.437
	Explained variance (%)	10.153
Financial constraints	FC1	0.715
	FC2	0.605
	FC3	0.747
	FC4	0.651
	Eigenvalue	2.106
	Explained variance (%)	8.774
Entrepreneurial bricolage x Financial constraints	BRFC1	0.882
	BRFC2	0.586
	BRFC3	0.483
	Eigenvalue	1.747
	Explained variance (%)	7.280
Regulatory constraints	RC1	0.778
	RC2	0.911
	RC3	0.743
	Eigenvalue	1.545
	Explained variance (%)	6.437
	BRRC1	0.833
Entrepreneurial bricolage x Regulatory constraints	BRRC2	0.718
	BRRC3	0.661
	Eigenvalue	1.394
	Explained variance (%)	5.806
Total explained variance (%)		72.402

5.5 Tests for normality assumptions

The methodology literature on interaction terms in SEM suggests that dataset with product indicators is often non-normal at both univariate and multivariate levels (see table 5.4). Furthermore, CFA results in chapter 4 confirmed violation of normality assumptions in the initial dataset. Thus, subsequent analyses were carried out using an estimation method that takes into

account violations of normality assumptions. In this case, robust ML was used as an estimator for both CFA and SEM analyses.

Table 5. 4 Multivariate kurtosis

Measurement	Estimate
Mardia's coefficient	175.603
Normalized estimate	30.596

5.6 Confirmatory factor analysis (CFA)

CFA was performed to confirm the factor structure of a new measurement model which consisted of seven exogenous (i.e. predictors) constructs and two endogenous (outcomes) constructs. Four of the exogenous constructs were first-order constructs represented by entrepreneurial bricolage, financial constraints (FC), market constraints (MC) and regulatory constraints (RC). The remaining three exogenous constructs were latent product constructs constructed by combining items of entrepreneurial bricolage and other first-order constructs. Innovation (IP) and firm performance (FP) constituted endogenous constructs.

The CFA results of the measurement model are presented in tables 5.5 and 5.6 below. As it can be seen from table 5.5, the Sattora-Bentler Scaled Chi-square ($S\text{-}B_{\chi}^2$) value of 472.030 (df = 398; $p < 0.05$) suggests inadequate fit of the hypothesized model to the data. However, comparative fit index (CFI) value of 0.977 indicates a good fit and was above the cut-off value of close to 0.95 suggested by Hu and Bentler (1999). Moreover, the root mean square error of approximation (RMSEA) and standardized mean-square residual (SRMR) values of 0.027 (90% C.I. 0.016, 0.037) and 0.042 respectively were within the scope of a well-fitting model and were below the cut-off point of 0.08 for a good fit (Browne & Cudek, 1993).

Table 5. 5 Goodness-of-fit Statistics

Sattora-Bentler Scaled Chi-square ($S\text{-}B_{\chi}^2$)	472.030 (df = 398; $p < 0.05$)
Comparative Fit Indices (CFI)	0.977
Standardized Mean-square Residual (SRMR)**	0.042
Root Mean Square Error of Approximation (RMSEA)	0.027 (90% C.I. 0.016, 0.037)

Table 5.6 below presents CFA results of unstandardized and standardized factor loadings, adjusted standard errors and *t*-values. All parameter estimates of both first order and product indicators appeared reasonable and were statistically significant at a level of 0.05 and exhibited correct size and signs. Standard errors were in good order as well. The values of

standardized factor loadings of product indicators ranged from 0.446 to 0.932. Hence, it was concluded that the measurement was adequate in all aspects and could be used for SEM analysis.

Table 5. 6 CFA results of an overall measurement model

Construct	Indicators	Unstandardized loadings	Standardized loadings	Standard errors	*t*-value
Entrepreneurial bricolage	BR1	1.00	0.932	0.00	0.00
	BR2	0.957	0.897	0.037	25.83
	BR3	0.929	0.869	0.035	26.46
	BR4	0.946	0.922	0.034	27.90
Financial constraints	FC1	1.00	0.700	0.00	0.00
	FC2	0.871	0.566	0.152	5.74
	FC3	1.151	0.777	0.151	7.60
	FC4	1.057	0.667	0.147	7.21
Market constraints (MC)	MC1	1.00	0.618	0.00	0.00
	MC2	1.334	0.821	0.146	9.12
	MC3	1.069	0.697	0.147	7.25
	MC4	1.413	0.846	0.159	8.90
Regulatory constraints (RC)	RC1	1.00	0.775	0.00	0.00
	RC2	1.214	0.902	0.105	11.52
	RC3	1.003	0.778	0.089	11.29
Bricolage x Financial constraints (BRFC)	BRFC1	1.000	0.912	0.000	0.000
	BRFC2	0.666	0.607	0.144	4.61
	BRFC3	0.492	0.449	0.150	3.28
Bricolage x market constraints (BRMC)	BRMC1	1.000	0.804	0.000	0.000
	BRMC2	1.105	0.889	0.117	9.46
	BRMC3	0.955	0.768	0.111	8.62
Bricolage x Regulatory constraints (BRRC)	BRRC1	1.000	0.842	0.000	0.000
	BRRC2	0.883	0.743	0.115	7.71
	BRRC3	0.819	0.689	0.135	6.08
Innovation (IP)	PDI	1.00	0.583	0.00	0.00
	PRI	1.610	0.860	0.179	9.01
	MKI	1.619	0.927	0.173	9.34
Firm performance (FP)	FP1	1.00	0.619	0.000	0.000
	FP2	1.554	0.922	0.130	11.98
	FP3	1.607	0.926	0.136	11.80
	FP4	1.486	0.906	0.126	11.81

5.7 SEM analysis of moderating effect of entrepreneurial bricolage

The analysis of moderating effect of entrepreneurial bricolage was based on Geldhof et al. (2013)'s double-mean centering approach. Interaction effects are performed in two stages with

the first one involving a core structural equation model (first-order constructs including the moderating factor). The first SEM testing was performed in chapter 4 and the path coefficient of knowledge constraints construct was insignificant. The second SEM testing was performed on the structural equation model comprising interaction terms in addition to first-order constructs. Only significant coefficients were included in the second SEM testing.

The adequacy of the structural equation model (figure 5.1) was assessed by model fit indices and significance of path estimates among latent constructs. The model fit indices used were Bentler chi-square ($S\text{-}B_{\chi}^{2}$), comparative fit index (CFI), standardized mean-square residual (SRMR) and root mean square error of approximation and its corresponding confidence interval (RMSEA). Evaluation of statistical significance of the hypothesized relationships between constructs was based on *t*-values associated with path parameter estimates. If the *t*-value is ≥ 1.96 at a level of 0.05, then the path parameter estimate is considered statistically significant and the hypothesized relationship is supported.

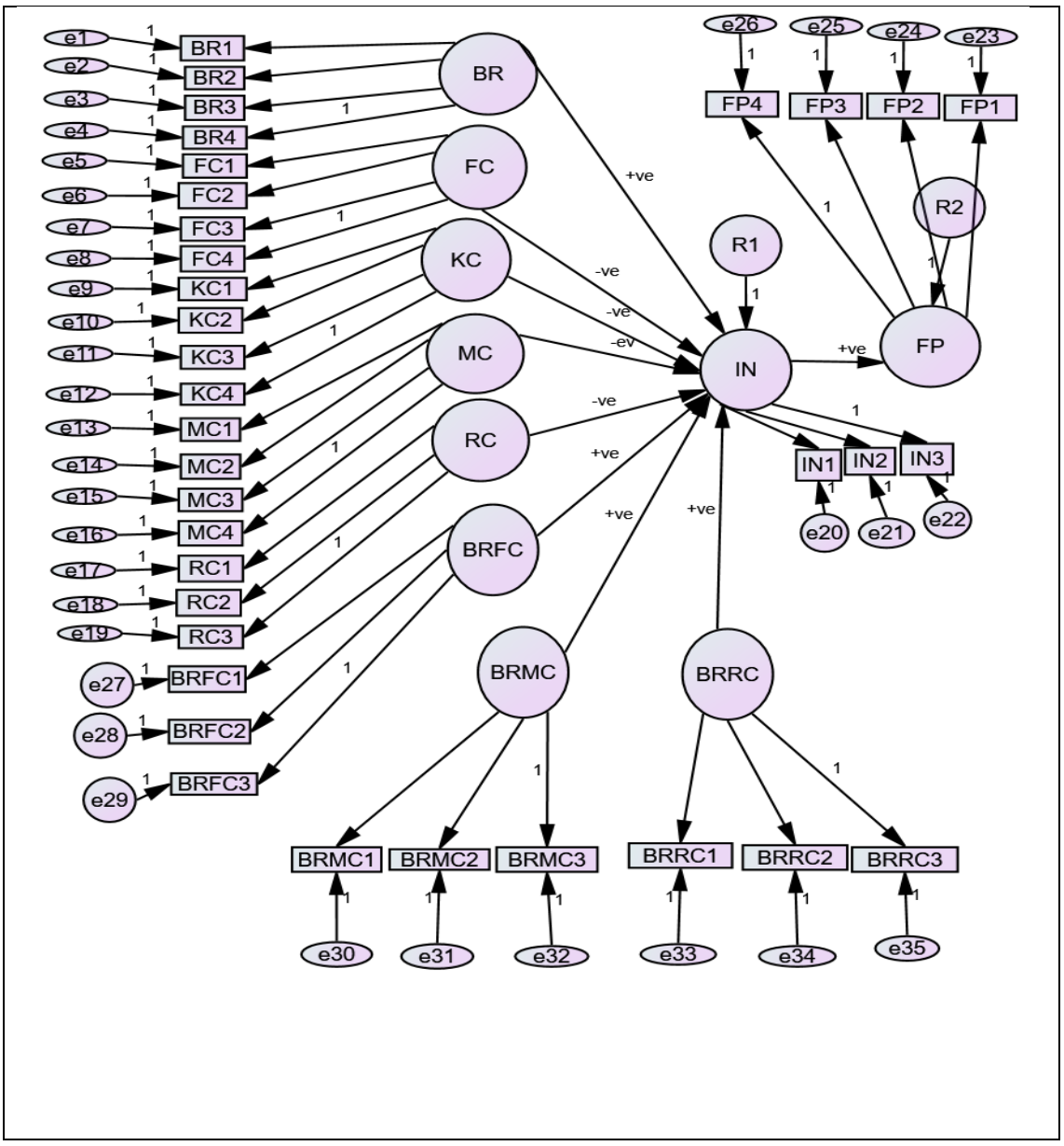


Figure 5. 1 Structural equation model with product latent constructs

Note: BR = Entrepreneurial bricolage; FC = Financial constraints; KC = Knowledge constraints; MC= Market constraints; RC = Regulatory constraints; and BRFC, BRMC and BRRC are product latent constructs

5.8 Results of SEM testing

Table 5.7 presents model fit indices, of which the Sattora-Bentler Scaled Chi-square (S-B_x^2) value of 491.406 (df = 405; $p < 0.05$) indicated a poor fit of the model to the data. The $_x2$ statistic for model fit evaluation is often affected adversely by sample size, violation of normality assumptions and model complexity (Brown, 2006; Nye & Drasgow, 2011). However, the values of comparative fit index (CFI = 0.973), standardized root mean-square residual (SRMR = 0.055) and root-mean square error of approximation (RMSEA = 0.029 (90% C.I. 0.019, 0.039) suggested

adequate model fit. The values close to 0.95 for CFI and below 0.08 for SRMR and RMSEA below 0.08 indicate a good fit. The overall model fit statistics confirmed an adequate fit of the structural model.

Table 5. 7 Model fit Statistics

Sattora-Bentler Scaled Chi-square (S-B_x^2)	491.406 (df = 405; p < 0.05)
Comparative Fit Index (CFI)	0.973
Standardized Mean-square Residual (SRMR)**	0.055
Root Mean Square Error of Approximation (RMSEA)	0.029 (90% C.I. 0.019, 0.039)

Table 5.8 presents parameter estimates of the relationships between interaction terms and innovation. Hypotheses H2b, H4b and H5b predicted positive paths from interaction terms of entrepreneurial bricolage with financial constraints, market and regulatory constraints to innovation. Path coefficients of the interaction terms of entrepreneurial bricolage with financial constraints (*t*-value = 0.828; *p* > 0.05) and market constraints (*t*-value = 1.536; *p* > 0.05) were positive but statistically insignificant but the coefficient of the interaction term of entrepreneurial bricolage with regulatory constraints (BRRC) remained negative and insignificant *(t*-value = -0.704; *p* > 0.05).

A notable consequence of introducing entrepreneurial bricolage as moderating factor in the model was the reverse direction of the impact (i.e. from negative to positive) of financial and market constraints on innovation but the direction of impact of regulatory constraints remained unchanged. Thus, hypotheses H2b, H4b were partially moderated. These findings suggest that entrepreneurial bricolage was neither the only nor main strategy which innovative firms used to address innovation constraints. Research evidence (Baker & Nelson, 2005) indicates that growth oriented firms apply bricolage selectively to solve particular problems before it is abandoned to avoid what Bojica et al. (2014; pp. 5) call “the constraints of embedded ties and recursive use of bricolage”.

Table 5. 8 Moderating effects of entrepreneurial bricolage on innovation constraints

Hypothesis	Hypothesized path	Standardized Estimates	Unstandardized estimates	Std errors	t-value	Results
H1	BR to IN	0.358	0.220	0.044	4.95*	Supported
H2a	FC to IN	-0.189	-0.291	0.065	-2.42*	Supported
H2b	BRFC to IN	0.048	0.067	0.081	0.828	Not supported
H4a	MC to IN	-0.188	-0.184	0.089	-2.08*	Supported
H4b	BRMC to IN	0.138	0.112	0.073	1.536	Not supported
H5a	RC C to IN	-0.411	-0.291	0.063	-4.64*	Supported
H5b	BRRC to IN	-0.053	-0.048	0.069	-0.704	Not supported
H6	IN to FP		0.241	0.120	2.00*	Supported

Note: * $p < 0.05$

KC = Knowledge constraints; FC = Financial constraints; MC = Market constraints; RC = Regulatory constraints; BR = Entrepreneurial bricolage; IN = Innovation and FP = Firm performance

It is somewhat surprising that entrepreneurial bricolage didn't fully moderate the relationships of financial, market and regulatory constraints with innovation. It is highly probable that innovative firms applied other strategies in addition to entrepreneurial bricolage to overcome innovation constraints. The present study raises the possibility that food and beverage manufacturers employed multiple strategies in dealing with innovation constraints when undertaking innovation activities. Building on this view, further qualitative study was conducted to gain a deeper understanding of how and which strategies innovative firms used to overcome innovation constraints. The findings of this qualitative inquiry are reported in chapter six.

Chapter 6 QUALITATIVE FINDINGS

6.1 Introduction

Semi-structured interviews were conducted with 17 managers/owners of food and beverage manufacturing firms. The qualitative sample was drawn from a quantitative survey sampling frame and comprised 4 small enterprises, 8 medium sized enterprises and 5 large enterprises drawn from beverage, edible oil and coffee subsectors. Selection of responding enterprises was based on two criteria: the extent of firms' involvement in innovation activities and mean scores computed from ratings (on five-point Likert scales) of the importance of constraints to innovation.

In the quantitative phase, respondents were asked to indicate whether they had introduced any innovation(s) for the past five years. There were 9 items reflecting product, process and market dimensions of innovation. The responses were "yes" or "no". Firms with the highest number of yes (s) were more innovative than firms with more no (s). They were eventually arranged in a descending order based on the number of innovations introduced. Firms with at least three innovations in each size classification and aggregate score on each of the four constraint constructs above the construct's mean score qualified were picked for interviews.

Contact details of selected enterprises were obtained from the questionnaires they completed. The researcher made telephone calls to seek their consent and appointment for interviews. Those who accepted the request for being interviewd were also asked to indicate convenient date and time for interviews. Most of the interviews were held at respondent's premises, with exception of three respodents who opted to be interviewed outside their offices and after working hours. The interviews followed a protocol that consisted of questions related to innovation activities and sources of innovative ideas, innovation constraints and mitigation strategies for innovation constraints with opportunities for follow-up probes. Consent was sought from interviewees to use a digital recorder to record interviews. The duration of the interviews varied from 38 for short interviews to 65 minutes for long interviews. The interviews were conducted in either Swahili or English language depending on respondent's preference. Those interwiews in Swahili language were translated into English during transcription (before analysis) by the reseracher himself, as he was conversant with both languages.

Translation is sometimes done by researchers themselves without a need for extensive experience in translation or professional translators (Suh et al., 2009; Zhu et al., 2019). The translation by researchers themselves is viewed as lacking reflectivity or having bias towards

favouring research findings but researchers often have an advantage of in-depth undertstanding of the interview context and research (Zhu et al., 2019). In this study, the researcher's familiarity with the contex helped him to achieve technical and conceptual translation by choosing words that represented actual participants' expression and experiences. According to Choi et al. (2012), a translator who fully understands the participants' culture and language will reduce potential threats to the validity of the data.

Full interview transcripts were translated from Swahili to English language but the exercise was tedious and time-consuming. However, it helped the researcher to gain complete familiarity with the data before extracting codes from the transcripts. Again, this sort of one-way translation would have cost the reseracher a lot of money if a professional translator had to be involved. The qualitative data was imported into Nvivo version 11 for coding and analysis. Appendix 10 presents different characterisitcs of both owners/managesr and their enterprises including the main product(s). The responses were given mainly by owners/CEOs of the interviewed firms.

6.2 Nature and types of innovations in SMEs

Respondents were asked to provide descriptions of innovations they indicated in the survey to have introduced over the past five years and sources of innovative ideas. The responses are summarized in appendix 11 for small and medium enterprises and in appendix 12 for large enterprises. The managers of SMEs gave examples of new products they had introduced and two forms of product innovations emerged from interviews: changes in products and packaging. The changes in products included new products made up of new ingredients, new product with new uses or modifications of existing products by improving formulae or adding new ingredients. Product packaging innovations were mainly introduced by coffee processors. The packaging designs and quality of packaging materials were important features that enterprises used to promote their products and differentiate them from competitors' products. For example, a company would use materials or design different packages for local customers and foreign customers.

> *"The Masai packaging is special for tourists and souvenirs.* Aluminium bags with air valve are packaging for local consumers and is normally available in supermarkets" ***(CME1).***

> *"So, we can say we are different from our competitors in terms packaging and quality of packaging and products in general"* ***(CME8).***

The comments from many managers of SMEs suggested that most of the product innovations were only new to the firm, which reflected the nature of innovations in developing country contexts. As noted by Egbetokun et al. (2016), innovations in developing countries are incremental and entail modifications of products offered by others in the market . Here are some comments from managers of SMEs:

"*We buy competitors' products to examine the contents and test their quality" **CME1***

*"We conduct market research to find out if there are new liquors, packaging designs and materials or new machines in the market" **BME5***

The driving force for product innovations was process innovation and it was apparent that process innovation was concerned with acquisition of new equipment and machinery for product manufacturing or packaging. The new equipment was not only used to manufacture new products, but also helped firms cut down production costs and improve productivity.

*"The new machine has helped us process more quantities of sunflower seeds per hour, save energy and minimizes wastage" **(OSE4).***

*"The new installed machine has reduced production costs and increased production capacity" **(OME3**)*

These results are in line with Baregheh et al. (2012a)'s findings which show that product innovations in the food industry are driven by process and market innovations. Different types of market innovations were also introduced particularly by firms which had introduced new or improved products. Market innovations ranged from changes in distribution methods to the use of social media such as Facebook and Instagram for advertising and promotion. Others market innovations included finding new markets and offering incentives for bulk purchases.

*"We use Facebook, Instagram to promote our products. Most of our customers are tourists, not local people. Social media are crucial to keep us in touch with our consumers" (**CME8)***

*"We now give incentives to our customers who buy in bulk. For example, a customer who buys a consignment of 100 cartons we give them 5 cartons for free" **(BME5**).*

Some managers reported introducing changes in organizational structure, methods of procuring raw materials and management processes such as cash and inventory control procedures. The

driving forces for these changes differed among enterprises and across sectors. More precisely, enterprises in the edible oil and beverages sub-sectors introduced changes in the procurement methods to solve pertinent problem of inadequate supply of raw materials but changes in the management processes were driven by continuous losses of organization's assets or the need to improve employee productivity.

> "*As means of dealing with this problem we decided to engage sunflowers farmers in contr*act farming***" (OME3)***

> *"We bought computers and have a cash and inventory management system installed on them" (**BME5**)*

> *"In the beginning, when we were operating as a family business, it was difficult to exercise full control over cash. But now, we have introduced new ways of managing our assets, no credit sales, any cash collections are handed over to the accountant immediately. Unsold goods are returned to store after verification" **(BME7).***

6.3 Sources of ideas in SMEs

Respondents were also asked to provide answers to a question on the main sources of innovation ideas and information and their responses are summarized in appendix 11. The results show that SMEs used a combination of internal and external sources of ideas and information. In some firms, new ideas came from owners/managers or family members.

> *I am also responsible for innovative changes in products and operations. I look for information from different sources and learn from other entrepreneurs" **(OME4).***

Interestingly, customers, suppliers of equipment and business associations were the most important external sources of ideas in the industry. Ideas and information from customers and suppliers came as suggestions or feedback. For example, there were several pieces of evidence of customers suggesting packaging designs, labels, ways of mixing ingredients and kinds of products they would like to be manufactured. Strong ties with customers made it easy to obtain feedback and suggestions as well as information about competitors' new offerings in the market such as new products, packaging materials and designs etc.

> *I decided to make passion dry wine after getting a suggestion from one of my customers **(BSE1)**.*

"*First, our customers give us ideas of what they want, and then we produce for them" **(BME5)**.*

Relationships between food and beverage manufacturers and business associations and suppliers were strong and brought several benefits to the former group. For example, suppliers of equipment and business associations such as Small Industries Development Organization (SIDO), Central Zone Sunflower Oil Processors Association (CEZOSOPA), Tanzania Chamber of Commerce and Industries Association (TCCIA) were active in supporting their members by offering training in areas like human capital development, new product development, new technologies, product quality and packaging designs. Additionally, business associations provided their members with information on new developments in the industry and upcoming trade fairs. These findings are consistent with much of the existing literature that stresses the importance of suppliers and business associations in providing ideas and information which is utilized in the innovation processes (Mpangile et al., 2008; Ciliberti et al., 2016; Voeten et al., 2016).

Competitors were also a relevant source of ideas and information. The interviewees acknowledged the use of competitors' customers and employees, members of their marketing teams to gather information on competitors' market activities and their products. They sometimes bought competitors' products and examined the content, formulae and quality, packaging materials and designs etc. to look for something new to imitate.

*"I do market research to find out if there are new liquor products in the market, new packaging materials, new packaging designs and new liquor making machines" **(BME5).***

*"There are people we meet in coffee shops and drink coffee. For example, I am also in tours business, we meet with tour companies' drivers who interact frequently with tourists and we get input from them. They inform us about the products that tourists prefer to buy from various courier shops" **(CSE2**).*

These results reflect those of Colurcio et al. (2012) who also found that Italian and Swiss small and medium food manufacturers imitated competitors' products.

The interviewees also acknowledged the importance of internet, industry's magazines, trade fairs, overseas visits, family members and peers as sources of ideas and information. These sources provided important input for innovation.

"*When I want to do something new, I read from the internet, I get innovative ideas*

*from the internet" **(OSE4**).*

"*I get new information from the internet. I do a lot of internet searching" (**CME1**).*
*"We use different forums and coffee magazines like Roast Magazine. Many companies dealing with coffee products are subscribers and advertise their products in there. They send us copies monthly, and as we read, we know new developments in the industry" **(CME6)**.*

*"For the past ten years, we have been traveling to different countries and places to attend souvenir exhibitions We have been to China, Germany, UK and South Africa. We learn new things and get new ideas from them. We often implement the new ideas in our business" **(CME8).***

6.4 Nature and types of innovations in large enterprises

Appendix 12 summarizes descriptions of innovations, and sources of ideas and information in large food and beverage manufacturers. Large enterprises introduced different types of innovations and utilized a variety of internal and external sources of ideas and information. The interview analysis uncovered that many new products introduced were made from new ingredients, with a few innovations involving improvements in the taste and quality of products, or changes in the formulae and quality of raw materials.

*"Our recent innovation is [….] and its demand is rising significantly such that we have failed to meet it" **(BLE3).***

*"We have changed some formulae to make water have a better taste" **(BLE5)***

*"……. they can extract juice and sell it to us as back wine instead of grapes" **(BLE1).***

There were also several responses that explained packaging innovations:

"*We changed appearances and quality of 350ml bottles and 500ml bottles" **(BLE3);***

*"We used to package in Euro glass bottles with long necks, but now we have new bottles with good quality and appealing appearance" **(BLE3**).*

The comments on packaging innovations broadly support previous studies in this area that food and beverage manufacturers utilize packaging innovations as a tool for differentiating

themselves and their products from others and for improving quality perceptions as well as to facilitate distribution (Mahalik & Nambiar, 2010; Caiazza & Volpe, 2013; Trott & Simms, 2017).

Process innovations focused on acquisition of new equipment and machinery in order to expand production capacity, reduce production costs, improve employee productivity and support production of new products. Some enterprises introduced changes in product quality testing procedures and procurement methods of raw materials. Here are comments from two managers:

> *Our new technologies which are energy efficient have helped us minimize manufacturing costs and improve productivity per unit/ or hour* ***(BLE3****).*

> *"As the shortage became critical, we needed to change and start buying the seeds from distant regions. We have also built godowns in some areas"* ***(OLE4)***

Marketing innovations included changes in distribution methods (i.e. use of sales agents), expansion into new markets, use of traditional methods (i.e. television, radio, billboards and newspapers) and social media for product advertising and promotion. This finding confirms the importance of market innovations for firms actively involved in product innovations (Baregheh et al., 2012b).

6.5 SMEs vs large enterprises: similarities and differences in innovation and sources of ideas

The analysis revealed similarities and differences in the nature and types of innovation and sources of ideas between SMEs and large enterprises. More precisely, similarities were noted in the types of innovation and drivers for product innovations, but the differences appeared in the nature of innovation and sources of innovative ideas. On the types of innovation, both SMEs and large enterprises equally engaged in product, process and market innovations. However, most innovations introduced by SMEs were modifications or imitations of what had been already offered by competitors. In contrast, large enterprises were equally involved in both radical and incremental innovations. It might be possible that these differences were due to the nature of knowledge utilized in the innovation process. SMEs relied heavily on external sources (i.e. customers and suppliers of equipment) of ideas and information to provide input for innovation processes, but large enterprises combined both internally generated knowledge from R&D and external knowledge (i.e. market research). Previous studies emphasize the importance of

various sources of knowledge for introduction of different types of innovations (Capitanio et al., 2010; Varis & Littunen, 2010; Lefebvre et al., 2015).

6.6 Business Performance

The results of qualitative research showed growth in sales volume, employment, market share and production volume among interviewed firms. None of the firms had experienced contracted growth in the above measures. Although, interviewed managers provided information on growth in employment and production, they were reluctant to reveal financial information on sales, capital and profits. However, survival, growth in employment and expansion in production capacity were indicative measures of growth in profits and sales as well.

> "*Yes, we have grown, our market share and capital have increased. We started with two employees plus two directors. In total, we were 4 people when we started. We started in 2012 as an informal and home-based business, with no registration"* ***(CSE2).***

The manager from an edible oil company (OME4) mentioned that their company had registered growth in capital and employment.

> "*I started [2005] with 3 employees and capital investment in machine of TZS 5 million. Now, our capital has grown, and we have 15 permanent employees and more than 40 casual workers".*

Another manager from a brewery company noted that the market share for their company's products had risen tremendously.

> "*I can say our market share is more than 70%"* ***(BLE2).***

The preceding section discussed the nature, types and sources of ideas and growth performance in both small and large enterprises. It is widely recognized that innovation is a risky and difficult activity and takes place in uncertain environment. The following section presents interview responses about innovation constraints facing innovative firms in the industry.

6.7 Innovation constraints

This section reports the results of interview analysis of innovation constraints. Five main themes emerged from the interviews, four of which corresponded to the main factors that were investigated in the quantitative phase. These four themes were: financial constraints, knowledge constraints, market constraints and regulatory constraints. The fifth theme termed as "other constraints" consisted of constraints that did not fit into the first four themes.

6.7.1 Financial constraints

Financial resources are needed to fund innovation activites including commercialization of innovation output but when they are inadequate or unavailable, innovation activities are adversely affected. Financial constraints are difficulties faced by firms involved in innovation activities. They represent lack of financial resources, high costs of innovation and risks (Madrid-Guijarro et al., 2009a; Paananen, 2012a).

6.7.1.1 Inadequate internal finance

Innovation literature suggests that internal finance is the main source of funds required for innovation activities (Eniola & Entebang, 2015) . However, insufficient internal financial resources force potential innovators to seek additional finance from external sources.

> *"My plan was to package ground coffee in tins, but a lot of money is needed, and I can't afford it. I need an investment of more than US$10,000, that's a lot of money. I want an automatic filling, packaging and labelling machine"* ***(CME5).***

6.7.1.2 Lack of bank loans

Credit finance is an important source of finance for investment in innovation projects (Yang et al., 2014). The study cases provided evidence that many innovative firms depended on credit finance from financial institution to fund innovation activities. However, high interest rates, complex terms and conditions including evidence of unmovable assets as collateral and other related costs discouraged firms from accessing debt finance. Here are comments made by some managers:

> "*The interest rate on loans is high to the extent that it becomes an obstacle to borrowing companies. Tanzania is one of the countries whose financial institutions charge very high interest rates"* ***(BLE3).***

> *"We can't borrow more money from commercial banks because they charge high interest rates. To borrow from a commercial bank, you need to present a brilliantly written business plan. Writing such a business plan may cost you TZS 500,000 [£188] while interest rates can amount to 21% if you include all other charges"* ***(OME5)****.*

This finding reflects the results of several other studies (Hansen et al., 2012; Linna, 2013; Ayalew & Xianzhi, 2019) that reported high lending rates, high collateral requirements and complex loan application procedures as obstacles to debt finance access in developing countries. In African countries, for example, credit constraints are more severe in small, medium and young firms

and those owned by female entrepreneurs than in large enterprises and subsidiaries (Ayalew & Xianzhi, 2019). Large enterprises generate more profits which they can plough back into business for the purpose of financing innovation projects while subsidiaries are more likely to get additional resources from within the group.

Notable effects of lack of finance as mentioned by participants included: failure to undertake advertising and promotion campaigns for new products and expand production capacity by purchasing new equipment, abandonment of innovation projects, delays in implementing innovation projects and sometimes operating under capacity due to insufficient working capital.

> *"The big challenge was to get customers. We didn't have enough money for advertising and promotion"* ***(BSE3).***

> "*We wanted to expand our production capacity by installing new machines, but we delayed implementation of our plans because it was not an easy task to get financial resources" (**BLE1)**.*

6.7.1.3 High costs of innovation

High costs of innovation hampered innovation in several ways and different causes were identified by participants. Interview analysis revealed several causes of high costs of innovation. Respondents complained about high costs of compliance with multiple regulations and the time it takes to register a new product with regulatory authorities. According to CTI[12] (2013), total compliance cost in the industry amounts to TZS 100 billion [£37,588,615] which is equivalent to 40% of the sector's total tax contribution and 17% of total operating costs.

It was reported that the period of 6 months including long lead times for product registration were more likely to have financial implications and destabilizing effects on planning and sales projections. For example, the manager from a brewery company said:

> *"Innovation costs in Tanzania are very high, not just in financial terms, but also in terms of the time innovation takes to get innovation to the market"* ***(BLE3)**.*

In contrast, other managers associated high innovation costs with increasing prices of domestically produced packaging materials, import duty on imported raw materials and local currency exchange rate fluctuations against major currencies. Their major concern was

[12] Confederation of Tanzania Industries

importation taxes on materials which they considered high and greatly contributed to increased costs of input.

> *"We import packaging materials and pay import taxes. Import duties are very high. It is really difficult to implement a new idea" (**CME5**).*

> *"On top of that, fluctuation of our local currency against major currencies is also a major challenge we face. We import raw materials and when our currency depreciates it adversely affects our raw materials budgets and profit margin. We must maintain the selling prices of our products but at the expense of reduced profit margins" (**BLE5).***

These findings are consistent with the results of Mpangile et al. (2008) who found that higher tax rates limited food manufacturers' investments in growth-oriented activities such as innovation as they were eroding profit margins.

It was also revealed that instability of raw material prices affected implementation of plans and budgets. Because of that some firms ended up selling their products at a loss. This could be interpreted as poor planning or lack of hedging strategies, but these issues are inevitable in developing countries due to large amounts of uncertainties in the business environment and having under-developed hedging markets. As one interviewee said:

> "*The price of sunflower seeds and processed oil is not stable. It keeps on fluctuating. I cannot plan for materials and work out a production budget. For instance, we used to buy sunflower seeds at TZS 850/= per kg and now it has dropped to TZS 580/= per kg. Soon it may rise and reach TZS 900/= per kg" **(OME4)**.*

6.7.2 Skill gaps

Skill gaps occur when an enterprise fails to access a workforce that can perform required tasks (Sami El-Khasawneh, 2012). Three types of knowledge gaps emerged from the data: lack of people with technical know-how, skills and qualifications, and experience in product and packaging designs. With exception to technical skills, the rest were sub-sectors' specific skills shortages particularly in coffee and winemaking sub-sectors. These sub-sectors needed experts but finding skilled people or with experiences and qualifications in coffee tasting or winemaking was very difficult. Talking about this issue one interviewee from the coffee industry said:

"Lack of skilled people especially coffee roasters and tasters is a big problem in the coffee industry in our country. We are finding it notably harder to recruit baristas from the industry". I

think there are only 3 rikalas in Moshi, and they are busy and actively involved in training coffee shops and coffee roasters' staff **(CME8**).

Another respondent who was a winemaker had this to say:

> *"Considering the current situation, it is not easy to find people with deeper knowledge and skills in winemaking* **(BLE1)**.

People's lack of interest in coffee business, government's failures to invest in human resource development were the main causes of lack of people with skills and qualifications. In addition, local universities and colleges had failed to introduce in their teaching curricula specific courses related to winemaking, coffee or oil processing.

> *There are very few Likalas [coffee masters] in the country because of low interest in coffee business by local people* ***(CME8).***

> *"Many university graduates lack skills and knowledge of grapes farming and winemaking. I worked for Grape Research Institute and I know, people with knowledge and experience in the wine industry are exceptional and we are few"* ***(BLE1****).*

Notable effects of skills shortages included failure to enter international markets due to poor packaging designs and inability of firms to expand and properly plan for succession.

> *"One of the major problems SMEs face is lack of innovative packaging designs. That's why most of them fail to enter international markets"* ***(CME1).***

> *"Majority of experienced people have retired. I am worried, I don't see if there are serious young people who can take over from us when we retire"* ***(BLE1).***

6.7.3 Market constraints

Three types of market constraints to innovation emerged from the analysis: sluggish demand for innovative products, counterfeits/product imitation and competition. These were constraints that innovative firms experienced when introduce their products in the market.

6.7.3.1 Sluggish demand

Lack of demand for innovative products was one of the main problems facing innovative firms in the industry. Several issues were raised during interviews concerning consumers' behaviour of not responding to innovative products. Culture, economic status and conservative behaviour of food consumers, counterfeits and informality were the main causes of sluggish demand for

innovative products. Many consumers were considered low income earners who could not afford to pay premium for innovative products.

> *"The main problem is lack of demand for new innovative products ……..Sometimes, customers don't like new products……"* ***(CME8****).*

> *"The major challenge we face is that many consumers have low purchasing power…….and not many consumers can afford it"* **(CME6)**.

On the other hand, some interviewees attributed low demand for innovative products to consumers' behaviour of preferring cheap products. According to Ochieng et al. (2018), Tanzanians pay attention to price when making buying decisions. If consumers do not like buying quality products, then they would go for cheap products and of poor quality or counterfeits. As one respondent put it:

> *"The problem of Tanzanians, when it comes to drinking water, is that they look only at price and volume. Quality is not important to them; they normally prefer cheap products"* **(BLE5**).

Other respondents had different views and indicated that consumers' behaviour of avoiding new food products (i.e. conservative behaviour) was the main cause of low demand for innovative products. It was revealed that consumers were reluctant to accept new products or any products whose features or taste had been changed from the original ones. This was a difficult situation for innovative firms because it was not possible to predict whether their innovations would be accepted in the market.

> "*A good example is TDS-the amount of minerals in water. There is no limit of it, but they say it might be a thousand. A lot of foreign companies and experts say that the higher the TDS, the better the water for health. But a higher level of TDS brings a slight change in water taste. But it is healthy. But if you go for what local people want, using lower levels of TDS, the water will have a lighter taste, the taste which is liked most by our local customers. So, it is like a tag of wars, will you go for healthy method or low levels of TDS which is unhealthy and sells more?"* ***(BLE5)****.*

This view was echoed by one manager of a brewery company **(BME7)** who said that consumers' resistance to change in the taste of products made them suffer a huge loss. This is what had to say:

> *"The taste changed but our objective was to produce the same quality product with*

less sugar. It didn't work out, the sales dropped significantly. So, we had to destroy the stock we produced using a new formula and the loss we suffered was huge".

These results support previous research which found that consumers' conservative behaviour of resisting innovative changes in the food products constitutes a significant constraint to innovation. For example, the findings of a recent study by Nandonde (2018) in the Tanzanian food industry indicated that fortification of maize flour to meet the government requirements resulted into rejection of the product by consumers. Looking at these results one might conclude that these innovative firms were neither engaging consumers in their innovation process nor were they carrying out market research to understand customers' perceptions and reactions before introduction of any innovation.

However, results reported in appendices 10 and 11 indicate a higher degree of customer involvement and market research as sources of ideas and information. It can be argued that customers' engagement was partial and limited to provision of ideas without fully involving them in all stages of product development (i.e. ideation to product commercialisation). On the other hand, it is possible that information collected from market research is not used to design programmes for education on safety and health benefits of innovations after commercialisation so as to reduce consumer resistance to a greater extent (Huang et al., 2003).

The counterfeit products and those supplied by informal sector are often cheap and substitutes for genuine products. Tanzania's market for food products and beverages is characterised by consumers with low purchasing power and very keen on cheap products. Therefore, it is more likely that the demand for ingenuine products will be higher, inevitably causing the demand for innovative products to drop drastically.

*"From last year, when people started to complain about their reduced purchasing power, almost all companies reduced their prices (**BLE3**).*

6.7.3.2 Counterfeits and imitation

Many managers/owners of small and large enterprises spoke about proliferation of counterfeit products and their effects on the country's economy. This was a major setback to innovation, given the fact that customers' awareness of health effects resulting from consumption of counterfeits was very low. One of the main concerns of respondents was about the scale of counterfeit products. The market share of counterfeits was perceived to be big as that of formal market, thus lowering the demand for genuine products. There are larger amounts of counterfeit products in the country and research evidence suggests that from 2010 to 2016, the

government seized countrfeifet goods worth of TZS 2.9 trillion [£1,090,071,274][13] (CTI, 2017) while in 2008, market value of counterfeited foodstuffs and beverages was estimated at TZS 5.00 billion [£ 2,066,278][14]. The manager from a beer making company (**BLE3)** said the following.

> *"Another challenge we are facing is that the market is dominated by illicit beer products. This is a very severe problem. Tanzania's beer market is 3.8 million people. And the size of illicit beer is 50% of the total market. The ratio is 1:1. Then, you can draw a line and say this is formal alcohol and that is illicit alcohol".*

The researcher probed further into the issue to get more details of as to why the market size for counterfeits was so big. Some respondents attributed it to multiplicity and weak regulations dealing with counterfeiting and consumers' behaviour of preferring cheap and low-quality products. Regulations are too many (i.e. about 22 laws and regulations and more than 15 regulatory bodies) to extent that they confuse consumers and producers over which government departments, regulators are responsible for combating counterfeits (Charles & Mambi, 2013). Counterfeit products are popular among low-income earners and in markets with relatively lower purchasing intentions of genuine and innovative products (Albers-Miller, 1999; Kaufmann et al., 2016). This what the manager from a brewery company **(BLE1)** said:

> *It is easy to find people who sell counterfeits but not who make them. Our law doesn't allow to follow the supply chains, from the seller to the producer of counterfeits. It is possible to trace the source and arrest them if the law allows it. ……..Because, the law does not require the seller to reveal the identity of the supplier, people will continue to make and sell counterfeits……. Something discouraging is that when Tanzania Bureau Standards takes copied samples of your products for testing and if they find that they meet their standards, then that becomes the end the story. They don't go further".*

Furthermore, some respondents expressed dissatisfaction with the amount of penalties and fines that culprits were paying when taken to court and found guilty. Penalties were seen not heavy enough to deter counterfeit dealers from further engaging in such business. The Fair Competition Act 2003 provides for payment of fines up to two times of the financial loss suffered. One respondent recommended heavy punishment such as imprisonment in addition to fines.

[13] Bank of Tanzania Exchange rate as at 30th December 2016 [£1 = TZS 2,660.38]
[14] Bank of Tanzania Exchange rate as at 1st April, 2008 [£1 = TZS 2,419.81]

"*At the end he paid a fine of TZS 500,000 [£188] only! ……. the penalty is not severe and cannot deter them from engaging in counterfeits. I think the offenders should be imprisoned, instead of just paying fines".*

The fact that the market size of counterfeit products was so big, some firms had started to experience dramatic drops in sales volumes due to sluggish demand for their genuine products. In addition, consumers' health was at risk.

"Our sales have dropped by 50% for a period of two years because of counterfeits……. I can tell you in the next 2 or 3 years, we are more likely to close the business if the government will not do something serious to eliminate the counterfeits from the market" ***(BLE1).***

"…...currently our sales have dropped significantly due to high competition, the market is full of fake products" ***(BSE3).***

6.7.3.3 Competition

Competition can act as a driver or constraint to innovation depending on the level of its intensity and the nature of competitors. The industry's sources of competition are informal sector and established and large enterprises. Regarding informal sector, respondents mentioned of market distortion generated by unfair competition from informal rivalries. Generally, Tanzania is one of the developing countries with a higher share of informal businesses in the non-agricultural sector (Charmes, 2000; MTI & FSDT, 2012). Empirical evidence suggests that a larger informal sector in the country reduces formal firms' propensity to innovate (Demirbas et al., 2011).

There are many sunflower oil products sold in Dodoma at cheaper prices. These are normally sold by informal oil processors and most of them don't pay taxes. They sell their products at lower prices ***(OME3)****.*

There are many competitors and most of them operate informally. As they do not pay taxes, their products are cheaper than ours. So, this makes our products more expensive" ***(OLE2).***

Interview analysis produced mixed findings of respondents' perceptions about the degree of competition. While most interviewees reported experiences of intense competition, others viewed it as unthreatening or minimal.

"Competition is stiff in the domestic market as there many brands that are produced by well established companies with big names in the world" ***(BLE1).***

"One of the biggest challenges we face in the market is emergence of many competitors…… For example, last year alone there were six new competitors" ***(BLE5).***

Some respondents especially managers/owners of SMEs reported unethical actions of large enterprises which they considered intentional and aimed at tainting image of their products and company. The actions such as packaging fake products using their packages and labels or colluding with government officials to harass sales agents distributing their products

The most disgusting thing about these large competitors is that they sometimes take unethical and unfair actions against our products. They can use your labels to repackage fake products, just to spoil your image in the market. Sometimes, customers complain that our products have a higher level of alcoholic content and are very strong. So, we ask our marketing people to bring samples for testing. When we do the tests in our laboratory, we get different results. We may find 1 or 2 cartons of fake products mixed with our genuine products" (**BME5)**.

6.7.3.4 Regulatory constraints

Respondents identified multiplicity of regulators, inconsistency and uncertainty of regulations and high tax rates on input as the most important constraints to innovation. The consequence of multiplicity of regulators manifested itself in increased innovation costs, failure to export and delays in getting innovative products to the market. Manufacturers of food products and beverages are required to register any new product they introduce, but issuance of certificates can take up to 3 years. As a result, food and beverage manufacturers find it difficult to fully comply with all regulations or may decide to ignore these registration requirements and distribute their products without having them registered (Nandonde, 2018). Good examples were given by the managers from a coffee processing company and beer making company**.**

"The major obstacle is that there are too many regulators. We have many certificates, for example, TBS, TFDA, TCB, OSHA, Fire, TRA, Municipal Council and many others" ***(CME6).***

"All these have to put their hands in it and it takes time to deal with one of these" ***(BLE3).***

Multiplicty of regulations and regulators raise compliance costs which adversely affect firms' investment in innovation activities (Charles & Mambi, 2013; Charles & Rweikiza, 2015). The

World Bank Easy of Doing Business reports for the past ten (2010- 2020) years show little signs of improvements in many areas of the business environment, with the highest ranking of 125 reached in 2010.

Lack of uniformity among regulatory authorities was an example of regulation inconsistencies that was mentioned as a constraint to innovation. Respondents expressed their dissatisfaction with the way regulators were inconsistent in assessing applications for new product registration. For example, a new product would be approved by one regulator and disapproved by another regulator on the grounds of failing to meet the standards. This means, one standard would be applied differently by two different regulators. Consequently, some innovative products were discontinued. A good example was given by the manager of a beer and spirits making company**:**

> *"I will give you another example……. We applied for product registration to TBS and TDFA. These spirits have been accredited worldwide. TBS approved them based on international standards, but TFDA disapproved them. They said they cannot approve production or importation of spirits with 40% or more alcohol content. But this rule is against WTO trade rules, to reject an internationally accredited product from entering your country. These are kinds of our innovations that have been discontinued or have failed to hit the market because of old and outdated regulations or double standards. We have spirits with 45% alcohol content rejected and this is a drawback to our innovation efforts"* **(BLE3**).

Respondents also expressed their concern over the growing tendency of regulators to refuse approving innovations that seemed to be either novel or new to the market. Thus, potential innovative firms seemed to be discouraged from engaging in further innovations for fear of wasting their resources and efforts if their innovations didn't get approval from relevant regulators. The following comments were made by the manager from an edible oil manufacturing company:

> *Regulations are also one of the main obstacles to our innovation efforts. Last year (2016), we came up with an innovative product "Blended edible oil" that we made by mixing palm and sunflower oil. We sent a sample to TFDA for registration and approval, but it was rejected on the ground that it was not recognized. They don't want cooking oil made from mixed ingredients. So, we had to drop it"* **(OLE4)**

Although, blames were directed to regulators for creating uncertain regulatory environment, prior studies in the industry indicated that new food and beverage manufacturers tend to have little awareness of regulatory requirements which might be the main reason for their failure to

comply with regulations (Nkya, 2003; Charles & Mambi, 2013). This can be attributed to either managers/owners' lack of proactivity to seek relevant information on issues related to regulatory requirements or regulators' failure to guide and coach enterprises on compliance issues before they [enterprises] embark on any innovation projects.

On the one hand, changes of policies and regulations in the industry were described as ad-hoc and unpredictable. The authorities could change regulations in no time without considering the consequences of such changes. For example, from January 2017, the government banned production and sale of viroba (spirits packaged in sachets) by giving a three-month notice. The decision to ban "viroba" aimed to curb massive alcoholism among the youth, but the way it was implemented angered the business community. It was a very short notice for manufacturers and traders to sell out their stocks and find alternative packages. These kinds of ad hoc changes in regulation constantly put food and beverage manufacturers in a very difficult situation such that some of them fail to quickly adjust their operations to fitting in with new regulations, thus resulting into business closures. Empirical evidence from previous studies suggests that uncertainty of regulations is the most important constraint affecting quantity, quality and originality of innovations both at firm and country levels (Kotey & Sorensen, 2014; Bhattacharya et al., 2017) and is more common in developing countries.

> *"For those companies that did not make a quick move and waited for the government directives on the types of packages have failed to resume production*" **(BME5).**

The last regulatory constraint that respondents mentioned was high tax rates. They laid blames to the government for creating unfriendly business environment through regular tax hikes on food products and beverages. The burden of tax hikes is often passed over to final consumers by raising product prices. However, continuous price increases would lead to locally made products becoming more expensive and less competitive in the market than imported products. The business community had made several efforts to request the government to put tax increase on hold. However, the government has been hesitant to take business community proposals on board because of rent-seeking (Charles and Mambi, 2013). The manager of a spirits making company **(BME5**) had the following to say:

> *"The government is not friendly with businesses. Every year they hike taxes on alcoholic beverages. The increasing tax does not affect producers only but also final consumers. What we do as producers is to transfer the burden of tax increase to consumers by raising the prices we charge for our products".*

Similarly, the manager from the beer making company explained the following:

"You know, in Tanzania we have this thing called excise duty. It has been increasing every year. For example, in 2013 it was increased by 20%. You have to find a way of absorbing into your business the impact of this excise duty hike. The easiest way is to increase beer prices. As a result, we have seen beer prices increasing each year" ***(BLE3)****.*

6.7.4 Other constraints to innovation

6.7.4.1 Shortage of raw materials

One of other constraints that emerged from the analysis was shortage of raw materials. The problem was so serious that it made some food and beverage manufacturers fail to operate at their full capacity or meet the market demand for their products. The manager from an edible oil manufacturing company made the following comments:

"We do not operate at our full capacity because of limited supply of raw materials. We don't have stable supply of raw materials, we sometimes run out of materials while we have unfulfilled orders" (**OME3).**

Two main causes were identified from the data. First, many food and beverage manufacturers relied on local farmers to supply them with raw materials but most of them were small scale farmers who grew crops during rainy seasons only. Thus, the supply was not continuous throughout the year.

"During low season we cannot get sufficient raw materials for us to operate at our full capacity ***(OLE4****)"*

Second, poor farming practices and farmers' ignorance on seed varieties contributed to lower yields per piece of land. As a result, the supply was inadequate. One manager from the wine making company made the following comments:

"Shortage of grape supply is also a result of poor farming practices which lead to low productivity per acre. In Tanzania one acre yields 4 to 5 tons but the same size of land in South Africa can yield up to 40 tons of grapes" ***(BLE1****).*

6.7.4.2 Constraint related to packaging materials

In the industry packaging is an important tool for product marketing and differentiation. The interview analysis showed that packaging materials were procured from both local and foreign suppliers. However, respondents raised concerns over the quality, quantity and costs of materials. The packaging materials sourced from local suppliers were seen to be of poor quality, expensive and limited in supply with their prices being considered incommensurate with the quality. The import duty on imported materials was very high.

*"Quality packaging materials are not available locally" (**OLE4)**.*

*"They sometimes fail to supply us with the required quantity. It is the only company in the country that manufactures glass products and it has a limited capacity to meet total local demand for glass products" **(BLE3)***

"*We do not have a local manufacturer who can supply adequate quantity and quality packaging materials on time. So, we have to pay high taxes for the imported materials" **(CME6).***

It was also very hard for small and medium enterprises to order materials from abroad because these firms lacked financial resources to place a minimum order quantity required by foreign suppliers.

*"Ordering materials from abroad has its own challenges…… They told me that they would be able to do business with me if I could order a 40-feet container of packaging materials which is a minimum order quantity. The quantity is too large for me and will cost a lot of money" **(CME1**).*

6.7.4.3 Lack of government support and corruption

Lack of government support and corruption were other constraints that respondents reported. Whereas, some food and beverage manufacturers complained about the government's reluctance in cooperating with them to solve pertinent problems hampering industry's innovativeness (such as lack of skilled labour and informal sector, research and development), one firm failed to get government support when they wanted to export their products. The following comments were made by some managers:

"Two years ago, I presented a proposal to the Government on creating a joint fund to support people in the industry to attend short trainings in South Africa. We were ready to pay 50% of the total training costs, but our proposal was not taken on board. Our intention was to help the country to have a pool of experts and skilled people in wine making and grape farming" **(BLE1).**

We don't export. We planned to export wines to Rwanda and other neighbouring countries, but we did not get support from the government, so we decided to stop it **(BLE2).**

Respondents also explained their negative encounters with government institutions when

registering their products. They expressed their dissatisfaction with the way regulators were creating bureaucratic procedures and viewed them as deliberate actions taken to make the process complicated and lengthy in order to attract bribes. Some respodents were tired of continuous arrests and upsetting disturbances caused by police officers.

> *"We are having problems with regulators; we do not know which food standards they want. When they do inspections, they say our products and working conditions meet their standards. But when they take our samples to test in their laboratories, the results are contradictory. They say we don't follow standards!! We have our own experts who ensure that manufacturing standards are adhered to. This is bureaucracy that demands us to bribe them. The approval process is cumbersome. They unnecessarily delay your product registration until you bribe them. It is not easy to get your product registered without bribing the officials"* **(BME5***).*

> *"The major problem is corruption from law enforcers; the police officers. We have been arrested many times by the police. When you ask them the reasons, they just say it's because we are making beer. It seems like making beer is a crime. It is really discouraging and making it difficult to do business. Our business is legal and registered, but what they want from us is just money" (**BME7).***

6.7.4.4 Poor infrastructure

Poor infrastructure and long distances were also mentioned as constraints to innovation. The conditions of roads in some rural areas made it difficult to access rural markets. The road conditions in rural areas tend to deteriorate in rainy reasons. As a result, access to rural markets becomes impossible during that period.

> "*There are places we cannot go. Tanzania is a large country. It is unprofitable to ship beer from Dar es Salaam to Ileje Mbeya (Southern part of Tanzania), more than 1,000 miles. Transportation costs are too high. The roads are not good enough, even the distance is long. In this way profitability is reduced" **(BLE3)***

6.7.4.5 Lack of management skills and focus

Lack of management skills affected appropriate allocation of time and resources to facilitate innovation activities. Findings of interviews analysis showed that some managers placed more weight on expansion and increasing sales volume, while paying little to no attention to implementation of strong internal control systems for assets such as cash and stock. As a result, dishonest employees took the opportunity to steal cash and product inventories by colluding with customers. The comment below from the manager of a brewery company **(BME7)**

illustrates the extent of losses they suffered from dishonest employees for a period of two years as a result of poor asset management:

> *"The losses we suffered amounted to TZS 135 million [£48,078][15] within two years".*

Time as a resource is always limited and is a critical problem in organizations with poor management skills as they cannot properly allocate it to competing activities. Lack of time is one of the most important constraints to innovation in developing countries (Hadjimanolis, 1999). This is a serious problem in SMEs and happens when managers carry out as many tasks for themselves or become too much involved in administrative duties with little or no time being alloted to innovation and organization's future activities. The manager from a coffee processing company complained about this:

> *"The problem is not lack of financial or human resources, but it is lack of time. For new opportunities, we often delay implementing or acting timely. If we talk of time as a resource, then that is our major problem"* ***(CME8****).*

[15] Exchange rate as at 30th June, 2017 (£1 = TZ 2868.31)

6.7.4.6 Lack of family support

Lack of emotional support from family members and friends emerged from interview analysis as one of the constraints to innovation. The owner-manager from a high growth beer making company cited religious belief as the main cause and pressures had been amounted on him to abandon the business because it manufactured products (alcoholic drinks) which were against religious belief and teachings.

> *"However, I am being stigmatized by my church. I am a practising Anglican Church members, including the pastor often say I am a sinner because am making alcoholic drinks which are forbidden. My wife who was one of the executive directors has resigned, she is not involved in running the company anymore. She says that the business is against our Anglican faith. I don't want to abandon this business until I find an alternative business"* ***(BME7).***

> *I do not have support from my husband. My husband does not see if I am making any progress in my business, he doesn't believe if my business will grow and be successful (**BSE1).***

6.7.4.7 Power outages

Machine breakdowns was a major technical issue and participants mentioned power outages and fluctuations as the main causes. Many issues were raised in relation to the consequences of machine breakdowns which included disruptions of production, spoilage of work-in-progress and damages to machine parts, systems and programmes.

> *"When there is any power fluctuation, all preheated preforms get spoiled, they can't be used any more. If there are three or four power fluctuations in a day, we are talking about 5 lines of 500 preforms each times the number of fluctuations, this is equivalent to 7,500 or 10,000 spoiled preforms. This is a big loss"* ***(BLE5).***

> "*Sudden power cuts and fluctuations is another big problem. When happens, production processes must be restarted and unfinished products at that time would be discarded; they are no longer suitable for re-processing into final products. Power fluctuations also damage our machine motors and switches, which leads to stoppage of production. The only solution is to replace damaged parts with new ones"* ***(OLE4).***

In the previous section respondents described their experiences of the constraints they faced, the causes and effects of such constraints on innovation activities. The next section, however,

will present findings of the investigation of strategies that innovative firms employed to overcome financial, knowledge, market, regulatory and other constraints.

6.8 Strategies to overcome innovation constraints

6.8.1 Overcoming financial constraints

6.8.1.1 Lack of internal finance

Research evidence suggests that innovative firms often use internally generated funds to finance innovation projects. However, insufficient internal financial resources force them to seek external finance (Lin et al., 2013). In developing countries where financial systems are bank-based, bank loans are considered the main source of external finance. This was evidenced by managers of two brewery companies:

> *"We seek external finance when our internal resources are not enough. We got a loan from a commercial bank to buy a packaging machine that failed to work"* ***(BLE2).***
>
> *"……..we borrowed TZS 52 mil [£19,546], although it was very difficult to get that loan"* ***(BME7****).*

6.8.1.2 Lack of bank loans

As pointed out earlier in section 6.7.1.2 that innovative firms were discouraged by high interest rates charged by commercial banks and complicated conditions attached to the loans. However, lack of bank loans was addressed through grants, lease financing, diversification, borrowing from within the group and use of soft loans. But short-term financial needs were met by trade credits and short-term borrowing from friends and family.

First, grants were one of the main sources of external finance and were used to acquire new equipment and machinery. The grants were awarded to managers/owners who won pitch competitions. The pitch winners would get either cash or machinery and equipment as prizes. International NGOs supporting emerging entrepreneurs in the sector organize pitch competitions to identify entrepreneurs that they can support. Four of the responding enterprises bought machinery using grants they received grants after winning pitch competitions. For example, one respondent said:

> *"We participated in a pitch competition which was organized by an NGO called Tuboreshe Chakula. Only entrepreneurs from Morogoro, Dodoma, Kagera, Iringa and Dar es Salaam regions could pitch. We went into the competition with confidence to win it. The competition was tough, but our business plan won a grand prize. We got a refinery plant, but we were required to contribute 10% of the total cost of the plant"* ***(OME4)****.*

Second, finance lease emerged as another strategy to overcome long-term financial problems. The finance lease gives enterprises an opportunity to access a better alternative of capital and flexible source of finance necessary for the purchase of equipment and machinery. This is an ideal strategy for companies seeking long-term finance but lacking collateral or with bad credit history. The lease financiers do not require security because the equipment which is planned to be purchased is used to secure the loan. Previous research findings suggest that firms facing severe financial constraints prefer leasing to borrowing (Lin et al., 2013). But this study found that that the decision to use lease financing was reached following several years of failed attempts to secure bank loans.

> *"It took us about three years searching for finance from various sources until we got assistance from [……]. The bank had a lease financing package. At that time many banks required borrowers to offer immovable assets as a loan security. ……they wanted us to identify a potential supplier of machines that we needed, and they would pay them. It was a lease financing. The ownership of the machines is under the bank and they will be ours when we finish paying back all their money. The lease finance was worth TZS 2 billion [£751,772] and we got all the machines and equipment we needed. To be honest, it was difficult to borrow that amount from other commercial banks"* ***(BLE1).***

Third, investment diversification - another strategy for overcoming long-term financial challenges was employed by portfolio entrepreneurs who invested in more than one business and in different sectors. The funds they generated from other investments were used to finance investment activities of their enterprises in the food and beverage industry. For example, the manager of a coffee processing company explained the following:

> *"For now, we use our own financial resources. We are not taking bank loans anymore. ……We operate a SACCOS[16] which generates enough cash to finance expansion of our coffee business"* ***(CSE3****).*

Fourth and last, companies operating as part of a group of companies (subsidiaries) or income generating units (IGUs) overcome long-term financial problems by obtaining resources from

[16] SACCOS = Savings and Credit Co-Operative Society

within the group. They could get loans at significantly reduced interest rates or be supplied with input materials such as packaging materials at transfer prices.

> "*We did not borrow from any bank. ……. We got the loan from our sister company ……The interest rate was very low. We used the loan to buy a new machine and to finance other activities" **(CME6).***
>
> ***"**Our sister company manufactures caps, p-form, labels, shrinker frat. We buy these materials from our sister, but it is an internal arrangement" **(BLE5)***

6.8.1.3 Lack of working capital

Along with overcoming long-term financial problems, food and beverage manufacturers devised some strategies to overcome shortages of short-term finance. Interview analysis revealed that firms relied much on trade credit and free interest loans from friends and family members to address short-term financial needs. Trade credits allowed firms to obtain supplies of raw materials without making immediate payments of cash and trade credit terms ranged from 1 week to 1 month. Paying within the terms was considered a critical aspect in building trust and maintaining good relationship with the suppliers of raw materials.

> *"They normally supply us raw materials on credit. We buy ethanol on credit and pay within 1 to 2 weeks, for labels the trade credit terms is 15 days. So, during that period our resources are directed to paying labour costs. As of today, we owe our suppliers about TZS 70mil [£26,312]. ……we pay our suppliers on time to maintain business relationship and trust. These arrangements have enabled us to grow and reach our goals" (**BME5**).*

6.8.1.4 High costs of innovation

As discussed earlier in section 6.7.1.3, high costs of innovation emanated from multiplicity of regulations, bureaucracy and raising costs of input such as raw materials and packaging materials due to high import duty and exchange rate fluctuations. The measures taken by firms to cut down costs of innovation included review of the formulae so as to drive cost out of the products by reducing the amount of materials, use of recycled packaging materials and internalizing the manufacture of packaging materials.

However, one enterprise reviewed the formulae to reduce production costs but it backfired on them because consumers rejected the new product as the taste changed. As a result, they had to return to their original formulae, ending up in massive losses.

Using recycled packaging materials was a common method among manufacturers of beverages especially local brands of banana wines and beers. One manager from a beverage company

noted that the main reason for them to use recycled packages was that they were cheap and easy to find.

> "*We often use recycled Heineken bottles; they are cheap and easily available in our locality" (**BME7**).*

The motivation for manufacturing a product internally was financial savings from low costs of manufacturing a product internally compared to buying it from suppliers. One respondent reported that manufacturing packaging materials internally helped them cut down the costs of packages by 50% to 70%.

> *"We buy one bottle for TZ 200 with VAT inclusive, but if we mould our own bottles, the cost will go down to between TZS 60 and TZS 100 per bottle" **(BME5)**.*

6.8.2 Overcoming Skills gaps

These were difficulties related to lack of people with technical skills, product knowledge and industrial experience. Food and beverage manufacturers were finding it difficult to recruit and retain skilled people on permanent basis because the labour market did not have a pool of such people. The firms had to devise strategies to ease this problem. They sought these skill sets from either within the country or abroad on a temporary basis, obtained assistance from their network partners or facilitated in-house or external training. Addressing skills gaps through temporary hires was a common strategy employed by coffee processors and was used whenever the needs arose. The manager from a coffee processing company had this to say:

> *"……but we also use external services of coffee tasters or "Rikala". A coffee taster helps us identify quality coffee when we buy from the auction" **(CME8).***

However, the use of experts was costly and unaffordable to some firms. Because of that several firms turned to their network partners for support. The network partners, who were suppliers of equipment and machinery offered support in the forms of staff training (on-the job training), professional advice and product designs. These kinds of support were important as they would enable local innovative firms improve both technical skills and knowledge of products. This strategy seemed to provide long-term solutions to problems related to lack of people with product and technical skills in the sector. These results seem to be consistent with previous studies which found network partners important source of technological and non-technological knowledge and skills (Larsen & Lewis, 2007b; Si et al., 2018). The manager from a coffee processing company explained this:

"We sometimes get technical assistance from Trabacker Company of South Africa……They often come here and conduct short trainings for our staff. They even designed our coffee shops, did painting and everything" ***(CME6****).*

Another manager from a water bottling company ***(BLE5)*** said the following:

"Our current technology and machines were bought from Germany and we have a good relationship with suppliers. They often come here to train our people".

Another interesting strategy that emerged from the analysis was that some firms facilitated specialised trainings abroad for their employees. This was either short training or university education (first degree) and basically aimed at overcoming skill shortages in respective firms. These findings are line with scholarly arguments that training helps to retain employees and build strong commitment and tacit knowledge that contribute to improved ability to engage in both incremental and radical innovations (De Massis et al., 2018).

"Two weeks ago, I sponsored two employees to attend wine making training in South Africa" ***(BLE1).***

We are now forcing our family members to study these machines, and some to take engineering degrees at universities as they are future experts of our companies. We send them abroad for university education and short trainings ***(BLE5****).*

Apart from provision of training as a way of retaining employees and enhancing their commitment, one company had built staff houses near the factory as an incentive to motivate employees and to curb staff turnover. Free accommodation was provided to all factory staff. This move was also seen as a means of increasing employee productivity.

"We are building more houses for our production staff near the factory. This arrangement will reduce both travelling time of our staff from home to factory and transport costs. It will also increase productivity per employee" ***(OME3).***

6.8.3 Overcoming market constraints

Respondents were also asked about the strategies they employed to deal with market constraints to innovation. Results from analysis of responses discovered diverse strategies for counterfeits, sluggish demand, informality and competition.

6.8.3.1 Overcoming Counterfeits

The problem of counterfeits was one of the biggest obstacles facing innovative firms in the food

and beverage industry. This seemed to be a very complicated issue and difficult to deal with because of the nature of its causes, existing regulations and the type of people involved in counterfeiting business. Findings of one previous study by CTI (2008) showed that counterfeit dealers were wealthy and well-organized people who could sabotage effective enforcement of anti-counterfeit laws and regulations. They further found that the anti-counterfeits regulation was weak while the government capability to combat counterfeiting was very low due to limited resources.

The interview analysis revealed two distinct strategies that innovative firms used to deal with counterfeiting. On the one hand, they directed their efforts to counterfeits dealers (confrontation strategy) by involving various stakeholders like customers as informers and law enforcers for legal actions against offenders. On the other hand, the focus was on consumers in order to raise their awareness of the health problems associated with consuming counterfeit and substandard products. One common aspect among these two strategies is the placing of identification marks (secret marks or security marks or seals) on products to distinguish them from counterfeits or imitated products. The marks also ensured that their products could not be easily copied.

The confrontation strategy involved two steps. The first step involved identifying counterfeit dealers. That is obtaining information about suspected counterfeit goods and dealers. Different ways were employed by firms to get information, but they differed among firms depending on availability of resources. Some firms used customers as informers while others relied on their marketing personnel to provide such information.

> *"Customers often call us when they see changes to our product and show us where the counterfeits are sold"* ***(BSE4).***

> *"We have formed a team which goes around searching for counterfeits. We have different ways of identifying our products. We know our products very well and we have secret marks that identify them"* ***(BLE5)****.*

Second, measures would be taken to arrest the dealers by involving law enforcers. However, respondents raised two disappointing issues when they reported offenders to relevant authorities: upfront fees payment and lack of cooperation from the government. First, for law enforcers to take actions fees need to be paid beforehand.

> *"This year we found one businessman selling counterfeits of our products and reported him to [……]. For the [……] to take actions, you need to pay TZS 3.5mil [£1,316] upfront.*

We paid that amount, then they arrested the person, confiscated all the cartons of counterfeit wine and destroyed them all" ***(BLE1).***

Sometimes, law enforcers didn't take any actions.

"Even when we report to the government, they don't take any action" ***(BLE2).***

The second approach focused on consumers and aimed at raising public awareness of the side effects of consuming counterfeit and sub-standard products. A considerable amount of time and resources had gone into this strategy. This was accomplished through printing and distributing brochures and leaflets, running awareness campaigns or supporting government operations to combat illicit products.

We put more efforts to educate our customers and the citizens at large. We print brochures and distribute them freely as a means of educating coffee consumers ***(SE2).***

So……. we have a policy to support the government in combating illicit products. I received a proposal from……Regional Police Commander who wanted to launch an operation to root out illicit brews from his region and that he needed support from all stakeholders. We didn't hesitate, we immediately jumped in because it is the company's policy to support the government to combat illicit products in the market" ***(BLE3)****.*

6.8.3.2 Overcoming sluggish demand

Several causes of lack of demand for innovative products were identified in section 6.7.3.1. The food and beverage manufacturers adopted several strategies to deal with this challenge and they included, advertising and promotion, and offering free products (new products) to customers to test market acceptability of the product.

"Before we introduce a new product, we first involve some customers in the testing. We just send small quantities of the product to some customers selected randomly and to see if they will like it or not" ***(CME8).***

Research evidence suggests that advertising and promotion is correlated with increased sales turnover (Dinner et al., 2014), but using traditional advertising media such as radio, print media, television or billboards might not be a feasible method for some types of firms especially SMEs due to high costs associated with them. However, some firms used alternative methods such as trade fairs and social media as they viewed them as less costly but effective in promoting new products and reaching potential customers. Instagram and Facebook were the most common

social media used for promotion. On the other hand, trade fairs became a preferable promotion method for small firms because it offered them many advantages over traditional methods. First, participation costs in trade fairs were very low and more often SIDO[17] or local government supported participants by paying a larger proportion of participation fees, transportation expenses and other related costs. Another advantage was that trade fairs helped firms secure new business deals.

> *"We thought that the only way to get customers and promote our products was to attend trade fairs like SIDO trade fairs for small businesses, Sabasaba and Nanenane. ……..SIDO has been sponsoring us, paying for participation fees, transportation and other expenses, and we contribute a small portion of the total costs. Sometimes, we get financial assistance from the Municipal Council"* **(BSE3).**

6.8.3.3 Overcoming competition

The results of qualitative data analysis revealed intense competition from informal sector and well establish and large firms as one of major market constraints facing firms in the food and beverage industry. Two strategies emerged from the data: confrontation vs avoidance. The confrontation strategy involved identification of informal manufacturers and then reporting them to sectoral regulatory authorities. This was done purposely to weaken their market dominance as they would pay fines and be required to formalize their businesses. However, this strategy had little success and blames were directed to the government for failing entrepreneurs in the fight against informal traders, as the manager from a wine making company explained

> "*Even when we report to the government, they don't take any action"* ***(BLE2).***

Some food and beverage firms dealt with competition from informal manufacturers by adopting an "avoidance" strategy (i.e. creation of own products and markets). The adoption of this strategy allowed firms to produce high quality products that would not be sold in the markets dominated by informal operators. The informal market was characterised by cheap and low-quality products and its customers were low income earners. In contrast, a group of customers constituting the formal market preferred to buy quality products with recognized quality certification and from big retail shops and supermarkets. The big shops and supermarkets were used as distribution points or outlets. However, products produced by informal operators couldn't find their way into supermarkets due to poor quality and lack of quality certification.

[17] SIDO = Small Industries Development Organization

"But we focus on specific market: large retail shops and supermarkets. These shops do not sell products that are not certified by Tanzania Bureau of Standards (TBS). Our products have a TBS quality label and are of high quality. Most of our competitors sell products which are not approved by TBS. Our prices are relatively higher than our competitors. We target high income earners with our double refined products, but refined oil or sometimes known as pure oil is for medium income customers who form the largest group of our customers" ***(OME3).***

The same strategy was adopted by some entrepreneurs to counteract competition from large firms or well-established firms. They used this strategy to serve the markets which the large firms neglected or suspected to have low demand due to geographical location (remote areas) or level of income of customers (i.e. low-income customers in rural areas).

"We are now competing with large firms, but they focus most on urban areas and not rural areas. Most of our customers are in rural areas" ***(BME5).***

"*We target low-class customers. We have decided to focus on that group because it is the largest group of consumers in our market"* ***(BSE3).***

There were several other strategies that innovative firms adopted to deal with competition in general and they ranged from product differentiation (i.e. quality, taste, packaging, and price reductions), modernization of facilities, customer orientations (i.e. building trust, brand reputation, credit offering, frequent visits to customers) to the use of VAT[18] registration certificate.

"We try to compete by improving our product packaging to match international standards. We import our packaging materials from countries with the best wines and technology in the world" ***(BLE1).***

We had to lower our prices by 10-12% so that we can increase our sales volume. Lowering prices brought back our lost sales volume and increased the market share for retail and wholesale" ***(BLE5)****.*

"My final coffee is made from first class coffee (AA). We also differ in terms of labelling, brand name and flavor. If you taste our coffee, you will want more. Our coffee aroma is unique in the market" ***(CME1).***

[18]VAT = Value Added Tax

"Our products are known for being hygienic and of high quality. We are identified by quality" ***(OME3).***

"After being VAT registered, we became more accepted in the market, customers' confidence and trust increased. The VAT registration certificate has become our marketing tool as many of our competitors are not VAT registrant, and it even helped us eliminate some of them from the market" ***(CSE2)****.*

6.8.4 Overcoming regulatory constraints.

Different regulatory constraints to innovation were discussed in section 6.7.4. Various responses to questions about mitigation strategies were given, but many entrepreneurs seemed to unconditionally comply with regulations despite experiencing difficulties. It was evident that some firms were not able to find solutions to the problem, not because they ignored them, but they were incapable of dealing with them. This situation is described by Larsen & Lewis (2007a) as living with a constraint as a resolve it and was a common strategy adopted by manufacturing SMEs in the UK to deal with various constraints to innovation.

The use of sector's business associations and flexibility were other two mitigation strategies that entrepreneurs employed to cope with issues related to regulations. Business associations were used as platforms to discuss common regulatory problems in the industry and give recommendations to the government or to deal with constraints related to taxation.

"*We meet and discuss various issues affecting our industry and give recommendations to the Government. We are still waiting for the response from the Government to input levy"* ***(CME6****).*

However, some firms used their industry's business association to overcome the constraint related to high tax rates. For example, the business association for beverage manufacturers hired a tax consultant to present a case to government on how tax hikes had been affecting firms' competitiveness and government revenues. The manager from a beer and spirit making company explained what they had achieved so far from this strategy.

"*We said we cannot continue with that, we needed to do something to stop it……We needed to present this case to the government……..So, we hired a consultant…, as an industry to enlighten the government on the detrimental effects of excise duty hikes by tracing the history of beer in Tanzania. They also made comparison between Tanzania*

*and other countries. They made presentations to the MOFEE[19], MITI[20] and Parliamentary Budget Committee. The aim was to inform them of the impact of excise duty hikes. However, in 2015/16 it was 0% increase, last year (2016/17), the increase was 5% and this FY (2017/18) the increase is 5%. These are the years where we have seen less and less excise duty increases" **(BLE3).**.*

Flexibility that allows quick response to any changes occurring in the industry was considered the best approach to coping with uncertainty caused by abrupt changes in regulations. The owner and manager from a beverage manufacturing company noted that business survival and growth in such situations depends on how quick the company's management responds to changes and any delays in taking actions would jeopardize business survival.

*"We changed to plastic bottles immediately after the ban of sachets was in effect. Companies that did not make a quick move and waited for further government directives have failed to resume production" **(BME5).***

The above statement was indirectly confirmed by the manager and owner from another brewery company who attributed increased sales volume to government's ban of "viroba" which led to closures of businesses that failed to comply with the new regulation.

"*Our competitors used to be producers of spirits and gin packed in sachets (Viroba). Ever since they were banned, their customers shifted to banana beer which is more hygienic than viroba. The demand for banana beer is now high, but the biggest challenge is that we don't have enough capital to meet the market demand" **(BME7).***

6.8.5 Overcoming other constraints

6.8.5.1 Overcoming shortage of raw materials

Shortage of raw was a very critical problem especially in the edible oil sub-sector and wine making industry. Interview analysis revealed existence of several strategies directed towards solving this problem. The most common method was to downsize the number of temporary employees. These measures were taken purposely to cut down operating costs (i.e. salaries, incentives etc.) particularly during periods of acute shortages of raw material supplies. Other evident strategies included contract farming, use of alternative forms of raw materials, supporting farmers through provision of agricultural inputs, training on good farming practices,

[19] Ministry of Finance and Economic Empowerment
[20] Ministry of Industries, Trade and Investment

supporting farmers to add values to their farm produce (micro-vinification), and building and maintaining good relationships with farmers. These strategies were implemented in a bid to ensure adequate and quality supply of raw materials from farmers. On the other hand, some food and beverage manufacturers devised methods of procuring raw materials by increasing collection points and buying raw materials from distant areas.

> *"As means of dealing with this problem we have decided to engage sunflowers farmers in contract farming. Since last year (2016), we have signed agreements with 42 villages. This will help us in the long run to get adequate supplies of sunflower seeds"* ***(OME3).***

> *"First, we work closely with farmers and train them on modern farming practices. We give them the right seed varieties. I am an expert in both grape farming and winemaking. We also help farmers to add value to their farm produce by giving them simple machines to extract juice and sell it to us as back wine instead of raw grapes"* ***(BLE1).***

However, contract farming is difficult to implement because it is associated with problems such as price disagreements between parties and breaking of agreements by farmers etc. (Suryaningrat, 2016). The analysis revealed that farmers repeatedly broke the agreements. The manager from an oil processing company **(OME3**) hinted the following:

> *"We gave each farmer 2kg of seeds and the agreement was that when they harvest, they should sell their seeds to us. But after harvesting, they extracted crude oil and sold it directly to consumers. They said they were getting more money if they sell crude oil than raw seeds……. they haven't paid us back until today".*

6.8.5.2 Overcoming constraints related to packaging materials

To overcome the problems of poor quality and inadequate supply of locally manufactured packaging materials, some entrepreneurs used recycled materials but others bought the materials from foreign suppliers in countries like China, South Africa, Kenya, the UK and USA or obtaining them from other sister companies within the group (for subsidiaries).

> "We import the materials from USA…" **(CSE2)**

> *"We buy these materials from our sister company"* ***(BLE5)***

6.8.5.3 Lack of government support

The government supported food and beverage manufacturers through Small Industries Development Organization (SIDO). The kinds of support offered by SIDO have been discussed in several previous sections. For example, entrepreneurs who sought support from the

government but failed to get it decided to move on, assuming that the problems never existed. This situation often discouraged entrepreneurs and felt that the government had ignored them.

"*The situation still exists. We don't know where to report" **(BME7)***

*"But on the side of […..] industry as a whole, I can't do anything. I cannot train agricultural extension officers who help farmers in technical matters" **(BLE1).***

Chapter 7 DISCUSSION OF FINDINGS

7.1 Introduction

The first research question in this study sought to analyse the effects of financial, knowledge, market and regulatory constraints on innovation and firm performance while the second question examined the role of entrepreneurial bricolage in reducing the negative impact of innovation constraints on innovation. These two research questions were addressed quantitatively by drawing on the data collected from 248 firms in the Tanzanian food and beverage industry. It was hypothesized that financial, knowledge, market and regulatory constraints exerted negative effects on innovation but their impact would be reduced by bricolage. Structural equation models were developed to depict the relationships and subjected to analysis using structural equation modeling technique.

Several studies have shown that the four groups of constraints reduce innovation (Bratianu, 2011; López-Fernández et al., 2016; Maldonado-Guzmán et al., 2017b) but engagement in entrepreneurial bricolage leads to introduction of different types of innovations for firms operating in resource constrained and uncertain environment (Bojica et al., 2014; Witell et al., 2017). In such settings however, innovative firms can achieve their performance objectives if they integrate bricolage and conventional strategies to address innovation challenges(Baker & Nelson, 2005). Qualitative results provided additional insights into the specific constraints facing innovative firms and how they were dealt with.

7.2 Entrepreneurial bricolage and innovation

Emprical evidence suggests that differential innovation performance of firms operating in environments characterised by a higher degree of resource-and non-resource constraints is explained by the level of reliance on entrepreneurial bricolage to respond to challenges they face when engaging in innovation activities (Baker et al., 2013; Senyard et al., 2014a; Smith & Blundel, 2014b). A higher degree of bricolage is associated with better innovation performance. The direct and positive influence of entrepreneurial bricolage on innovation provided quantitative evidence suggesting that bricolage behaviour fostered innovation performance of innovative enterprises which in fact were entagled in resource poverty and uncertainities in their operating environments. This finding broadly supports the work of others (Senyard et al., 2014a; An et al., 2018b) in this area linking entrepreneurial bricolage with high innovation performance. The explanation for this result lies in the nature of the study sample which had a disproportionately large number of young and small firms. Findings from previous studies showed that the degree of application of bricolage as a strategy to deal with resource constraints

and uncertainties in the business environment decreases with firm age and size and is more pronounced in young and small enterprises (Senyard et al., 2014a; Davidsson et al., 2017; An et al., 2018b). This group of firms inherently lack both internal resources and capability to mobilize external resources.

7.3 Innovation constraints

The "constraints literature" recognizes the importance of regulatory and financial constraints in constraining innovation (Tourigny & Le, 2004; Crisostomo et al., 2011; Yang et al., 2014; Amara et al., 2016a), investments in R&D (Silva & Carreira, 2012) and firm performance (Coad et al., 2016b). The findings of descriptive analysis revealed higher rankings of financial and regulatory constraints with high interest rates and unpredictability of regulations being the most important constraints perceived by innovative food and beverage manufacturing firms. The SEM results showed negative effects of financial, market and regulatory constraints on innovation. On the other hand, empirical results provided support for the hypothesis that introduction of different types of innovation leads to firm performance(Klomp & Van Leeuwen, 2001; Gunday et al., 2011; Rajapathirana & Hui, 2018).

7.3.1 Financial constraints

Several lines of evidence suggest that the impact of financial constraints is mainly driven by limited internal funds (Savignac, 2008; Crisostomo et al., 2011) and is greater in small firms than in large firms (Tourigny & Le, 2004; Efthyvoulou & Vahter, 2016a). Many innovation projects tend to be financed by internally generated funds such as profits and retained earnings rather than external funds. The results of this study supported the claim that financial constraints have a strong and negative impact on innovation (Coad et al., 2016b; Efthyvoulou & Vahter, 2016a; Duarte et al., 2017; Maldonado-Guzmán et al., 2017b). It has been suggested that financially constrained firms can not adequately finance innovation activities (Crisostomo et al., 2011) and sometimes are forced to slow down or prematurely stop an innovation activity (Mohnen et al., 2008a).

Qualitative interview data offered additional insights into which financial constraints were critical, what caused them, and how they had affected innovation activities. Insufficient internal finance, inacessible bank loans and high innovation costs were the three major financial obstacles which severely constrained intrduction of new products, production capacity expansion and improvement, promotion and sales peformance of new products. These findings reflect those of previous studies (Mpangile et al., 2008; Voeten et al., 2016). The root cause

analysis showed differences in the causes among the three constraints. Insufficient internal funds could be explained by factors such as firm age and size, and structure of the industry. Many enterprises in the industry are small and young and hardly generate enough profits for re-investment in innovation activities. Furthermore, young firms lack reputational assets which are important resources in building trust and long-term relationships with suppliers of financial resources. Lack of reputational resources contributes to high interest rates which was identified as the root cause of lack of bank loans (Halabi et al., 2010; Voeten et al., 2016).

Interview data clearly indicated that multiplicity of regulations, bureaucracy and high input costs were the major root causes of high innovation costs. High input costs raise product costs and reduce product competitiveness. In this study multiple regulations acted as a constraint as well as a root cause. This finding is consistent with previous studies which found that compliance costs represented a significant proportion of operating costs and total tax paid by food and beverage manufacturers (Nkya, 2003; Charles & Mambi, 2013; Charles & Rweikiza, 2015). High interest rates posed a challenge and made it difficult for firms to access bank loans. This finding is contrary to the role it often assumes in quantitative studies (Savignac, 2008). It is often examined in those studies as an innovation constraint caused by a higher degree of information asymmetry between financiers and entrepreneurs. (Efthyvoulou & Vahter, 2016a). The constraint “financial risks too high” was included in the survey instrument, but did not appear in the qualitative findings, suggesting that it was not considered important at all in the industry.

7.3.2 Knowledge constraints

Knowledge constraints impact negatively on innovation activity (Demirbas et al., 2011; Paananen, 2012a; Botrić & Božić, 2018). However, this did not appear to be the case for the Tanzanian food and beverage industry. The relationship of knowledge constraints with innovation was negative but insignificant. This finding seemed to suggest that knowledge constraints were perceived as of little importance by innovative food and beverage manufacturers. This is also in line with previous studies which found that knowledge constraints were of less concern for low-technology industries like the food and beverage manufacturing industry (Tourigny & Le, 2004; Bartels et al., 2016). The explanations for this lies partly in the nature of innovation activity undertaken in the industry and developing countries in general, as well as the age structure of the study sample.

First, the fact that entrepreneurial firms in the food and beverage industry focus more on incremental innovations than on radical innovations and research and development (Schiefer et al., 2009; Trott & Simms, 2017), the need for highly skilled and experienced labour might be of

less importance (Bhaskaran, 2006). The food and beverage manufacturers can successfully introduce innovations by utilizing artisan skill sets with little to no need for expert skills (Oglethorpe & Heron, 2013). In developing countries, skilled labour endownments are not pivotal for successful introduction of innovations but the degree of firm innovation is mainly influenced by practices of the firms, particularly employee training (van Uden et al., 2017). Second, the survey data showe dominance of young firms (>50% are less than 4 years old) which, are according to (Pellegrino, 2018) tend to be well-equiped with skilled labour and human resources compared to large firms when they enter the industry or can easily find ways to overcome knowledge constraints.

There is clear-cut evidence that the findings of two strands of research are different. The findings of quantitative analysis reported insignificance of the knowledge factors in constraining innovation, but the picture that emerged from qualitative interviews and previous qualitative studies (Voeten et al., 2016; Nandonde, 2018) was completely different and it showed that the knowledge factors were also critical constraints. The qualitative research identified shortage of people with skills and knowledge, qualifications and experience in product and packaging designs as the main skills gap in the industry. As noted by Johnson and Onwuegbuzie (2004), the primary reason for incongruence of the findings of quantitative and qualitative strands when they undertaken in a single study is that, in most cases the categories and theories used in quantitative research do not reflect people's personal experiences of the phenomenon. Qualitative data provide richer details of the phenomenon based on respondents' own categories of meaning (ibid).

7.3.3 Market constraints

The negative and significant relationship between market factors and innovation hinted at the importance of market conditions in constraining innovation among food and beverage manufacturers. Comparison of this finding with those of other studies confirms that the fact that innovation efforts tend to stagnate in business environments with unpredictable customers' behavior, higher degree of competition, counterfeiting and informality. Many studies have shown that uncertain environment increases innovation costs, risks and uncertainty of having successful innovations (Tourigny & Le, 2004; Chang et al., 2011; Demirbas et al., 2011; López-Fernández et al., 2016; Maldonado-Guzmán et al., 2017b).

A higher degree of informality and proliferation of counterfeits are pertinent conditons characterizing the Tanzanian food and beverage industry (CTI, 2008; MTI & FSDT, 2012; CTI,

2017)[21]. Several factors such as economic status of consumers, weakness of regulation and the nature of counterfeit dealers have made counterfeits and informality thrive in the country. Empirical evidence and current findings of qualitative interviews showed that the purchasing decisions of food products for the majority of Tanzanians are influenced by income levels and prices of substitutes (Ochieng et al., 2018). Counterfeits and goods sold by informal suppliers are often lower-priced than genuine and innovative products and are seen as alternative options for the majority of consumers with lower purchasing power who typically prefer cheap products. These results support previous research into this area which links counterfeit consumption with limited financial resources of consumers and prices of counterfeits (Albers-Miller, 1999; Omeraki Çekirdekci & Baruonu Latif, 2019). These two issues together with consumers' conservative behaviour contribute greatly to lack of demand for innovative products. Lack of demand for innovative products has detrimental impact on investments in R&D and product development (Bartels et al., 2016).

Counterfeiting/product imitation is a big challenge in Tanzania and continues to frustrate innovative firms' efforts in the industry of engaging in innovations. According to CTI (2017), from 2010 to 2016, the Fair Competition Commission seized countrfeifet goods worth TZS 2.9 trillion [£1,090,071,274][22]. An earlier study conducted by the Confederation of Tanzania Industries in 2008 found that the market value of counterfeited foodstuffs and beverages in the country was about TZS 5.00 billion [£ 2,066,278][23]. The persistence of this problem was driven partly by lack of consumers' awareness and partly by weakness and multiplicity of regulations. Evidence suggests that a larger proportion of Tanzanians cannot either identify fake products or distinguish between substandard goods and counterfeits (CTI, 2017). Furthermore, there are too many legal requirements to follow (i.e. legislation is spread across 13 different Acts) but they are not strong enough to produce a deterrent impact. This large amount of Acts is confusing many consumers and manufacturers to the extent that they are unable to identify which Ministry, Department or Agency (MDA) is responsible for fighting counterfeits. On the other hand, the fines paid by offenders are not sufficiently punitive to discourage future engagement in counterfeit trade (CTI, 2017). Previous findings suggest that counterfeit dealers are wealthy and well-organized people who could sabotage effective enforcement of anti-counterfeit laws and regulations(CTI, 2008).

[21] CTI = Confederation of Tanzania Industries; MTI = Ministry of Industries; FSDT = Financial Sector Deepening Trust
[22] Bank of Tanzania Exchange rate as at 30th December, 2016 [£1 = TZS 2,660.38]
[23] Bank of Tanzania Exchange rate as at 1st April, 2008 [£1 = TZS 2,419.81]

7.3.4 Regulatory constraints

It is interesting to note that multiple regulators, unpredictability of regulations, bureaucracy and high costs of compliance jointly reduced firms' ability to introduce innovation. This was not a surprising finding in the context of a developing country and food and beverage industry in particular, and broadly supports the work of other studies in this area linking regulations with reduced innovation and firm competitiveness (Hadjimanolis, 1999; Mpangile et al., 2008; Kotey & Sorensen, 2014). Of all regulatory constraints, findings of previous studies pointed to uncertainty of regulations as the most important constraint affecting quantity, quality and originality of innovations at firm and country levels (Kotey & Sorensen, 2014; Bhattacharya et al., 2017).

The observed negative impact of regulatory constraints on innovation could be attributed to the sample size which comprised a larger proportion of small firms as the impact of regulation is much more felt by small firms than large firms do (Sleuwaegen & Goedhuys, 2002; De Fuentes et al., 2018). Further research evidence suggests that increase in regulations leads to reductions in employment among small firms (Chambers et al., 2018). The impact of multiple and uncertain regulations is reflected in raising compliance costs and reduced firm competiveness and investment in innovation activities (Nijhoff-Savvaki et al., 2012; Charles & Mambi, 2013; Charles & Rweikiza, 2015).

Previous studies indicated that the industry is overseen by 15 regulatory bodies whose roles and functions often overlap and entrepreneurs are required to comply with about 22 laws and regulations. The effects of over-regulation on individual firms and the whole industry are immense and greatly contribute to increasing wastage of entrepreneurs' time, operating costs, bureaucracy, and number of informal operators and incidences of corruption. Over-regulation increases compliance costs which manifest themselves in reduced firms' financial capability and competitiveness due to increased innovation costs and product prices. According to Charles and Mambi (2013), total compliance cost in the food and beverage industry amounts to TZS 100 billion which is equivalent to 40% of the sector's total tax contribution and 17% of total operating costs. On the other hand, the government loses an equivalent of 30% of tax (i.e. TZS 33 billion) per year due to compliance costs. The industry also loses 5,000 direct jobs and 360,000 indirect jobs in the value chain every year due to over-regulation.

Qualitative interviews mirrowed these results. More precisely, respondents identified multiplicity of regulators, unpredictability, inconsistencies in enforcement of regulation and high

taxes as the main regulatory aspects constraining their innovation efforts. Detrimental effects of regulatory constraints as explained by interviewed firms included: increasing innovation and production costs, delays in introducing innovations and abandonment of innovation projects. However, Mpangile et al. (2008) observe that lack of policy awareness among managers and owners of firms is an obstacle to utilizing trade policy for their benefits, instead they see them as growth constraints. The results of this study provide further support for the hypothesis that regulatory constraints in developing countries are hinderances of innovation and entreprenuership growth (Mpangile et al., 2008; Charles & Mambi, 2013; Charles & Rweikiza, 2015; Nieuwenhuizen, 2019).

7.4 Innovation and firm performance

The impact of innovation on firm performance was significant and positive which confirmed attainment of performance objectives. The explanations for these results lie in the nature of our sample which has a disproportionately large number of SMEs and the use of entrepreneurial bricolage and conventional strategies to overcome constraints. With regard to SMEs, it is understood that they experience more and severer constraints to innovation and their effects are more profound in them than they are in large enterprises (Hewitt-Dundas, 2006; Coad et al., 2016b). Prior research suggests that the impact of innovation on performance in small enterprises is relatively low due to limited resource base, higher degree of severity of both resource and non-resource constraints, low levels of competencies and ability to reconfigure resources to enhance innovativeness (Hewitt-Dundas, 2006; Madrid-Guijarro et al., 2009; Coad et al., 2016). Thus, recognizing these limitations, SMEs are more likely to set lower and achievable performance objectives than large enterprises do.

Second, innovation activities in the food and beverage industry are incremental in nature(Baregheh et al., 2012a), but several lines of research evidence suggest that enhanced firm performance is brought about by radical innovations (Domínguez-Escrig et al., 2018) and that competitive advantages derived from radical innovations are better than those from incremental innovations(Baker & Sinkula, 2007). This means, radical innovations contribute to increased sales, customer benefits and substantial reductions of costs (Baker & Sinkula, 2007; Löfsten, 2014). These benefits are more likely to be missed out by enterprises with focus on incremental innovations. However, both quantitative and qualitative findings of this showed that innovative firms achieved performance objectives from the innovations they introduced which suggests managers' and firm capabilities of developing mitigation strategies that were in alignment with firms' performance objectives.

7.5 Entrepreneurial bricolage and innovation constraints

The results of quantitative analysis of the role of entrepreneurial bricolage in reducing the negative impact of innovation constraints on innovation were contrary to expectations. The study was unable to demonstrate whether entrepreneurial bricolage was the main strategy employed by innovative firms to overcome innovation constraints. Considering the moderating effects of entrepreneurial bricolage, it was extremely surprising to find that bricolage led to a partial reduction of financial and market constraints only. No effect of entrepreneurial bricolage on regulatory constraints was revealed. It is difficult to explain these results, but it might be related to the firms' growth orientation and nature of the constraints. It has been suggested that growth-oriented firms apply bricolage selectively and combine it with other strategies when dealing with new challenges or exploiting new opportunities (Baker & Nelson, 2005). This appears to be the case as excessive reliance on bricolage deprives innovative enterprises of an opportunity to try alternative ways of dealing with new challenges that would enhance growth, instead they become locked into a pattern of recurring activities (Baker & Nelson, 2005; Bojica et al., 2014).

The absence of a moderating effect of entrepreneurial bricolage on the relationship of regulatory constraints with innovation suggests difficulties and related consequences of using bricolage as a strategy to deal with different types of regulatory constraints. The use of bricolage to address regulatory constraints is challenging as it involves disregarding regulations and engaging in activities considered impermissible by others (Baker & Nelson, 2005). Thus, taking this action would be too risky because the consequences of being caught as offenders for engaging in impermissible and prohibited activities would be big and unbearable.

7.6 Other constraints to innovation

In addition to the four groups of constraints discussed above whose effects on innovation were tested empirically, the analysis of qualitative interviews revealed many other constraints facing innovative food and beverage manufacturers. These constraints fell into three major categories: input related constraints, management-related constraints and institutional constraints. The input related constraints included shortage of raw materials and problems with packaging materials. The shortage of raw materials was a serious challenge among edible oil processors and winemakers and the intensity of this constraint caused some firms fail to operate at normal capacities to meet the market demand for their products.

The shortages of raw materials had persisted for several years in the industry with measures to solve it being fragmented and taken at firm level. Responding firms identified farming practices as the main root cause. Farmers grew sunflowers and grapes on small pieces of land but their farming practices were poor as well (Mpangile et al., 2008; Sutton & Olomi, 2012). Looking at these root causes, one can point figures to the government for not taking concrete initiatives to end the problem. It is obvious that provision of extension services to the farmers and coordination efforts for large scale farming are basically government's responsibilities(URT, 2015; Brüntrup et al., 2016). However, these efforts seem to be insufficient or lacking, and interview results suggest absence of heavy investment in research, grape and sunflower farming and training. As pointed out by one respondent, the institute responsible for research and training in grape farming had been inactive for several years, with no research output or training programmes for grape farmers due to lack of funds. Although, some respondents had taken some initiatives to solve the problem within their firms, to a large extent it was a still big problem.

The results also indicated that locally manufactured packaging materials were either of poor quality or limited in supply, in addition to featuring high prices. The food and beverage manufacturers were optimistic that importation of packaging materials would be the best option to obtaining quality materials and from reliable sources, but the import duty imposed on them was very high and discouraging (Mpangile et al., 2008; Voeten et al., 2016). The quality of materials and the design of packaging were important aspects in terms of product marketing and differentiation especially for coffee processors. The enterprises used these features to differentiate their products from either competitors or from other product brands within the same company. Therefore, the use of quality materials and well-designed and appealing packages was inevitable, but could result in increasing product costs which in turn, were translated into high selling prices. In markets where consumers with low purchasing power or who are interested in cheap products are dominant, high product prices greatly affect product demand.

Other constraints revealed by qualitative data were lack of management skills and emotional support. The former constraint manifested itself in poor planning and misallocation of time and other organizational key resources. Absence of hedging strategies for price instability of raw materials was a clear indication of lack of planning skills. The qualitative results also showed that some managers/owners were more interested in expansion than safeguarding organizational resources. They probably never thought about the consequences of such mismatch between the two aspects. Overall, lack of management skills caused serious losses of organization's assets.

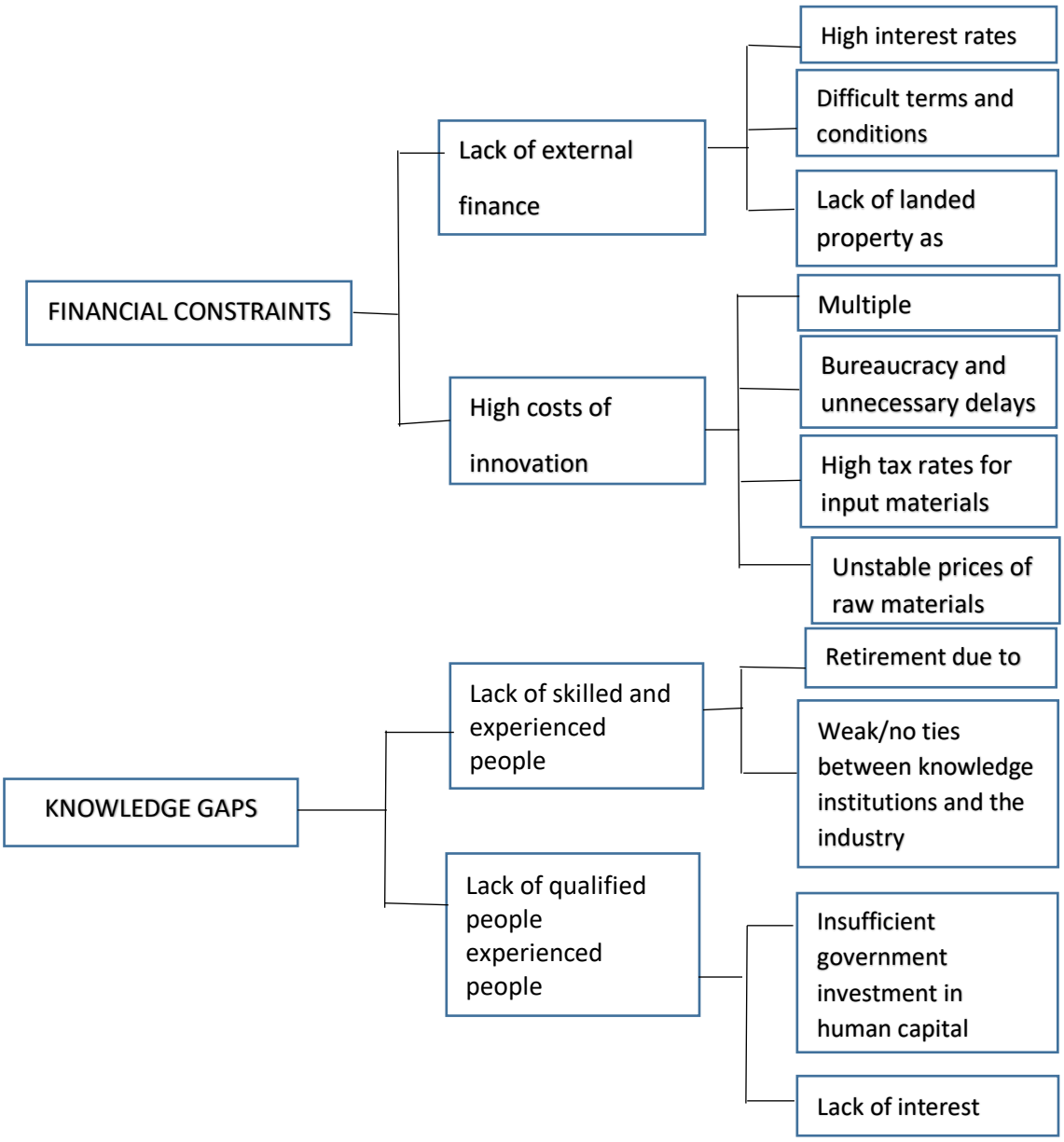
The qualitative interviews identified lack of government support, corruption, poor infrastructure and repeated power cuts as institutional factors affecting entrepreneurial firms (Mpangile et al., 2008; Sutton & Olomi, 2012; Voeten et al., 2016). Food and beverage manufacturers expressed their disappointment at the government's failure to support or collaborate with them in solving problems facing the industry. Interview evidence suggests that some firms which showed willingness to collaborate with the government by providing financial support to address the very problem of shortage of skilled labour, were held back by government reluctance. Similarly, bureaucracy and corruption thwarted food and beverage manufacturers' innovation efforts, leading to unnecessary delays in both product registration and commercialisation. These results are line with previous studies (Anokhin & Schulze, 2009; Sutton & Olomi, 2012; Dincer, 2019; Pirtea et al., 2019) which suggest that lack of government support and corruption are critical factors hindering innovation and development of entrepreneurship in both developed and developing countries in the long run.

Poor infrastructure limiting access to some remote markets, especially during rainy seasons are common problems facing entrepreneurial firms in the country (Sutton & Olomi, 2012). Because of this, some firms abandoned those markets, as it was not profitable to supply them with their goods. On the issue of frequent power cuts, it was evident that innovative firms experienced several problems such as disruptions of production, spoilage of work-in-progress and damages to machine parts, and systems and programmes. These interruptions in production schedules as a results of continuous machine breakdowns can translate into increased production costs and high product prices.

7.7 Root cause analysis

The root cause analysis of qualitative data revealed a long list of constraints with their root causes. The results in a causal tree in figure 7.2 show that most constraints have had more than one root causes. For example, lack of external finance, high innovation costs, sluggish demand and counterfeits are examples of constraints with many root causes. This represents a group of constraints which were essentially difficult to overcome because multiple strategies would be needed to address a single constraint. The same level of difficulty could be experienced when dealing with regulatory constraints whose root causes were not easily identifiable. This complexity of constraints in terms of root causes is more likely to be a big challenge for firms with limited capabilities and research evidence suggests that they are more inclined to live with constraints or avoid engaging in innovation activities than finding workable solutions (Larsen & Lewis, 2006; 2007c; D'Este et al., 2012; Rosenzweig & Grinstein, 2016).

INNOVATION CONSTRAINT CATEGORIES	INNOVATION CONSTRAINT	UNDERLYING CAUSES



INNOVATION CONSTRAINT CATEGORIES	INNOVATION CONSTRAINT	UNDERLYING CAUSES

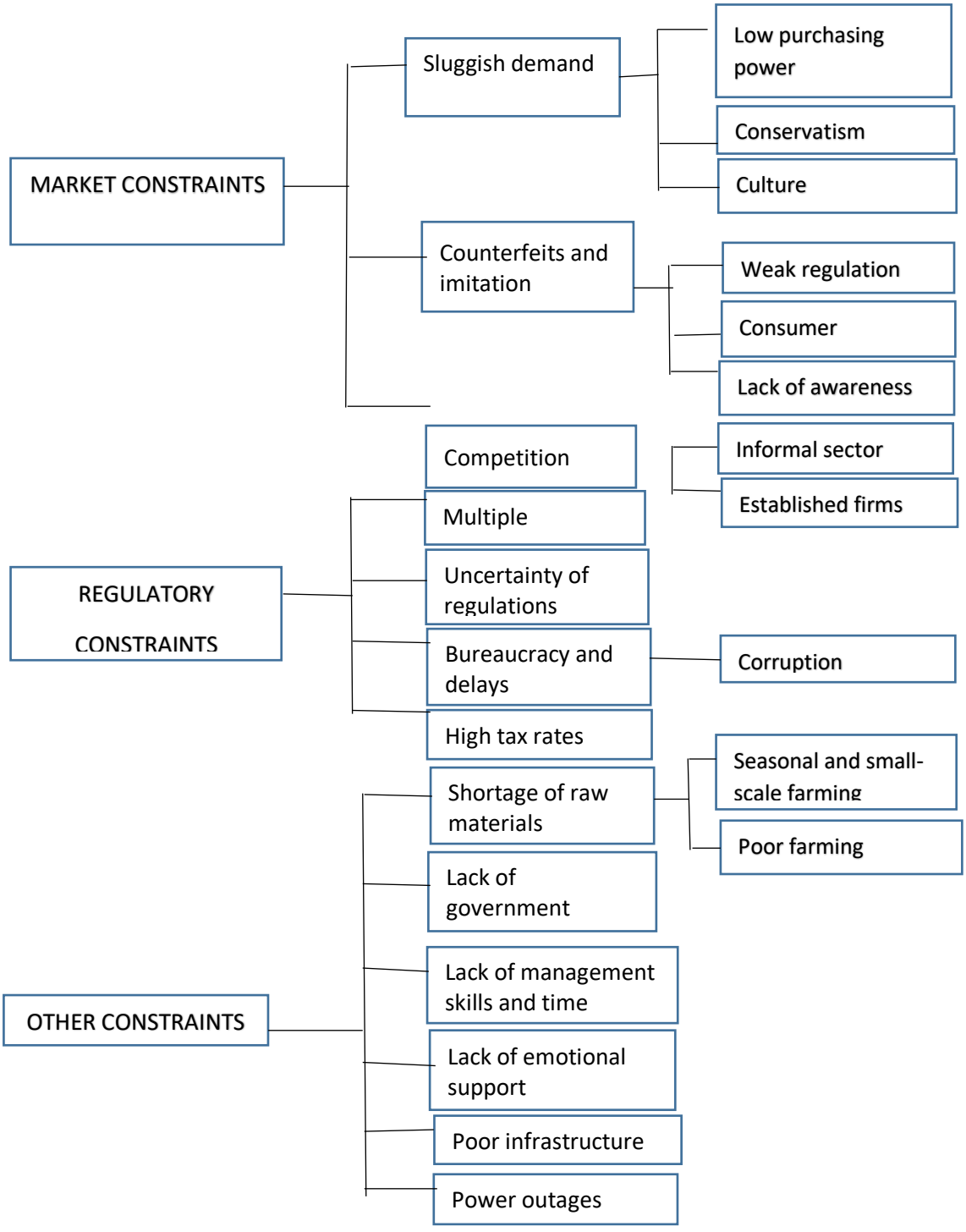


Figure 7. 1 Root cause analysis: Constraints and their respective root causes as identified from interviews

7.8 Types of innovations introduced by entrepreneurs

The qualitative results indicated that SMEs laid more focus on product innovations than any other types of innovations. There were few new product innovations like passion wine, millet wine and sunflower medicinal oil which were novel, new to market and were made from new ingredients. But most product innovations were adoptions and upgrading of what were already offered in the market. Existing research shows that SMEs suffer from both limited human and financial resources as well as weak ties with knowledge institutions which in turn affect their in-house capabilities to undertake R&D which is the main source of knowledge needed to undertake radical innovations (Adeyeye et al., 2016). In contrast, large food and beverage manufacturers equally undertook both radical and incremental product and process innovations utilizing internally generated knowledge from their R&D projects and external partners. Kahn (2018) remarked that successful organizations balance the innovation efforts by allowing small wins when undertaking big wins. These findings contradict with Esbjerg et al. (2016b)' results who found that radical product innovations were rarely undertaken by food manufacturers in Belgium, Denmark and the UK.

Product innovations were driven by acquisitions of equipment and machinery and backed up by market innovations. It is understood that the knowledge needed for product innovation is often the embodied technology in equipment and technology (Schiefer et al., 2009; Ciliberti et al., 2016; Toselli, 2017). The purchase of new equipment and machinery facilitates improvement of existing products and packages or manufacture of new products whereas new marketing strategies aim to promote new products to increase the likelihood of market acceptance and to ensure wider distribution of products as well as understanding customers' reactions to changes in the products (Baregheh et al., 2012b). According to Otero-Neira et al. (2009), profitable innovations come from coordinated innovation plans involving product, process and market innovations. These results support the findings of previous studies confirming that introduction of product innovation by food and beverage manufacturers relies heavily on acquisition of equipment and machinery (Ciliberti et al., 2016). Whereas large firms brought changes in the marketing methods by using both traditional methods (i.e. televisions, newspapers, billboards, radio etc.) and social media (Instagram, Facebook etc.), the SMEs relied on social media and trade fairs for advertising and promotion.

The majority of responding managers/owners of large firms had research and development (R&D) departments, which was evidence that innovations in those firms utilized internally generated knowledge, in addition to ideas and information obtained from customers, suppliers and market research. The knowledge created internally through R&D fosters new combinations

of old and new knowledge to create innovation (Amara et al., 2016b; Frick et al., 2019). Some manufacturers of edible oil and beverages implemented changes in procuring methods to solve problems of inadequate supply of raw materials. Other changes introduced were related to management processes which were basically driven by recurring events of losses of cash and inventory and a zeal for improvement of productivity but those related to organizational structure were implemented to cope with organizational complexities as a result of expansion.

7.9 Strategies to overcome innovation constraints

A review of literature highlighted several factors that determine the types of strategies adopted by innovative firms to overcome innovation constraints. Strategies to overcome innovation constraints differ among firms even those operating in the same environment (Larsen & Lewis, 2007c). Empirical evidence suggests that skills and capabilities possessed by the firm and its managers, form of ownership, intensity of challenges and managers' degree of risk taking are key factors influencing adoption of mitigation strategies. For example, family owned firms tend to dislike the idea of using external financial resources as they fear erosion of their control or autonomy in the business (De Massis et al., 2018). Similarly, risk averse managers do not embrace risky strategies.

7.9.1 Strategies to overcome financial constraints

The current findings showed that lack of internal financial resources forced innovative firms to seek additional finance from different external sources such as commercial banks and other financial institutions (i.e. debt credit and lease financing), international aid organizations (i.e. grants), sister companies (i.e. parent companies), friends and family members or diversify investments. These findings, on the one hand, render support for the previous studies, but on the other hand differ from them (Larsen & Lewis, 2006; 2007b; De Massis et al., 2018).

The findings of previous studies suggest that innovative firms deal with insufficient internal funds through improvement of internal processes such as efficient utilization of available internal funds, building long-term and close ties with suppliers of financial resources, product simplification, borrowings from friends and family members, joining associations/networks, cutting down costs by contracting out some functions such as product manufacturing or sales function(Larsen & Lewis, 2007b; Mpangile et al., 2008; De Massis et al., 2018). Efficient utilization of internal funds can be achieved by undertaking innovation activities in a series of steps (one at a time), taking a conservative approach to growth or avoiding financial overstretch..

In developed countries where financial systems are market-based, it is common for innovative enterprises to finance innovation activities through equity, business angels, venture capital or bonds (Larsen & Lewis, 2006; 2007b). This is not the case for entrepreneurs in developing countries where financial systems are bank-based. In these settings, bank loans are a preferred option to raise finance for long-term investments such as innovation activities (Mpangile et al., 2008). However, the main problem with bank loans in developing countries is that they are collateral based and subjected to a myriad of cumbersome and complex formalities and high interest rates, as a result they become inaccessible and too expensive to afford (Hadjimanolis, 1999; Mpangile et al., 2008; Hansen et al., 2012). This is a very serious problem for small firms due to size disadvantage which is explained by less possession of material and reputational resources necessary for access to debt finance.

These results seem to be consistent with findings of previous studies which found that raising finance from conventional financial institutions for investments in innovation projects in developing countries is the greatest handicap that faces entrepreneurial firms (Chowdhury, 2007; Mpangile et al., 2008). However, strategies to overcome lack of bank loans differed among entrepreneurs and on the purpose of finance: long-term finance vs short-term finance. To overcome long-term financial problems, firms used grants, leasing financing, diversifications and borrowing from friends and family members, and from within the group. Grants and leasing finance were used to acquire equipment and machinery. Interestingly, grants and diversification strategies were employed mainly by enterprises run by managers with many years of experience in the industry. The grants were provided through pitch competitions and interview evidence showed that the winners of such competitions were also firms whose managers had several years of experience in the industry and substitute skills.

The current study identified two main strategies to overcome lack of working capital. Trade credits and borrowing from friends and family members were employed to solve working capital problems. It seems that these strategies were less expensive and easy to use. However, previous studies showed that lack of working capital can be addressed through product simplification (Larsen & Lewis, 2007b) by changing the material components (i.e. reducing the quantity, changing types and quality of raw materials) used in the manufacture of a product. This strategy helps cut down production costs that contribute to increasing innovation costs.

Several strategies such as using recycled packages, producing packaging materials internally and buying packages from sister companies for subsidiary companies were employed to cope with high costs of innovation. The recycled materials were often seen as cheap and easily available

while products made from recycle materials are considered affordable to many users (Baker & Nelson, 2005; Linna, 2013). This illustrates the concept of bricolage that allows innovative firms to use cheap and locally available resources to introduce low-cost innovations (Linna, 2013).

The constraint related to high production costs was overcome by reviewing the formulae of products to reduce the amount of materials, although the strategy seemed not to work as expected due to high levels of consumer resistance. Consumer resistance in the industry is primarily because of issues of safety and health related to new food products and less involvement of customers in the development of new products (Fortuin & Omta, 2009; Beckeman et al., 2013; Trott & Simms, 2017). The degree of consumer resistance is higher if consumer lack enough information about product usage and benefits (Beverland et al., 2016; Reinhardt et al., 2019)

It was surprising to find that finance guarantee schemes were not mentioned at all by respondents as one of their main sources of finance. The Government of Tanzania and local commercial banks have had several sectoral and general finance guarantee schemes to support entrepreneurs in all and specific sectors (Hansen et al., 2012; FSDT, 2013). Unfortunately, none of the interviewees mentioned such schemes, which implied that the schemes were not in innovative firms' reach or firm managers and owners themselves were not aware of them. Previous findings suggest that most of the credit guarantee schemes in the country are surrounded by uncertainty and bureaucratic procedures that discouraged borrowers (FSDT, 2013).

7.9.2 Strategies to overcome knowledge constraints

Evidence obtained from interview data indicated that knowledge gaps as a constraint was caused by institutional failure and people's lack of interest particularly in coffee processing. It was clearly seen from the interview results that resources such as experience and specialised skills are embedded in the aging labour force but efforts to replace them are absent. These findings imply that the government, on the one hand had not done enough to support the private sector by investing heavily in human resource development. On the other hand, the implication is that the national education system has not improved enough to address the knowledge gaps facing the industry.

Empirical evidence suggest that the knowledge obtained from universities could help firms overcome different constraints (De Fuentes et al., 2018). The failure of local training institutions to address skills shortages by developing courses and offering training that bridge the skills gap

of the industry suggests disconnection of the education system from the industry. However, one respondent noted that a local university college in collaboration with Tanzania Coffee Board had introduced a certificate programme in coffee processing. This is a recommendable move, but the programme continuity is in jeopardy because most of the trainers are aged and about to retire from public service. It seems that there are no immediate efforts being made by the two partners to replace aged trainers once they retire.

The strategies to overcome knowledge gaps fall into three major categories: temporary hires, assistance from network partners and provision of training. The latter two categories enhance learning capability of organizations. Temporary hires, a common strategy in the coffee processing sub-sector was implemented on a needs basis, as it was not easy to recruit coffee baristas on a permanent basis due to shortages of qualified coffee masters in the country. This finding is consistent with Voeten et al. (2016) and Oglethorpe and Heron (2013)'s findings who found that shortage of skilled labour in the industry is often addressed by hiring consultancy firms or individuals from other fields or abroad. However, this strategy is potentially feasible in the short-run and companies needed to provide training and apprenticing to address long-term skill requirements (van Uden et al., 2017). Although, staff turnover was not a problem in the industry, some firms took pre-cautionary measures of providing their employees with free accommodation with the assumption that such incentives would foster employee superior relationships and make employees remain committed to the company for longer periods (De Massis et al., 2018).

Although, food and beverage manufacturers relied on suppliers of equipment to improve their technical know-how and knowledge of products, prior studies emphasize the importance of other network partners such as customers and business associations as alternative sources of both technological and non-technological knowledge (Larsen & Lewis, 2007b; Si et al., 2018). For example, joining business associations gives firms an opportunity to share their experiences of the constraints they encounter and how they deal with them (Larsen & Lewis, 2006). Associations are also useful in consolidating lobbying efforts to demand relaxation of some conditions regarding collateral needs tied up to bank loans (Mpangile et al., 2008).

It was also evident that financially sound firms improved employee knowledge through training, apprenticeships and education. Murat Ar and Baki (2011) note that promotion of organizational learning capability plays a critical role in improving process innovation. Managers and owners of some firms upgraded their skills by using free and easily available sources of knowledge such as the internet, industry magazine etc. Other strategies suggested in the innovation literature to

overcome knowledge constraints include learning through research and trials, and employing people with appropriate complementary skills who can work on different tasks (Larsen & Lewis, 2007b; Si et al., 2018). However, these strategies are appropriate for firms with enough financial resources, R&D departments and technologically skilled people.

7.9.3 Strategies to overcome market constraints

Counterfeits and product imitation, sluggish demand for innovative products, consumer resistance, and competition were the major market constraints facing food and beverage manufacturers. Advertising and promotion campaigns using traditional media, social media and trade fairs were employed to overcome consumer resistance (sluggish demand) while printing and distribution of leaflets, running or sponsoring awareness campaigns aimed at addressing lack of consumer awareness of counterfeit products.

While financially stable firms (especially large enterprises) used a combination of traditional and social media but financially constrained firms (i.e. small firms) combined both social media and trade fairs to advertise and promote their products with the aim of stimulating demand. These findings reflect the results of previous studies suggesting that strategies to overcome problems related firm's failure to carry out marketing and promotion activities are contingent upon the types of root causes. For example, lack of financial resources as a root cause can be overcome by adopting strategies that would need little or no resources to implement. These strategies include: use of the internet(Larsen & Lewis, 2007b), customer word-of mouth (Larsen & Lewis, 2007b; Linna, 2013) as customers are good at spreading the innovator's message. However, some firms are not comfortable with advertising and promotion using the internet for fear of having an idea being copied. But, if the cause is lack of marketing skills or proper promotional media, the best way to address the constraint is to employ professional marketing personnel (Larsen & Lewis, 2007b).

The chances of new products being rejected by consumers were higher in the industry because of consumers' conservative behaviour, economic status and culture. The enterprises which experienced consumer resistance halted the changes and stuck to their original products. Surrendering to consumers resistance is described by Huang et al. (2003) as lack of visionary and imaginary managers with willingness to take risks to actualize the vision and ability to see the constraint as an opportunity. The best way to overcome consumer resistance is to ignore their suggestions and move on with the launch of innovations (Huang et al., 2003). They further suggested educating customers to achieve acceptance of the new products.

Resistance builds up in customers when they fear that the price of a new product is too high for them to afford or information about the product usage and its benefits is not available or insufficient (Si et al., 2018; Reinhardt et al., 2019). This uncertainty can be reduced by knowledge acquisition which enhances understanding of the innovation (Reinhardt et al., 2019). Huang et al. (2003) recommends conducting market research to understand customers' perceptions and reaction to the proposed changes in products and it should be supplemented with provision of education on the potential benefits of the changes. Education provided must address the main findings of market research. Marketing and promotion campaigns can be used to enhance customers' knowledge but for campaigns to be effective, the focus needs to be laid on usage and benefits of the products. Consumers can also garner information about the product from freely available sources such as internet research or recommendation by others or innovators themselves through targeted marketing campaigns (Larsen & Lewis, 2007b; Linna, 2013).

To overcome counterfeits and product imitation innovative firms focused on dealers (i.e. confrontation strategy) and consumers (i.e. awareness creation strategy). The pursuit of confrontation strategy relied on customers and marketing personnel to provide information that would enable manufacturers to identify counterfeit dealers and imitators before passing such information to law enforcers and regulators for action. However, this strategy poised many challenges because it involved many parties with different interests and capabilities.

The approach to funding or running education campaigns to raise consumers' awareness and risks associated with consumption of counterfeit or substandard products aimed to solve a long-term problem of lack of knowledge and awareness of fake products which is a serious problem among Tanzanians. The drawback of this strategy was that it needed a lot of financial and human resources, which couldn't be afforded especially by small and medium enterprises. The two strategies differed from those found in the literature which involve the use formal and informal means to protect innovation ideas and core competency underlying innovations against copying. The literature recommends protecting products from being copied by simplifying them to the extent that they become unworthy of being imitated by others, or could be patented locally and internationally (Larsen & Lewis, 2006). Sometimes, innovation protection would be achieved through establishment of close and long-term ties with existing customers who can become protective of the resources and core competency surrounding innovation (De Massis et al., 2018).

The strategies to deal with informal sector competition differed from those employed to overcome competition from established firms. Informality and established firms were two

underlying causes of unfair and intense competition respectively in the industry. Innovative enterprises coped with informal traders by either confrontating them directly or avoiding their markets. The first strategy entailed arresting and fining informal suppliers. This strategy had little success because it involved different parties in identifying, reporting, arresting and punishing the culprits. Firms relied on customers to supply them with information about the identity of informal dealers, but the responsibilities to arrest and punish them were bestowed upon regulators and law enforcers. In most cases, the regulators were slow or reluctant to take actions due to limitation of both financial and human resources. Unfortunately, the majority of regulatory authoritie suffer from inadequate resources to carry out their duties efficiently and effectively (Charles & Mambi, 2013).

The avoidance strategy was adopted to deal with competition from informal traders and large enterprises. The strategy involved avoiding markets dominated by either informal suppliers or large enterprises. However, the way it was implemented differed between the two types of competition. In order to cope with informality innovative firms produced quality goods for high income customers, who would not be served by informal suppliers. But to overcome competition from established and large players in the industry, food and beverage manufacturers, particularly small and medium enterprises, created their own markets by producing products that were previously unavailable or creating markets that did not exist before. This was achieved by producing products in the shadow and lacunae of institutionalized practice for people who have been side-lined by conventional markets because of their economic status, location or choices (Baker & Nelson, 2005). The approach commonly known as frugal innovation seeks to provide people in those subsistence markets with products which satisfy their essential functions (Cunha et al., 2014).

The findings revealed that large and established players were rather keen on urban customers. However, owner/managers of beverage manufacturing SMEs focused on rural customers who were not served by conventional markets. These results seem to be consistent with Linna (2013)'s findings which showed that entrepreneurs in Kenya were developing renewable energy solutions (biogas and wind turbine) for poor people. In this way, they were creating their own markets through frugal innovation. According to Cunha et al. (2014), enterprises which serve subsistence markets with frugal innovations tend to register successes due to social intimacy which is accorded to them by the local community because the community does not trust the outsiders and considers their behaviour exploitative and uncaring.

There were several other strategies that innovative firms employed to overcome competition in general and they included product differentiation, modernization of facilities, customer orientations, offering trade credits, frequent visits to customers' premises and use of VAT registration certificate. Product differentiation focused on improvement of product quality, taste, packaging, and price reductions while customer orientation aimed at building brand reputation and customers' trust.

7.9.4 Strategies to overcome regulatory constraints

As far as regulatory constraints were concerned, the current findings showed many of the constraints had unknown or difficult to identify root causes. This proved difficulties in coping with these constraints. The current findings indicated that many entrepreneurs just complied with regulations despite being heavy burdens on them in terms of costs and time. This finding is consistent with that of Larsen and Lewis (2006; 2007b) who found that manufacturing SMEs in the UK used this strategy to deal with various constraints to innovation. However, the finding is contrary to Baker & Nelson (2005) results which showed that innovative firms dealt with regulatory constraints by intentionally deviating or disdaining them so as they could undertook impermissible activities.

The constraint related to high tax rates was addressed by employing consultants who would lobby against tax hikes by presenting the facts to the government and law makers about the detrimental effects of tax hikes. The hiring of consultants was coordinated by industry's business association. Similarly, the business associations were also used as platforms for discussing critical regulatory issues facing the industry. This strategy was appropriate for small firms which needed collective voice to air their concern to the relevant authorities over the problems they faced. Previous studies (Charles & Mambi, 2013) in the industry identified several mitigation strategies that food manufacturing firms employed to comply with regulatory requirements: employing a person responsible for compliance issues, engaging a consultant to help them cope with regulatory requirements, negotiations with regulators to get temporary licenses while addressing weakness identified, strengthen quality control departments. However, these strategies cannot work for small firms due to limited financial and human resources.

Uncertainty of regulations is a common regulatory obstacle in many developing countries and most entrepreneurs are often caught in surprise by unexpected changes in regulation that leave little room for adjustment. The current results indicated these situations were well managed by managers/owners who were flexible in decision making and quick in responding to changes in

the business environment. Inflexibility and sluggishness in taking actions is more likely to have an adverse impact on survival and growth of enterprises in uncertain environment.

7.9.5 Strategies to overcome other constraints

There were several other innovation constraints such as shortage of raw materials, constraints related to packaging materials, lack of government support and corruption, lack of management skills and time, lack of emotional support, poor infrastructure and power outages. The analysis of interview data revealed mitigation strategies for shortage of raw materials, constraints related to packaging materials and power outages only. For the rest of constraints, it is difficult to explain whether the entrepreneurs ignored them, deferred the mitigating decision to a later date or lacked the capabilities to cope with them (Rosenzweig & Grinstein, 2016).

Shortages of raw material was a big problem in edible oil and beverage subsectors. Poor farming practices and small-scale farming were mainly to blame for poor quality and inadequate supply of raw materials (Mpangile et al., 2008; Mutungi & Affognon, 2013). Efforts to overcome this constraint focused on contract farming, using alternative forms of raw materials or building long-term relationships with farmers through provision of agricultural input and training on modern farming practices. The latter strategy ensured manufacturers adequate supply and quality materials by providing workable a solution to scarcity of raw materials, but its success depended on whether the entrepreneurs possessed knowledge and skills in agricultural farming practices. The interview analysis showed that the strategy was mainly adopted by entrepreneurs whose educational background and previous work experience was in the field of agriculture.

On the question of constraints related to packaging materials, the entrepreneurs were optimistic that importation of packaging materials would provide a long-lasting solution to problems associated with locally produced packaging materials. However, high import duty forced entrepreneurs to seek alternative solutions like using recycled packaging, have packaging materials manufactured internally or obtaining packaging materials from sister companies for subsidiary companies. Last, for power outages, the entrepreneurs installed stand-by generators that would automatically start off in case of abrupt power cuts, this helped them to avoid/minimize damages of power fluctuations.

7.10 Entrepreneurial bricolage as a strategy to overcome innovation constraints

The results obtained in chapter 6 demonstrated that entrepreneurial bricolage was used in conjunction with conventional strategies to deal with various innovation constraints. Table 8.1 shows the extent to which entrepreneurial bricolages was employed to overcome various innovation challenges. The innovation literature suggests that when firms are faced with resource constraints or uncertain situations in the environment, they take one or a combination of the following course of actions: (1) acquire standard resources from external sources (Smith & Blundel, 2014b), (2) engage in entrepreneurial bricolage (Witell et al., 2017; Tasavori et al., 2018), or (3) take no action and live with the challenge(Larsen & Lewis, 2007b; Rosenzweig & Grinstein, 2016). The latter response means that the enterprise lacks the capability to deal with the challenge, resulting in putting innovation project on hold, terminating it or in some extreme cases undergoing downsizing or disbanding. However, growth-oriented firms tend to take both options 1 and 2 either concurrently or sequentially (Baker & Nelson, 2005).

The results revealed several instances where entrepreneurs employed bricolage to solve innovation challenges they encountered or to take advantage of the opportunities. Interestingly, network (external) bricolage was used substantially as to overcome both resource and non-resource constraints. External bricolage entails utilization of resources residing in the network in which the firm is embedded. Network embeddedness is referred to as the ability of the firm to forge long-lasting ties with key stakeholders or potential providers of important resources (Tasavori et al., 2018). These are connections with customers, suppliers, research centres, schools, local governments, community banks and other institutions in the local community (De Massis et al., 2018). The current findings suggest that food and beverage manufacturers seemed to engage customers, suppliers, business associations in their innovation activities by being open-minded to their ideas and suggestions. The enterprises utilized knowledge accumulated from various network partners to introduce product, process and market innovations.

Table 7. 1 Areas in which entrepreneurs employed bricolage to deal with innovation challenges

Domain	Constraint	Interviewee	Illustrative quotes
Materials: Combining and effective utilization of existing resources	High costs of innovation	BLE2	*"We use recycled Heineken bottles. We buy empty bottles and remove the labels, wash and sterilize them before they are re-used".*
		OME4	*"Our gear box machine failed to operate when we were processing baobab oil. We replaced it with a tractor shaft gear and it worked".*
		BME7	*"…. our objective was to produce the same quality product with less sugar."*
		CME8	*"Many of our products are new and every time we introduce a new product, we don't need to add new resources. What is mostly needed is a product designer. Fortunately, we have our own designer who is on a permanent contract. He designs all products and packages. When we have a new idea, we just present it to him for the design, be it a new product or new packaging".*
Finance: Involving internal external partners in free or low interest rate loans	Lack of credit finance	CME6	*"The loan was obtained from within the company……..The interest rate was very low as it[loan] was from internal.".*
		CME8	*"We started with a single product and in small quantities, but the volume has continuously increased and new product lines have been added. It is not easy but we try to be very careful with using our [financial] resources to develop new products".*
		BME5	*"They normally sell to us raw materials on credit. We buy ethanol on credit and pay after 1 to 2 weeks, for labels, the trade credit terms is 15 days"*
		BSE3	*"We produce wines in small quantities due to limited financial resources…. For example, they agree to supply us raw materials like sugar and the like on credit and we pay them after we sell our wines".*
Labour: Involving external partners in free work	Lack of technical skills and knowledge of products	CME6	*"We sometimes get technical assistance from Trabacker Company of South Africa……They often come here to conduct short training for our staff."*
		CME8	"*I thank customers for the suggestions they give us on how to improve our packaging and products……..They tell us what to change, add or remove from the packaging and even the labels"*.

			"*We were selling tea, just black tea, not flavoured tea. But one of our friends came up with the idea of making spiced tea. He told us to mix tea with various spices to make flavoured tea. We did it and it became a successful product".*
		BSE3	*"We applied through SIDO and SIDO submitted our application to TFDA[24] and TBS[25] on our behalf"*
		BSE1	"*She [mom] taught the basics of wine making*"
Labour: Involving internal partners in free work	Lack of technical skills and knowledge of products	OME4	*"They will get job training on how to solve minor problems and breakdowns that may arise. I will train them [*production line staff*] myself. I am currently doing the same to production staff*". *"I do not work by routines"*
		BLE5	*"We are now forcing our family members to study these machines….."*
		CME8	*"We train our own people…….. What we do, we recruit form six leavers or college graduates and train them for three or four weeks on all issues related to coffee and from there they are supposed to upgrade their skills themselves".*
Skills: Leveraging self-taught skills	Lack of skills	OME4	*"I am also responsible for innovative changes in products, and operations. I look for information from different sources and also learn how other entrepreneurs innovate."*
		OSE4	*When I want to do something new, I read from the internet, I get innovative ideas from the internet"*
		CME6	*"We use different forums and coffee magazines like Roast Magazine. Many coffee companies are subscribers and advertise their products in there. They send us copies monthly, and as we read, we know new developments in the industry"*

[24] TFDA = Tanzania Food and Drugs Authority
[25] Tanzania Bureau of Standards

		CME8	"*In general, many entrepreneurs in the coffee industry lack formal education or training about coffee business but they are self-learners"*
		CME1	*"I get new information from the internet; I do a lot of internet searching".*
Customer/market	Counterfeit products	BLE3	*"So……. we have a policy to support the government in combating illicit products."*
		BSE3	*"Customers often call us when they see changes in our products and show us where the counterfeits are sold"*
		BSE3	"*They give us information on fake banana beers that are in the market. In general, our customers are key partners and foundation of our business".*
		BLE5	*"We investigated them with the help of TFDA. TFDA are doing a quite good job to fight counterfeit products".*
	Lack of finance for advertising	BSE3	*The big challenge was to get customers. We didn't have enough money for advertising and promotion. We thought that the only way to get customers and promote our products was to attend trade exhibitions like SIDO trade fairs for small businesses, Sabasaba and NANENANE.*
	Competition from established firms	BME7	*"It needs extra efforts to enter their [large and established firms] markets. What we do is to gather market intelligence data. Everyone at our company and friends of our employees who work with our competitors are all involved". "Most of our customers are in rural areas"*
		BSE3	*We target low-class customers. We have decided to focus on that group because it the largest group of consumers in our market"*
		BME5	*"We decided to focus on rural markets which have high demand. We did not opt for urban markets because they were saturated and had low demand."*
Regulations	Uncertainty of regulation and business environment	BME5	*"We changed to plastic bottles immediately after the ban of sachets was in effect. Companies that did not make a quick move and waited for further government directives have failed to resume production"*
		OME4	*"We do not work by routines...we are flexible, we can easily adapt to any change in the business environment including regulations"*

The grants and diversifications provided solutions to long-term financial constraints, but solutions to working capital problems came from network bricolage. Whereas some suppliers of raw materials granted trade credits, family members and friends provided free interest loans that served to address short-term financial needs. Conventional strategies such as bank loans, grants and lease financing were in constant use to address long-term financial needs and enabled enterprises to acquire additional financial resources. Thus, qualitative findings confirm results of the quantitative phase by showing a partial role played by bricolage in reducing the impact of financial constraints on innovation.

The findings suggested that entrepreneurs addressed some of the skills gaps through bricolage. The network partners, particularly suppliers of equipment and machinery supported food and beverage manufacturers by offering professional advice and training to their staff. These forms of support were free and helped improve both technical skills and product knowledge and provided long-lasting solutions to problems related to knowledge gaps. More pieces of evidence showed that entrepreneurs upgraded their knowledge by using free and easily available sources of information such as the internet, industry magazines etc. which are in line with previous studies (Baker & Nelson, 2005; Linna, 2013).

Network bricolage also enabled entrepreneurs to overcome market constraints, particularly counterfeits and sluggish demand by engaging several stakeholders. Collaboration with customers, law enforcers and regulators to fight counterfeits demonstrated the role of network bricolage in addressing uncertainties in the business environment (i.e. non-resource challenges facing innovative firms). Addressing counterfeits would also help overcome lack demand as this constraint (i.e. counterfeits) was identified as one of the root causes of low demand for innovative products.

Research evidence suggests that bricoleurs possess a particular ability to recognize opportunities and then take actions with the assumption of finding a workable solution (Linna, 2013; Senyard et al., 2014a). They create their own markets and serve them with unique products which are different from those found in the conventional markets(Baker & Nelson, 2005; Linna, 2013). By doing so, they are likely to face less or no competition because they become sole suppliers in that new markets. The entrepreneurs that produced products to serve rural markets had recognized the opportunity which was ignored by large and established enterprises. Even though large and established enterprises viewed rural markets as not profitable and inaccessible due to having many customers with low income and poor infrastructure, bricolaging entrepreneurs could produce and supply them with affordable

products. It is possible that these entrepreneurs found some methods to overcome what were seen as constraints by large and established enterprises.

Entrepreneurial bricolage also surfaced as a strategy to overcome uncertainty in regulation. The use of bricolage to overcome regulatory constraints in this study contradicts with previous research (Baker & Nelson, 2005) which suggested that bricoleurs addressed regulatory constraints through intentional deviation and disdaining them. The managers' ability of some responding enterprises to foresee the consequences of abrupt changes in regulation and act promptly is an example of bricolage(Yang, 2018a). Following the government's decision to ban liquor packaged in sachets, some bricolaging entrepreneurs didn't want to wait but they immediately switched to bottle packaging. Research evidence suggests that when entrepreneurs are confronted with situations where resources such as time are limited, they often see planning to find workable solutions as an obstacle, instead they resort to rapid response where planning and execution are simultaneously undertaken (Baker et al., 2003; Cunha et al., 2014). This type of bricolage is often referred to as improvisation which is pursued in situations of unexpected events with limited time to adjust. Several previous studies indicated that improvisation is associated with introduction of different types of innovations (Smith & Blundel, 2014b; Tasavori et al., 2018).

Last, entrepreneurial bricolage was employed to overcome constraints related to packaging materials and raw materials. The costs of packaging materials and the minimum order quantities required by suppliers were too high for some enterprises to afford. These firms opted for recycled packages which they considered cheap and easily available, though other enterprises saw them as of no value to use. These findings are in line with previous studies (Baker & Nelson, 2005; Linna, 2013) which outlined the role of bricolage overcoming shortage of materials. For the case of shortage of raw materials, entrepreneurial bricolage involved forging and maintaining close and long-lasting ties with farmers for the purpose of ensuring adequate supply of materials. This was achieved through provision of training on good farming practices and supporting farmers to add values to their farm produce. This finding is contrary to previous studies which suggests that long-lasting ties with suppliers of resources is achieved when the firm operates in the same local community for a longer period and participates in community's social activities (De Massis et al., 2018).

7.11 Capabilities to overcome innovation constraints

The present study identified entrepreneurs' personal ties, knowledge and experience in the industry (i.e. at the level of management) and network relations and flexibility at the level of the

firm as important capabilities for overcoming innovation constraints. Prior knowledge and many years of experience of entrepreneurs and inter-firm relationships appeared to play crucial roles in the choice of mitigation strategies. Knowledge and experience reflected entrepreneurs' accumulated wealth of abilities that enabled them to access grants, establish backward linkages with suppliers of raw materials (i.e. farmers), identify knowledge gaps in their firms and facilitate training. The use of grants, bank loans, lease finance and investment diversifications to cope with lack of external finance was a common strategy in firms run by entrepreneurs with prior knowledge and many years of experience in the food and beverage industry. The entrepreneurs who had previously worked in the food and beverage industry or had undergone training in agriculture supported farmers by providing them with input (i.e. hybrid seeds) and facilitating training on best agricultural practices and value addition. These practices helped them solve issues of shortage and poor quality of raw materials. The focus on rural markets, and middle- and high-income consumers to deal with competition from established large firms and informal traders respectively illustrates another use of entrepreneurs' knowledge and experience in the industry.

The activities into which diversifications were launched depended on the entrepreneurs' previous experiences and knowledge of such activities. For example, entrepreneurs with previous knowledge and experience in the financial sector or who had worked as accountants diversified into the lines of microfinance. The finding that diversification was used as a mitigation strategy for lack of external finance contradicts with De Massis et al. (2018)'s study of the German Mittelstrand which found that persistent innovativeness of firms was related to avoidance of diversification, but embracing niche market focus. The niche market focus gives resource-constrained firms an opportunity to get rid of complicated processes and product lines, and additional financing needs, resulting in highly effective and efficient utilization of available resources (ibid).

The results of this study also support the idea that firms' network relations are important capabilities for overcoming various constraints. For example, firms that operated as subsidiaries relied on sister companies for assistance and solutions to innovation problems they encountered (see table 8.1). Other network partners such as suppliers of equipment, customers and business associations played an important role in overcoming knowledge gaps, shortage of raw materials, counterfeits, informality and regulatory constraints.

Chapter 8 CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This research examined three separate but inter-related research questions that sought to understand the factors constraining innovation efforts of the Tanzanian food and beverage manufacturers and how the constraints were overcome. The study adopted mixed methods explanatory sequential design where quantitative approach preceeded the qualitive inquiry. The first two research questions were adressed quantitively while the qualitative research approach was used to answer the third research question. The first research question sought to understand the factors responsible for constraining innovation and firm performance while the second research question examined the role of entrepreneurial bricolage in overcoming constraints to innovation. These two questions were addressed quantitatively from the lens of entrepreneurial bricolage that postulates that differences in innovation among firms operating in resource-constrained and uncertain environment is a result of employment of entrepreneurial bricolage to deal with innovation challenges (Baker & Nelson, 2005; Bojica et al., 2014; Witell et al., 2017). Based on empirical evidence, several hypotheses were developed and tested using structural equation modeling technique. The survey data were collected from 248 enterprises in the Tanzanian food and beverage industry .

8.2 Summary of findings

Six hypotheses were developed and tested for the first research question. The first hypothesis examined the relationship of entrepreneurial bricolage with innovation. Other four hypotheses, depicting four categories of innovation constraints (i.e. financial, knowledge, market and regulatory constraints) identified from the “constraints” literature explored the effects of constraints on innovation. The four hypotheses posited negative relationships of the constraints with innovation. The last hypothesis examined the relationship of innovation with firm performance and it posited that the propensity to innovate improve firm performance as far as firms use bricolage to address the constraints. The structural equation models, developed to depict the relationships were subjected to analysis using structural equation modeling. The results of this study confirmed that financial, market and regulatory constraints collectively hindered innovation of enterprises in the industry. These findings complemented those of earlier studies in the food and beverage industry and other industries (Tourigny & Le, 2004; Coad et al., 2016b; Duarte et al., 2017; Santiago et al., 2017). However, the relationship of knowledge constraints with innovation was negative but insignificant which suggested that knowledge constraints were perceived as of little importance by entrepreneurs.

The second research question addressed the moderating role of entrepreneurial bricolage in reducing the impact of innovation constraints on innovation. Previous studies associated entrepreneurial bricolage with introduction of different types of innovation (Linna, 2013; Smith & Blundel, 2014b) or firm performance (Bojica et al., 2014; An et al., 2018b) within firms operating in extreme resource constrained environment, but they failed to indicate the mechanism through which bricolage reduced the negative impact of innovation constraints. The current study adopted a double-mean centering approach - a SEM technique to investigate how entrepreneurial bricolage could moderate the relationships of innovation constraints with innovation. Entrepreneurial bricolage was found to have partial moderating effects on the relationships of financial and market constraints with innovation, but such effects were absent in regulatory constraints. The implication for these results was that entrepreneurial bricolage was not a sole means through which enterprises dealt with various innovation constraints. Further research which employed qualitative methods, with emphasis on uncovering other mitigation strategies was conducted. The qualitative research provided detailed descriptions of the actual constraints encountered in the innovation process, their causes and the strategies employed to overcome them. The qualitative research addressed the third research question.

Qualitative data offered additional insights by identifying specific constraints that innovative firms considered important, how they affected their innnovation efforts and what caused them. Important financial constraints that emerged from qualitative data included insufficient internal finance, inacessible bank loans and high innovation costs, while knowledge constraints were shortage of people with skills and knowledge, qualifications and experience in product and packaging designs. Market constraints included limited demand for innovative products, higher degree of informality, product copying/counterfeits. Multiplicity of regulations, high compliance costs, high tax rates and uncertainty of regulations emerged as main regulatory constraints in the industry. Other constraints identified from qualitative interviews were shortage of raw materials, poor quality and high costs of domestically manufactured packaging materials, lack of government support, poor infrastructure and lack of management skills. These results match those observed in earlier studies in the industry (Mpangile et al., 2008; Charles & Mambi, 2013; CTI, 2017; Nandonde, 2018).

However, even though the constraints were diverse and possibly extreme, still some firms could introduce different types of innovations by utilizing a variety of internal and external sources of ideas and information. Some new products introduced were made from new ingredients, but most product innovations involved improvements in the taste and quality of products, or changes in the formulae. Packaging innovations became an important tool for innovative

enterprises to differentiate themselves and their products from competitors. Product innovations were driven by acquisitions of equipment and machinery (i.e. process innovation) and backed up by market innovations. Many innovations undertaken by SMEs were adoptions and upgrading of what were already offered by competitors and relied on external network relations and owners as sources of knowledge for innovation. However, large enterprises utilized knowledge obtained from both and external sources to undertake radical and incremental innovations.

The results categorize mitigation strategies into two major groups: bricolage and conventional strategies. Some constraints were addressed by a mix of strategies while others were dealt with by either conventional strategies or bricolage only. For example, conventional strategies such as bank loans, investment diversification, grants and lease financing (i.e conventional strategies) were used to deal with long-term financial needs but knowledge gaps were addressed by a mix of conventional strategies and bricolage (i.e. hiring experts, provision of training and education or self-learning.

The root cause analysis revealed that most innovation constraints had more than root causes, while other constraints shared the root causes, some caused others. On the other hand, the root causes of many regulatory constraints were unknown. The complexity of root causes signifies the difficulties that entrepreneurs encounter when trying to devise strategies to deal with the constraints. Probably, this could be one of the reasons for many constraints to remain unattended. (Weenen et al., 2013) pointed out that without knowledge of the root causes of it would be difficult for managers to develop effective strategies to overcome the constraints.

8.3 Methodological and empirical contribution

Research on innovation constraints has been often pursued from a post-positivist angle, with the majority of studies employing quantitative techniques to test the effects of different constraints on innovation and decision to innovate (Maldonado-Guzmán et al., 2017b; Strobel & Kratzer, 2017; An et al., 2018a; Pellegrino, 2018). However, despite improving our understanding of the roles of different factors in constraining firms from undertaking innovation activities, these studies remain limited in terms of methodological approaches, regional coverage, analysis of the relationships of innovation constraints with firm performance, analysis of the factors that contribute to the reduction of negative effects of innovation constraints and exploration of strategies to overcome the constraints.

One strand of innovation literature (Canepa & Stoneman, 2008; Efthyvoulou & Vahter, 2016b; Durmusoglu et al., 2018; Pellegrino, 2018) is focused on identification and examination of the relationships of innovation constraints with innovation performance (the "constraint literature") while another line of research (Rao & Drazin, 2002b; Smith, 2007; D'Este et al., 2014a; Marvel & Patel, 2018) explores mitigation strategies for innovation constraints. Although these studies have improved our understanding of innovation constraints and mitigation strategies, so far there have been limited studies that take an integrative approach to studying innovation constraints and mitigation strategies in a single study.

The current study employed a mixed-methods sequential explanatory design to study innovation constraints and mitigation strategies. Whereas quantitative approaches provided an opportunity to understand the factors responsible for constraining innovation and firm performance, and the role of entrepreneurial bricolage in reducing the negative impact of constraints on innovation, the qualitative approach provided results that added insights into the quantitative findings. More precisely, the qualitative results provided descriptions of individual innovation constraints and their root causes and consequences as well as information on strategies that innovative firms employed to overcome them. These additonal insights obtained from qualitative research would have been missed out if the current research had employed quantitative designs only.

The use of a mixed-methods approach made it possible to obtain a more complete picture of innovation constraints: important and specific factors that constrained innovation, how they affected innovation, what caused them and how innovative firms dealt with them. These multiple purposes would have not been addressed if a single method design had been used. Therefore, this study lays the groundwork for future research into innovation constraints by demonstrating how quantitative and qualitative methods can be integrated in a single study for a better understanding of innovation constraints and mitigation strategies.

A growing literature investigated the effects of constraints on either innovation or firm performance, but quantitative research in this field still lacks an integrative model that links innovation constraints, innovation and firm performance (see Gibbert et al., 2007; Madrid-Guijarro et al., 2009; Criso´stomo et al., 2011; Keupp & Gassmann, 2013). The absence of integrative models make it difficult to conclude whether innovative firms operating in resource-constrained and uncertain environment achieve or do not their performance objectives. This study applied SEM approach to testing a structural model depicting the relationships of innovation constraints with innovation, and innovation with firm performance. The current

results indicated that firms which were able to introduce innovations despite experiencing financial, market and regulatory constraints achieved their performance objectives (i.e. profitability, sales, market share and cash flows objectives). In general, one can argue that since most enterprises in the industry are small with limited resources, they are more likely to set performance objectives that can be easily achieved. However, qualitative research provided a clear picture of the types of strategies pursued by firms that had contributed to the attainment of objectives. The limited use of bricolage supports the idea that innovative firms tend to use bricolage selectively to avoid being locked up in routinized practices which limit growth.

Prior studies on innovation constraints provided valuable knowledge on the factors constraining innovations but most studies had been conducted in developed countries, with a handful of them originating in developing countries. The findings reported here shed new light on which constraints were important in the context where most innovations introduced are incremental in nature and intensities of constraints to innovation were high. This study is one of the few studies to apply quantitative techniques in the context of a developing country to analyse the impact of various innovation constraints on firm's innovation and performance. The findings of this study suggest that financial and market constraints were of significant importance in constraining innovation in developing countries. However, differences were noted in the influence of knowledge and regulatory constraints. Whereas, knowledge constraints appeared to be of less importance, regulatory constraints were significant factors. The opposite effects of these constraints have been often reported by studies conducted in developed countries(Crisostomo et al., 2011; Paananen, 2012a). The principal theoretical implication of the findings is that innovations in developing countries, and food and beverage industry in particular were just improvements and adaptations to existing innovations that did not need highly skilled labour to be undertaken, but the legal and policy environments of these contexts provided unconducive conditions for the development and growth of entrepreneurship.

8.4 Theoretical contribution

The present study makes theoretical contributions to the theory of bricolage, mitigation strategies and innovation constraints literature in the following ways: First, a large and growing body of quantitative literature investigating strategies to overcome scarcity of resources from the lens of entrepreneurial bricolage (Ferneley & Bell, 2006; Bojica et al., 2014; Witell et al., 2017) suggests that entrepreneurial bricolage is associated with innovation (Senyard et al., 2014a; An et al., 2018b) and firm performance (Bojica et al., 2014) within new and young firms which are considered resource-constrained. This line of research shows a positive and significant relationship of bricolage with innovation which is interpreted that innovation is an outcome of

bricolage and implies that bricolage is the sole strategy for coping with resource constraints. The assumption underlying these studies is that the occurrence of innovation is entirely a function of bricolage and that enterprises with less use of bricolage are considered non-innovative.

Like previous studies, the findings of this study showed a positive and significant impact of bricolage on innovation. Based on these results the conclusion would have been drawn suggesting that bricolage was the only means employed by enterprises to overcome innovation constraints, but this was not the case. The analysis of the role of bricolage as a moderator of the relationships between innovation constraints and innovation produced findings which showed that bricolage partially reduced the negative impact of innovation constraints on innovation. This was a new understanding of innovation behaviour of enterprises operating in resource-constrained and uncertain environment which suggested that innovation is an outcome of a mix of bricolage and conventional strategies. The qualitative findings shed light on the complementarity of bricolage and conventional strategies to overcome innovation challenges. For example, firms employed a mix of conventional strategies (i.e. bank loans, grants, leasing financing) and bricolage (i.e. trade credit and interest rate free borrowing from friends/family) to deal with lack of finance.

The study adds to the theory of bricolage by suggesting that bricolage is used also to overcome non-resource constraints, although the focus of past research has been entirely on resource constraints. Quantitative results revealed the role played by bricolage in reducing the negative impact of market constraints (see chapter 5) while qualitative findings highlighted the importance of existing contacts (customers, suppliers of equipment and raw materials, business associations) in overcoming competition, shortage of materials, lack of working capital, lack of demand, counterfeits and knowledge gaps. For example, the enterprises' focus on rural markets by creating unique products for people with low income who were neglected by conventional markets and pursuit of flexibility and promptness in actions provided solutions to issues related to lack of demand and competition, and uncertainty of regulations and shortage of materials.

The study also contributes to the concept of "capabilities" to overcome constraints by identifying management knowledge and experience in the industry, network relations and flexibility as important capabilities in devising strategies to overcome innovation constraints. The knowledge and experience in the industry reflected managers' accumulated wealth of abilities that allowed them to access grants and other forms of financing, to establish backward linkages with suppliers of raw materials (i.e. farmers), to identify neglected markets and knowledge gaps in their firms and facilitate training. For example, strategies such as grants, bank

loans, personal loans, trade credits, lease finance and investment diversifications to overcome lack of finance were employed by firms managed or owned by entrepreneurs with prior knowledge and many years of experience in the food and beverage industry. The same capabilities were used to overcome competition with large and established enterprises and informal traders. Relationships with suppliers, customers and business associations as well as flexibility were important capabilities demonstrated in developing strategies to overcome knowledge gaps, lack of finance, product imitations and unpredictability of regulations. The results of this study add to the rapidly expanding field of mitigation strategies for innovation constraints by revealing that entrepreneur's experience, knowledge, network relations and flexibility are important skills and capabilities in overcoming innovation constraints.

8.5 Practical implications

From practical point of view, the results of present study point towards the importance of financial, market and regulatory constraints in constraining innovation. The managers of firms must be aware of those factors so as to develop appropriate strategies to reduce their impact on innovation. The results indicated that small and medium sized innovative firms relied more heavily on external sources of knowledge especially customers and suppliers of equipment and machinery than internal sources. This implies that SMEs paid less attention to internal factors (i.e. skills and competences of staff, employee training, individual initiatives etc.) as important sources of new ideas and information, although evidence from interviews analysis suggested that internal factors such as skills and experience of managers played an important role in accessing external finance (i.e. grants, bank loans and lease finance) and developing strategies to cope with shortage of raw materials and lack of demand.

It is therefore important that these firms while concentrating on building close and long-term ties with customers and suppliers of equipment and business associations, they should also devote the same efforts to improving their internal competences as well as removing any potential constraints that seem to prevent improvement, gathering, sharing and utilization of internal knowledge. Organizational competences can be enhanced through facilitation of employee learning and training while making the firm as a learning organization by integrating learning and work into a single system. Firms can remove the knowledge sharing constraints by embracing experimental mindset, culture and openness to new ideas where employees are encouraged to develop new ideas and solutions and rewarded for their innovation efforts.

Insufficient internal funds, lack of access to external finance, high costs of packaging materials, lack of resources to run promotional campaigns and knowledge gaps were some of the critical

innovation constraints in the industry. Access to bank loans, skilled labour and quality packaging materials which were out of reach for the majority of innovative firms posed no serious threat to innovation activities of companies operating as part of a group of companies (i.e. subsidiaries) as those firms could receive financial and other kinds of support from within the group. However, these kinds of support were not available to firms of different forms of ownership. Thus, it is important for the owners/managers of firms with other forms of ownership to consider alternative ways of accessing resources such as formation of long-lasting ties with potential providers of important resources in local communities (i.e. banks, education and research institutions, suppliers, etc.) or joining business associations which would provide a learning platform and facilitate joint negotiations with commercial banks to soften the conditions regarding collateral needs tied to the loans.

Long-term and close ties with financial institutions provide firms with an opportunity to build trust and reputation which are important resources valued greatly by providers of finance in their lending relationships. The relationship with banking system gives the firm an easy access to loans, advice and public equity support. Partnerships with local research centres and universities help firms enhance trust and reputation required by local banking systems, in addition to facilitation of innovation through R&D collaborations and provision of training to workers. The importance of network relationships was also emphasized by qualitative results which showed the role played by network partners in overcoming knowledge, market and regulatory constraints and shortage of raw materials. The engagement of customers, regulators and business associations in the fight against counterfeits, informality, and lobbying for tax rate reductions was compelling evidence of the need for joint efforts to overcome innovation constraints.

Managers are also advised to be proactive in finding information on alternative external financing opportunties. For example, the government credit guarantee schemes would be considered an alternative resource of external finance particularly for small and medium sized firms. Financial institutions in Tanzania are hesitant and very cautious about establishing lending relationships with small and medium enterprises due to perceptions of high risks and low profitability associated with these firms. As a result, many banks set high collateral requirements and conditions that are difficult to meet. Credit guarantee schemes would provide a long-lasting solution to the problem as they take on a significant portion of the loan default risk. There are about four credit guarantee schemes covering SMEs in the country but interview results of present study showed that many food manufacturers (i.e. SMEs) were not aware of this source of finance.

The present study took place in settings characterised by uncertainties in market conditions like unfair competition from informal businesses, counterfeit products and multiplicity of regulations coupled with abrupt changes. The survival and growth of firms in such environments depend on how entrepreneurial, quick and flexible the managers are in responding to environment uncertainties. Abrupt changes in business environments require flexibility and promptness in action to cushion the impact of changes as time for planning and adjustment may not be available. The results also demonstrated that entrepreneurial managers were able to identify and exploit opportunities by focusing on rural markets, and middle- and high-income consumers, which in turn reduced competition from established large firms and informal traders respectively.

When individuals face resource constraints they become more creative and their perceptions of the challenges act as a catalyst for making use of resources in wise ways (Keupp & Gassmann, 2013). When managers feel that their efforts to raise financial support or acquire the needed resources is not the best option, they may focus on efficient and flexible use of the available resources and making cost out of the products through simplification of either products or production process. Both product and process simplifications will not lower product costs and prices but also make final products affordable to most Tanzanians who prefer cheap products. Another important practical implication is that innovation is the most strategic dimension for firms to achieve sustained sales volume, profits, cash flows and market share as well as survival for enterprises operating in resource-constrained and uncertain environment. Thus, this study takes a greater relevance for managers to emphasize innovation in their firms.

In summary, the findings of present study suggest the following courses of action for the managers of firms operating in resource-constrained and uncertain environment:

(i) Consider alternative sources of external finance such as credit guarantee schemes and trade credit to fund innovation activities and working capital respectively

(ii) Forge long-term and close ties with suppliers of important resources such as equipment and raw materials. Relationships with suppliers of equipment improve internal skills and knowledge while suppliers of raw materials ensure availability of adequate and quality raw materials.

(iii) Emphasize building close ties with customers and other stakeholders such as regulators, law enforcers and business associations to facilitate the fight against counterfeits, informality and product imitations

(iv) Emphasize continuous improvement of internal competences through provision of training, education and mentorship to facilitate absorption and utilization of external knowledge and addressing of various innovation obstacles.

(v) Embrace flexibility and promptness in taking actions to respond to abrupt changes in the business environment that have no room for planning adjustments.

(vi) Spend considerable time and efforts to identify the root causes of constraints before embarking on any course of action.

(vii) Avoid dealing with constraints in piece meal ways as some constraints might have inter-related root causes or certain constraints are the root causes of other constraints.

(viii) Implement internal systems to ensure efficient utilization of limited resources in a productive manner.

8.6 Policy recommendations

Several factors emerged as constraints to innovation with financial, market and regulatory constraints being perceived by managers as of high importance. The current results offer input for developing targeted interventions aimed at improving the business environment. It is an undeniable fact that the Tanzanian food and beverage industry is overregulated with about 22 laws and regulations and it is overseen by more than 15 regulatory bodies whose roles and functions often overlap. Reforms of regulatory environment are needed to reduce the amount of regulations by creating one-stop compliance centres at regional or district level for all institutions issuing licenses and certificates or those requiring compliance with environmental regulations. These centres will eliminate bureaucracy and unnecessary delays in business and product registration which are the main causes of corruptions, high costs of innovation and informality. The very same centres can also offer technical support in the areas of compliance.

Lack of finance prevented innovative firms from investing further in new technologies, advertisng and human capital development. Bank loans is the main source of external finance for the majority of Tanzanian entrepreneurial firms but they are difficult to find or access them from financial institutions. Most financial institutions charge high interest rates and have high collateral requirements (125% of the value of the loan) which are coupled with complex terms and conditions. These are top constraints that discourage enterprises from using credit facilities to finance innovations and other business operations. The problem is more serious in SMEs because they have limited resources to offer as security against their loan requirements as financial institutions require a landed property as collateral. In addition, financial institutions

perceive SMEs as of high risk and less profitable ventures to deal with due to information asymmetry. Given the fact that borrowing is expensive and unaffordable for many enterprises especially SMEs, the use of credit guarantee schemes, provision of systematic support, simplifying credit terms and conditions as well as offering longer grace periods could provide a lasting solution to the problem.

Although, there are several credit guarantee schemes in the country, the majority of them are not known to entrepreneurs and they also lack efficiency and transparency in their operations. Lack of awareness of these schemes may be due to anability of the government to promote them or entrepreneurs themselves not being proactive to seek information on alternative funding opportunities available in the country. It is unfortunate that information about the schemes on the websites of guarantors and participating financial institutions is not comprehensive enough to enable potential borrowers to make informed decisions. The government needs to work closely with business associations and participanting financial institutions to promote the schemes to potential borrowers as many entrepreneurs are members of those business associations or have banking relationship with financial institutions.

A higher degree of informality and proliferation of counterfeit products are pertinent conditons characterizing Tanzania's business environment. The counterfeit trade is enormous and greatly affects brand owners. Without reversing the current situation, innovators won't see the benefits of their innovation efforts. Unfortunately, the existing regulation systems are not effective enough to solve the problem. Review of the current regulation is needed to make existing laws and fines sufficiently punitive to deter people from engaging in counterfeit trade. Other measures like intensification of surveillance at the country's porous borders, and recognition and involvement of local leaders in villages at or close to the porous borders can also help reduce the amount of counterfeit products smuggled into the country from overseas. The village leaders will play a key role in policing people living in their areas or using those routes.

Also, raising public awareness through introduction of lessons on counterfeiting in primary and secondary schools, as well as in higher learning institutions should be considered mid-term measures to combat counterfeits. Although informality can not be eliminated completely, it can be reduced significantly if deliberate measures are taken. For example, simplification of registration procedures, lowering registration fees and providing long-term incentives to entreprenurs who decide to formalize their businesses. These measures might make informal traders see the benefits of formalization exceed those of being informal.

The industry has insufficient people with relevant skills, education and experience in food processing. Training institutions including universities have been slow to respond to the realities on the ground of the skills needs of the industry. The managers and owners of firms complained that the current graduates lacked relevant skills and knowledge in oil, coffee and wine processing. It is important that these institutions take initiatives to consult the business community to try to spotlight essential skills that potential employers would require from their graduates. On the other hand the government should look into the possibility of facilitating specialised short and long training outside the country in order to create a pool of experts in the industry. Lastly, the government needs to promote formation of more partnerships among entrepreneurs and between food and beverage manufacturers and farmers. The experiences from interviews showed greater benefits brought by such arrangements.

8.7 Limitations and future research

There are several limitations that offer opportunities for future research. First, the survey data were collected from three subsectors in the food and beverage industry. Previous research has established that degree of perceptions and impact of constraints on innovation activity vary with sectors and industries due to differences in innovation intensity (Frenkel, 2003; López-Fernández et al., 2016). Therefore, the findings of this study should be interpreted with caution and might not be generalizable to other contexts.

The study presented findings of quantative research and qualitative research which are considered to have benefits in terms of improving understanding of complex issues of innovations in settings with limited reseach. Although qualitative research is appropriate for understanding and describing people's personal experiences of the phenomenon, the knowledge it generates might not be generalizable to other settings (Johnson & Onwuegbuzie, 2004; Bergman, 2011). The applicability of the results to new settings will depend on the degree of similarity with the setting of this study. The population of the current study comprised of SMEs and large firms that had introduced innovations in the past five years prior to conducting this study. There are three main features of the population from which the sample was drawn: (1) the industry is dominated by small enterprises (2) many of the innnovations introduced were incremental in nature(3) the environment was characterised by higher degrees of informality, counterfeits, multiplicity and higher degree of unpredictability of regulation and extreme scarcity of resources. The Tanzanian food and beverage industry (i.e. legal and policy environment and market conditions) represent features of innovation environments in many developing countries. It is expected that similar findings would be obtained in settings with the same circumstances with a few qualifications, including those highlighted above.

Innovation is a risky activity and its occurance involves relentless efforts to overcome numerous constraints. Although, the focus of quantitative phase was on investigating the impact of constraints on innovation activity and firm performance, it will be interesting if further research explores how innovative firms overcome innovation constraints. This is an area with limited research and several calls for further research have been made by several researchers (D'Este et al., 2014b; Reinhardt et al., 2019). The second phase of this study conducted in-depth case interviews with managers and owners of firms to explore strategies they employed in overcoming innovation constraints and interesting findings emerged from the analysis. However, the breadth of innovation constraints and their root causes and mitigation strategies identified in the qualitative research were limited to 17 interviews. It is possible that a large-scale qualitative study would reveal a broader range of items for each of the above themes.

Previous studies (Rao & Drazin, 2002; D'Este et al., 2014) have shown that employees with university education and recruitment of talents from rivals are important factors contributing to reduction of the negative impact of constraints on innovation. Interestingly, the second objective of this research was to explore the role of entrepreneurial bricolage in lowering innovation constraints. Quantative findings showed that bricolage played partial role in reducing the impact of financial, market and regulatory constraints. From qualitative research, two types of management capabilities (i.e. knowledge and experience) and two types of firm's capabilities (i.e. network relations and flexibility) emerged as important assets in overcoming different constraints. Further research employing quantitative techniques could be undertaken to investigate the moderating roles of these capabilities in reducing the impact of various constraints on innovation.

The findings reported in this study showed complementarity between entreprenenurial bricolage and conventional approach in overcoming innovation constraints. Future research, drawing on the logic from resource-based view should investigate the conditons that influence firms' choice of either strategy. Another important limitation lies in the fact that firm performance was measured subjectively due to difficulties of getting objective data from small and medium sized enterprises as most them do not keep proper records of their financial results and business operations (Halabi et al., 2010). However, qualitative data are common in innovation studies that employ quantitative techniques (Hadjimanolis, 1999; Madrid-Guijarro et al., 2009b).

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List of appendices

Appendix 1: Research clearance: Hull University Business School

UNIVERSITY OF Hull

Faculty of Business, Law & Politics Research Office
University of Hull
T +44(0)1482 463045
david.griffiths@hull.ac.uk

Ref: HUBSREC 2016/50

28 March 2017

Dear Mato

Re: An investigation into the effects and mitigation strategies for innovation constraints in Tanzanian food manufacturing industry

Thank you for your research ethics application.

I am pleased to inform you that on behalf of the Business School Research Ethics Committee at the University of Hull, Dr Wen-Ling Liu has approved your application on Tuesday 28th March 2017.

I wish you every success with your research.

Yours sincerely,

David Griffiths
Secretary,
Research Ethics Committee

Appendix 2: Research clearance: The Open University of Tanzania

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF RESEARCH, PUBLICATIONS, AND POSTGRADUATE STUDIES

P.O. Box 23409
Fax: 255-22-2668759
Dar es Salaam, Tanzania,
http://www.out.ac.tz

Tel: 255-22-2666752/2668445 ext.2101
Fax: 255-22-2668759,
E-mail: drpc@out.ac.tz.

17/04/2017

TO WHOM IT MAY CONCERN

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an act of Parliament no. 17 of 1992. The act became operational on the 1st March 1993 by public notes No. 55 in the official Gazette. Act number 7 of 1992 has now been replaced by the Open University of Tanzania charter which is in line the university act of 2005. The charter became operational on 1st January 2007. One of the mission objectives of the university is to generate and apply knowledge through research. For this reason staff undertake research activities from time to time.

To facilitate the research function, the vice chancellor of the Open University of Tanzania was empowered to issue a research clearance to both staff and students of the university on behalf of the government of Tanzania and the Tanzania Commission of Science and Technology.

The purpose of this letter is to introduce to you, **Mr Mato J. Magobe** who is an academic staff at the Open University of Tanzania and a PhD student at the University of Hull in the UK. .**Mr Mato J. Magobe** has been granted clearance to conduct research in the country. The title of his research is **"Overcoming Constraints to Innovation: A Study of Tanzanian Entrepreneurs in the Food and Beverage Industry"**.The period which this permission has been granted is from 17/04/2017 to 31/07/2017.

In case you need any further information, please contact:
The Deputy Vice Chancellor (Academic); The Open University of Tanzania; P.O. Box 23409; Dar Es Salaam. Tel: 022-2-2668820

We thank you in advance for your cooperation and facilitation of this research activity.
Yours sincerely,

Prof Hossea Rwegoshora

For: VICE CHANCELLOR

THE OPEN UNIVERSITY OF TANZANIA

Appendix 3 : Survey instrument

UNIVERSITY OF Hull

Dear Respondent

This questionnaire is about innovation activities, constraints to innovation and strategies employed by entrepreneurs to overcome the constraints encountered in the innovation process. The survey will take approximately 7-12 minutes of your time to complete.

Any information obtained in connection with this study will remain confidential and be used for academic purpose only. No one will be identified in any written reports and only group data will be presented. You are free to withdraw your participation at any time.

If you have any questions about the questionnaire or the research in general, feel free to contact one of the following:

Mr. Mato James Magobe (Student), Hull University Business School (HUBS), Email: M.J.Magobe@2015.hull.ac.uk **OR** The Open University of Tanzania, Faculty of Business Management, P.O. Box 23409, Dar es Salaam, Mob: 0766 773184, Email: mato.magobe@out.ac.tz

Dr. Antonio Malfense-Fierro (Supervisor), Hull University Business School (HUBS)
Email: A.Malfense-fierro@hull.ac.uk; Phone: +44 (0) 1482 46-3239

Thank you very much for your cooperation to complete this questionnaire.

Firm's name (**option**)	
Address	P.O. Box Tel/Mob:
Email	
District	
Region	
Respondent's position (**option**)	

A: General information

1. Indicate sub-sector(s) to which your business belongs (***Tick all that apply***)

Beverage	
Edible oil production	
Coffee processing	

2. How many types of food products are manufactured by your company?

☐ 1 – 3 ☐ 4 – 6 ☐ 7 – 9 ☐ 10 and above

3. How many full-time employees does your company currently employ (excluding owners)?

☐ 0 – 4 ☐ 5– 19 ☐ 20 – 49 ☐ 50 – 99 ☐ 100 and above

4. What is the value of your company's capital investment (in Tshs)?

☐ Above 5 to 200mil. ☐ Above 200 to 800 mil. ☐ Above 800 mil.

1

5. How long has your company been in business?
   ☐ Less than 3 years ☐ 3 to 5 years ☐ 6 to 10 years ☐ 11 to 20 years ☐ Over 20 years

6. What percentage of your full-time employees are university graduates?
   ☐ 0% ☐ 1% - 3% ☐ 4% - 6% ☐ 7% - 9% ☐ 10% and above

7. Does your firm possess any recognized quality certifications such as ISO 9002, TBS, etc.?
   ☐ Yes ☐ No

B: Firm performance

Rate the extent to which your firm has achieved the following objectives during the past five years. Rate on a scale from 1= Very low achievement to 5 = very high achievement.

		Very Low achievement	Low achievement	Moderate achievement	High achievement	Very high achievement
		1	2	3	4	5
	Financial performance objectives					
1	Profitability objectives	☐	☐	☐	☐	☐
2	Sales volume objectives	☐	☐	☐	☐	☐
3	Market share objectives	☐	☐	☐	☐	☐
4	Cash flow objectives	☐	☐	☐	☐	☐

C: Innovation activities

Indicate (Yes or No) whether your firm had introduced innovation during the past five years and rate the importance of that innovative activity in contributing to attainment of firm performance objectives. Rate on a scale from 1= very low importance to 5 = very high importance.

	Innovation activities	Has it been undertaken?		If YES, please rate the importance of that innovation output				
		Yes	No	Very Low	Low	Moderate	High	Very high
				1	2	3	4	5
1	Changes in products	☐	☐	☐	☐	☐	☐	☐
2	Changes in product packaging	☐	☐	☐	☐	☐	☐	☐
3	Changes in ways of operating	☐	☐	☐	☐	☐	☐	☐
4	Changes in manufacturing methods	☐	☐	☐	☐	☐	☐	☐
5	changes in product branding	☐	☐	☐	☐	☐	☐	☐
6	Changes in distribution channels	☐	☐	☐	☐	☐	☐	☐
7	Entry into new markets	☐	☐	☐	☐	☐	☐	☐
8	Changes in pricing methods	☐	☐	☐	☐	☐	☐	☐
9	Changes in advertising and promotion methods	☐	☐	☐	☐	☐	☐	☐

D: Constraints to innovation

Rate the extent to which the following factors were constraints to your innovation activities during the past five years. Rate on a scale from 1= not obstacle to 5 = very severe obstacle.

	Constraints	Not an obstacle	Minor obstacle	Moderate obstacle	Major obstacle	Very severe obstacle
		1	2	3	4	5
	Financial constraints					
1	Interest rates too high	☐	☐	☐	☐	☐
2	Lack of appropriate sources of finance	☐	☐	☐	☐	☐
3	Innovation costs too high	☐	☐	☐	☐	☐
4	Financial risks too high	☐	☐	☐	☐	☐
	Knowledge constraints					
1	Lack of qualified personnel	☐	☐	☐	☐	☐
2	Lack of information on technologies	☐	☐	☐	☐	☐
3	Lack of knowledge support from government and research institutes	☐	☐	☐	☐	☐
4	Lack of information on markets	☐	☐	☐	☐	☐
	Market constraints					
1	Competition from large and established enterprises	☐	☐	☐	☐	☐
2	Uncertain demand for innovative products	☐	☐	☐	☐	☐
3	Counterfeits and imitated food products	☐	☐	☐	☐	☐
4	Competition from informal sector	☐	☐	☐	☐	☐
	Regulatory constraints					
1	Multiple regulators	☐	☐	☐	☐	☐
2	Unpredictability of regulations	☐	☐	☐	☐	☐
3	Bureaucratic delays in product registration	☐	☐	☐	☐	☐
4	High costs of compliance with regulations	☐	☐	☐	☐	☐

E: Entrepreneurial bricolage

The following statements are about how your business uses various kinds of resources to deal with new challenges. Rate on a scale from 1= **'Never'** to 5= **'Always'**, how you go about doing things for your firm.

		Never	Rarely	Sometimes	Often	Always
		1	2	3	4	5
1	We find workable solutions to new challenges by using our existing resources.	☐	☐	☐	☐	☐
2	We gladly take on a broader range of challenges with our resources would be able to.	☐	☐	☐	☐	☐
3	We use any existing resource that seems useful to responding to a new problem or opportunity.	☐	☐	☐	☐	☐
4	We deal with new challenges by applying a combination of our existing resources and other resources inexpensively available to us.	☐	☐	☐	☐	☐
5	When dealing with new problems or opportunities, we take action by assuming that we will find a workable solution.	☐	☐	☐	☐	☐
6	By combining our existing resources, we take on a surprising variety of new challenges.	☐	☐	☐	☐	☐
7	When we face new challenges, we put together workable solutions from our existing resources.	☐	☐	☐	☐	☐
8	We combine resources to accomplish new challenges that the resources were not originally intended to accomplish	☐	☐	☐	☐	☐

Appendix 4 : Interview guide

Interview guide

A: General information

A1. Please can you tell me your position and responsibilities?

A2. How long have been you been working with this company?

A3. Would you please tell me your educational background?

A4. Before starting this business, did you have any experience of.....?

A5. How many years of managerial experience do you have?

A6. Please can you tell me a brief history of your company?

A7. Please can you tell me whether your business has grown in terms of employee numbers and turnover over the past five years?

A8. What are the principal activities of your company?

A9. Could you please describe your company's main products?

A10. How do you distribute your products from the factory to the final consumers?

A11. Do you believe you do things different from your competitors that allows you to produce superior products?

A12. What are your medium- and long-term goals?

A13. What strategies have you put in place to reach your goals?

A14. What role, if any, does innovation play in your business strategy?

B: innovation activities and output

Questions were based on the types of innovation the enterprise had introduced for the past five years (reference was made to a completed questionnaire)

B1: It has been learned that your enterprise has tried new ideas for the past five years leading to for example, introduction of new or improved products, new production techniques etc.

(i) Could you please tell me any specific examples of innovative changes in .....that you have introduced over the past five years?

(ii) Was this innovation considered successful or unsuccessful?

(iii) Where did innovative idea come from?

(iv) How do you organize resources to implement innovative ideas?

(v) Which sources of finance did you use to fund implementation of new ideas?

(vi) Was the innovation new to your enterprise or to the market?

(vii) What changes in the ways of running of the business have you implemented over the past five years?

(viii) Do you have innovation projects which have been abandoned or put on hold?

C: Constraints to innovation and mitigation strategies

In the process of innovation, it is more likely that your enterprise encountered several challenges (constraints) that threaten to block/obstruct your innovation efforts. Please think about the entire range of your enterprise's innovation activities and provide specific examples of the challenges/constraints you faced in relation to:

C1. Please can you tell me specific examples of the [financial, human resources, regulatory etc.] challenges you faced over the past five years?

C2. To what extent did..... affect your innovation efforts and business operations?

C3. Please can you tell me the biggest problems you faced in the market?

D: Other issues

D1. It has been learned that you participate in networks within and outside the industry.

(i) What is the main motivation for doing so?

(ii) How do you cooperate with research institutions and business associations, customers, suppliers etc.?

(iii) Please give specific examples of the areas/innovation activities where these network partners seem to be important.

D2. Do you use social media like WhatsApp, Facebook and the like for marketing/promotion and to do other business dealings?

Appendix 5: Results of no-response bias test

Variable	**Early respondents (N =118)**		**Late respondents (N = 130)**		***p-value***
	Mean	Std	Mean	Std	
Financial constraints	3.686	0.876	3.487	0.837	0.067
Knowledge constraints	2.720	0.684	2.723	0.720	0.976
Market constraints	2.102	0.834	2.027	0.833	0.481
Regulatory constraints	3.257	0.963	3.251	1.043	0.964

Appendix 6 : Correlations

	BR1	BR2	BR3	BR4	FC1	FC2	FC3	FC4	KC1	KC2	KC3	KC4	MC1	MC2	MC3	MC4	RC1	RC2	RC3	BRFC1	BRFC2	BRFC3	BRMC1	BRMC2	BRMC3	BRRC1	BRRC2	BFRC3
BR1	1																											
BR2	.816**	1																										
BR3	.831**	.786**	1																									
BR4	.867**	.840**	.771**	1																								
FC1	.076	.104	.074	.096	1																							
FC2	.018	.060	.035	.029	.470**	1																						
FC3	.073	.133*	.129*	.135*	.546**	.395**	1																					
FC4	-.032	.043	.012	.043	.416**	.391**	.541**	1																				
KC1	.089	-.053	.012	.050	-.022	.057	-.028	.016	1																			
KC2	-.065	-.076	-.040	-.083	-.045	-.003	.007	.045	.397**	1																		
KC3	.066	.028	.084	.057	.004	-.041	-.007	.092	.518**	.593**	1																	
KC4	.011	.001	.011	-.004	-.007	-.050	-.039	.028	.403**	.464**	.565**	1																
MC1	-.174**	-.262**	-.224**	-.164**	-.134*	-.041	-.157**	-.087	.108	-.048	-.019	.000	1															
MC2	-.230**	-.242**	-.192**	-.273**	-.067	-.010	-.110	-.144*	.042	.021	-.010	-.035	.559**	1														
MC3	-.285**	-.342**	-.303**	-.346**	-.020	-.013	-.096	-.062	.005	-.014	-.032	.005	.447**	.506**	1													
MC4	-.263**	-.280**	-.290**	-.317**	.004	.019	-.069	-.119	.066	.027	-.017	.011	.467**	.708**	.624**	1												
RC1	.225**	.195**	.256**	.236**	.129*	-.021	.148**	.077	-.048	.004	.050	-.015	-.249**	-.220**	-.282**	-.205**	1											
RC2	.228**	.208**	.242**	.235**	.179**	.010	.189**	.056	-.021	-.027	.051	-.041	-.226**	-.304**	-.259**	-.233**	.705**	1										
RC3	.141*	.234**	.181**	.193**	.141*	.075	.158**	.056	-.053	-.068	-.003	-.032	-.289**	-.376**	-.292**	-.270**	.597**	.698**	1									
BRFC1	.000	.000	.000	.000	.000	.000	.000	.000	-.035	-.023	-.046	-.089	.030	-.050	.026	-.053	-.002	-.004	.045	1								
BRFC2	.000	.000	.000	.000	.000	.000	.000	.000	.023	-.028	.011	-.027	.048	-.028	-.029	.019	-.044	-.029	-.030	.551**	1							
BRFC3	.000	.000	.000	.000	.000	.000	.000	.000	.002	.086	-.030	-.013	.054	-.046	-.034	-.042	-.062	.006	-.054	.414**	.276**	1						
BRMC1	.000	.000	.000	.000	.004	-.025	-.096	-.092	-.004	-.109	-.037	.030	.000	.000	.000	.000	-.039	-.028	-.122	-.211**	-.076	-.060	1					
BRMC2	.000	.000	.000	.000	-.004	-.010	-.058	-.097	.005	-.097	-.017	.065	.000	.000	.000	.000	.029	-.018	-.051	-.133*	-.092	-.044	.722**	1				
BRMC3	.000	.000	.000	.000	-.038	.051	-.020	-.092	-.001	-.057	-.029	.069	.000	.000	.000	.000	-.037	-.014	-.021	-.172**	-.067	.011	.607**	.680**	1			
BRRC1	.000	.000	.000	.000	-.031	-.111	-.013	-.061	.009	-.013	.030	.017	-.086	.033	-.003	.053	.000	.000	.000	.256**	.187**	-.026	-.271**	-.279**	-.329**	1		
BRRC2	.000	.000	.000	.000	-.032	-.068	.058	-.036	.036	.107	.022	.032	-.112	.026	.042	.073	.000	.000	.000	.156*	.189**	.052	-.217**	-.392**	-.333**	.624**	1	
BRRC3	.000	.000	.000	.000	.006	-.083	-.017	-.057	.005	.075	.027	.046	-.044	.005	.044	-.035	.000	.000	.000	.215**	.128*	.112	-.196**	-.184**	-.306**	.586**	.506**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Appendix 7 : Template analysis

1. **Respondent's background**
    1. Managerial position
    2. Level of education
    3. Years of experience

2. **Firm background**
    1. Age
    2. Production and main products
    3. Firm growth

3. **Types of innovation introduced**
    1. Product innovation
    2. Process innovation
    3. Packaging innovation
    4. Market innovation
    5. Organizational innovation

4. **Sources of information and ideas**
    1. External sources
        1. Customers
        2. Suppliers
        3. Competitors
        4. Business associations
        5. Family members and friends
    2. Internal sources
        1. Research and development team
        2. Employees
        3. Management

5. **Innovation constraints**
    1. Financial constraints
        1. Inadequate internal finance
            1. Causes
            2. Consequences on innovation activities
            3. Mitigation strategies
        2. Lack of external finance
            1. Causes
            2. Consequences on innovation activities
            3. Mitigation strategies
        3. High costs of innovation
            1. Causes
            2. Consequences on innovation activities
            3. Mitigation strategies
    2. Knowledge constraints

1. Skill gaps
    1. Causes
    2. Consequences on innovation activities
    3. Mitigation strategies

3. Market constraints
    1. Sluggish demand
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    2. Counterfeits and product imitation
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    3. Intense competition
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies

4. Regulatory constraints
    1. Multiplicity of regulators
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    2. Uncertainty of regulations
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    3. High tax rates
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies

5. Other constraints
    1. Shortage of raw materials
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    2. Problems with packaging materials
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    3. Lack of government support and corruption
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies
    4. Poor infrastucture
        1. Causes
        2. Consequences on innovation activities
        3. Mitigation strategies

Appendix 8: Descriptive statistics of product indicators

Product indicator	Mean	Std. Deviation
BRFC1	.0000000	.98367237
BRFC2	.0000000	.98367237
BRFC3	.0000000	.98367237
BRMC1	.0000000	.98367237
BRMC2	.0000000	.98367237
BRMC3	.0000000	.98367237
BRRC1	.0000000	.98572812
BRRC2	.0000000	.98572812
BRRC3	.0000000	.98572812

Appendix 9: Univariate skewness and kurtosis for product indicators

Product indicators	Skewness	$Z_{skewness}$	Kurtosis	$Z_{kutorsis}$
BRFC1	.625	4.043	2.511	8.150926
BRFC2	.120	.773	1.886	6.124444
BRFC3	-.015	-.095	2.192	7.115076
BRMC1	.064	.415	2.536	8.232105
BRMC2	-.179	-1.156	3.603	11.69811
BRMC3	-1.041	-6.733	2.411	7.826249
BRRC1	.305	1.976	.066	0.21383
BRRC2	.586	3.791	1.578	5.123458
BRRC3	.158	1.021	.922	2.994055

Note: Standard error of skew is 0.155 and standard error of kurtosis is 0.308

Appendix 10: Characteristics of interviewed firms

Firm identifier	Year of establishment	Sub-sector	Key informant	Firm size	Number of employees	Ownership status	Main products
BSE1	2012	Beverages	Owner-manager	Small	3 permanent employees including the owner	Private	Rozella wine, pineapple wine and passion wine
BME2	2001	Beverages	Manager		8 permanent employees	Private	Bottled water
BSE3	2010	Beverages	Member & Founder	Small	9 members	Association	Rosella wine, banana wine, grape wine and millet wine
BME5	2014	Beverages	Founder and manager	Medium	23 permanent employees	Private	Pineaple flavoured gin, vodka
BME7	2005	Beverages	Founder and Managing Director	Medium	10 permanent employees and 60 temporary employees	Private	Banana wine
BLE2	1993	Beverages	Human Resources and Public Relations Manager	Large	160 employees (both permanent and temporary)	Private	Banana wines, beer and gin (manufactured) and energy drink (imported)
BLE5	1998	Beverages	General Manager	Large	200 permanent and 60 temporary employees	Subsidiary	Bottled water

BLE3	1988	Beverages	Corporate Relations Director	Large	492 permanent employees and about 490 temporary employees	Parent	Beer (value beer, mainstream beer and premium beer) and spirits
BLE1	2007	Beverages	Founder and manager	Large	25 permanent employees. The number of temporary employees varies between 25 and 50 depending on availability of raw materials	Private	Wines, both dry and sweet wines made from grapes
CSE2	2013	Coffee processing	Founder and manager	Small	12 permanent employees	Private	Roasted coffee beans and ground coffee
CME8	2005	Coffee processing	Operations Manager	Medium	9 employees	Subsidiary company	Ground coffee and green beans.
CME1	2004	Coffee processing	Founder & Managing Director	Medium	16 permanent employees	Private	Roasted and green beans roasted ground coffee, spiced tea
CME6	2006	Coffee	Operations manager	Medium	8 permanent employees	Subsidiary	Ground coffee and roasted coffee beans

OSE4	2002	Edible oil	Founder & Managing Director	Small	4 permanent employees and 8 temporary employees	Private	Sunflower cooking oil and sunflower medicinal oil
OME3	2009	Edible oil	Marketing & Operations manager	Medium	18 permanent employees but temporary employees vary between 10 and 20	Private	Refined sunflower oil and pure sunflower oil
OME4	2005	Edible oil	Owner and manager	Medium	15 permanent employees, but the number of temporary employees varies between 15 to 40 depending on availability of raw materials	Private	Sunflower oil, groundnut oil and baobab oil
OLE4	2012	Edible oil	Operations Manager	Large	50 permanent employees. The number of temporary employees varies between 50 and 300 depending on	Private	Refined sunflower oil

					availability of raw materials		

Sample: 17 responding firms

Firm identifier: First letter represents sector (**B**= beverages; **C** = Coffee; **O** = Oil); second letter represents firm size (**S** = small; **M** = medium; **L** = large) and **E** stands for enterprise. In each sub-sector, responding firms were arranged in alpahbetical order before assigning numbers.

Appendix 11: Innovation types and sources of ideas in SMEs

Firm	Innovations introduced	Sources of ideas
BSE1	(i) Two new products – made from new ingredients (i.e. pineapple wine and passion wine) (ii) Purchase of new machine for placing corks on bottles	(i) The manager comes up with innovative ideas. For example, pineapple wine was manager's own idea (ii) Customers -passion dry wine was a suggestion from customer (iii) Family members – especially mother
CSE2	(i) New product packages- packaging in vacuum bags and in decorated Masai clothing instead of porcelain bags (ii) New marketing and promotion methods – giving free samples for testing, then send follow-up emails, personal marketing (frequent visits to potential and existing customers, print and distribute brochures (iii) Organizational structure- establishment of a marketing department (iv) Introduced trade credit to encourage prompt payment by customers	(i) Foreign tourists particularly packaging designs and labels (ii) Friends and peers in the industry (iii) Drivers working with tour companies: Drivers collect information about tourists' purchases and preferences of coffee products (iv) Suppliers of machines and equipment (v) Trade fairs, both local and international (vi) Business associations (i.e. SIDO)

BSE3	(i) (ii)	New products – made from different ingredients (i.e. grape wine and millet wine). Grape wine is for sacramental use. New procurement methods: Provision of fertilizers and frequent visits to farmers to ensure that they do not fertilizers with poisonous chemicals	(i) (ii)	Business associations such as SIDO Customers- give feedback about taste and quality of products
OSE4	(i) (ii) (iii)	Two new products with different uses: e.g. sunflower medicinal oil Purchase of a new machine for oil processing. The machine has helped the company increase production capacity, save energy and minimize wastage	(i) (ii) (iii)	Internet: the owner uses the internet to search for ideas, technologies etc. NGOs such as like Tuboreshe Chakula. Business associations like SIDO and the Central Zone Sunflower Oil Processors Association (CEZOSOPA). CEZOSOPA has a mobile laboratory and food expert for testing and monitoring quality of members' products.
CME1	(i) (ii)	New product: spiced tea (a mix of tea, ginger, cloves, garlic etc) New packages: product packaging for souvenirs and tourists using porcelain bags and decorated Masai	(i) (ii)	Customers – suggested mixing tea and spices and gave the company a sample design for a 250gm package Market intelligence – buy competitors' products to examine the contents and test quality

	clothing. Packaging for domestic customers used aluminium materials. (iii) Marketing methods: formed a marketing team to visit different places in the country for product promotion (personal marketing). (iv) Organizational structure: departments such as marketing, production, storage, packaging and finance were established (v) Found new markets for existing products.	
BME2	(i) Purchase of new equipment (ii) New product –**new brand of bottled water** (iii) New package – small volume package (1/2 litre)	(i) Market research (ii) Manager's ideas
OME3	(i) Found new markets for the existing products (ii) New product packages with new label which is more attractive (iii) Installed a new production machine that has reduced production costs and increased production capacity (iv) New staff motivation incentives – built staff houses near factory (free accommodation for factory staff)	(i) Market survey to know how the products are perceived (ii) Customers' feedback especially wholesalers

	(v) New distribution channels: depots for wholesalers and retailers (vi) New methods of procuring raw materials – entered into contract farming with farmers	
OME4	(i) Two new products- groundnut oil and baobab oil which has medicinal nutrients (ii) Installation of new processing machine (iii) New markets for existing products	(i) Owner's ideas –owner-manager comes up with innovative ideas (ii) Competitors-learning from them how they do things (iii) Customers –They receive orders from customers for certain products not produced.
BME5	(i) New products – Gin with pineapple flavour, vodka, pineapple flavoured vodka (ii) New packaging – changed from sachets to plastic bottle packages (iii) Purchased new machine to mix ingredients (iv) Incentives for bulk purchases – 5 free cartons for every purchase of 100 cartons (v) Management processes – bought computer and installed cash and inventory management system,	(i) Customers –suggest what they want and produce for them (ii) Market research and to find out if new liquors, new packaging designs, new packaging materials or new machines are in the market (iii) International trade fairs – to learn from other manufacturers outside of the country (iv) Competitors – They look at their competitors' packaging if there were any changes. They also learn from them about brand development

		(v) Peers who work with corporate companies (brewery companies). They often meet with them during the evening for coffee or dinner
CME6	(i) New product development – use of barcode for all products (ii) Improved manufacturing processes – implementation of new product quality traceability procedures (iii) Purchase of new machines, one for roasting and another for grinding (iv) Improved product packaging –redesigning labels (more attractive than before) to reflect long term goals of the company (v) New product packaging -packaging is in aluminium bags with valves instead of porcelain bags	(i) Business partners from South Africa – bring them sample packages to learn (ii) Forums and coffee magazines such as Roast Magazine (monthly magazine) (iii) Business associations such as TCCIA and SIDO
BME7	(i) Organizational structure – established new departments such as production, bottle washing, sales and distribution, administration and accounts (ii) Product improvement by improving formulae and adding new ingredients imported from China	(i) Market intelligence: we persuade competitors' employees with money to share vital information with us (ii) Business association such as SIDO

	(iii) Changes in distribution methods – bought vehicles for distribution instead of using agents or demanding customers to collect goods from the factory (iv) Management processes – cash and inventory control procedures: no credit sales, cash collected to be handled to accountant immediately and unsold goods returned to store after verification	(iii) Market research- found that our formula is more unique than competitors (iv) Internal R & D – Came up with formulae through trials and errors in our laboratory and eventually found perfect formulae (v) Customers' feedback – our products do not cause a hangover like other banana beers. Marketing team collect information from customers and suggests actions to take
CME8	(i) New brand specifically for safari tourists who are not interested in climbing Mount Kilimanjaro (ii) New product: spiced tea made from a mix of different spices (iii) New promotion methods: use of social media such as Instagram and Facebook for advertising and promotion (iv) New packages: Traditional packaging that uses porcelain bags and a decorated wrap-up Masai cloth or sisal bag (v) New product distribution methods: Customers are given shelves full of a range of coffee, tea and other products	(i) Customers (distributors): Customers have been advising them what to change, add or remove from the packages or labels (ii) Peers. Flavoured coffee was an idea from one of their peers. (iii) International souvenir exhibitions: They learn new things and get new ideas when they attend such exhibitions

	without paying for them. Design and installation of shelves is done by the company. They make frequent visits	

Appendix 12: Innovation types and sources of ideas in large firms

Firm identifier	**Innovation activities**	**Sources of ideas**
BLE1	(i) New package design- (5 litre box package) and improvement in packaging quality (ii) Changed distribution methods from personal deliveries and use of public buses to use of sales agents (iii) Purchase of new machines and equipment to expand production capacity (iv) Change in raw materials – buying back wine juice instead of grapes (v) Three new products (wine brands) made from new ingredients	(i) Market research- to find out which wine products has high demand at a point of time so that they can produce it. (ii) R&D department
BLE2	(i) Changed product taste and quality (ii) New product with new ingredients- bottled water (iii) Purchase of new equipment	(i) Research & Development (ii) Market research-market intelligence
BLE3	(i) New product (Lite beer) made from different ingredients and used a different package (ii) New packaging designs: new bottles, no longer euro bottles	(i) Internal R&D that works closely with innovation team in the marketing department (ii) Market research – contracted a research company to do market intelligence and

	(iii) New distribution methods – it is called root -to-market (RTM) or root-to-consumers (RTC) and reduces nodes on supply chains and maximizes profitability (iv) New manufacturing technologies which minimize costs as they are energy efficient and improve productivity per unit/hour (v) New advertising and promotion methods: a combination of traditional methods (i.e. tv, radio, newspaper, billboards) and social media (i.e. Instagram, Facebook, WhatsApp, etc)	market research and use that information for innovation. They collect information on consumers' preferences and consumption behaviours, competitors and suppliers' activities.
OLE4	(i) New product made from new ingredients (palm oil) (ii) Improved product quality as a result of newly introduced quality testing standards and procedures: quality tests are done on raw materials, during production and after production (iii) Change in raw materials: buying crude oil in addition to seeds (iv) New procurement methods: construction of godowns for seed storage and establishment of collection stations in distant areas	(i) Internal R&D division with food experts and laboratory technicians (ii) Customers: Received information from product distributors

BLE5	(i) Purchase and installation of new plants for producing bottled water (ii) Changed some formulae to make water have a better taste (iii) New product packaging: changes in designs and quality of packaging materials (packages are made of quality PET granules). (iv) New advertising methods: Use of Tvs, billboards, Facebook and Instagram for advertising (started advertising 3 years ago) (v) Entered new markets	(i) Customers and suppliers in the form of feedback (ii) Internal sources: MD, chairman, General Manager and other board members sit as a committee, come up with ideas and then pass them on to R&D department. (iii) Marketing team – conducts market research