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The triggers for innovation in the agricultural processing industry, South Africa.

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Abstract

This study describes how firms in the agro processing industry within South Africa vary in terms of their types of innovation based on whether or not the firm exports into a developed context or supplies only into the local South African market. In conjunction with this the research attempts to describe who these firms engage with in order to develop their most significant innovations. Empirically this research set out to establish whether or not exporting firms differed considerably with regards to how they innovate relative to firms which only supply into the regional domestic market. This could provide insights as to whether either group could learn from one another and develop a collaborative relationship whereby a mutually reinforcing innovative model could be developed to support overall industry growth.

The central argument here is, given that the agro processing industry employs a large portion of the South African work force, any innovations which can create long term sustainable volume growth for the industry need to be taken advantage of. Thus not only does the South African agro processing industry need to develop innovative networks domestically but also internationally.

Chi squared and t-test were run on the responses of the firms belonging to the export or domestic categories. The results overwhelmingly suggest that in respect of innovativeness, the domestic suppliers do not differ from those that opt to export into the developed world. However the firms belonging to the domestic group differ considerably with regards to who they collaborate with for their innovations when compared to the export group.

Key Words:

Innovation

Collaboration

Networks

Exporting

Regional Markets

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____ 9th November 2011

Michael Smither

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Table of Contents

1. Introduction

One of the key features of an organisation is its ability to innovate in order to access new markets or to grow its current market share within the market in which it currently operates. What drives an organisation to innovate can depend on whether the organisation is being pushed by consumers to develop new and improved product features or organisations can be forced to innovate should they wish to enter new markets which could have tougher regulations.

This research attempts to describe how the triggers for innovation can vary depending on whether or not the organisation in question is exporting, and in this particular case to North America, Eastern, Western and Central Europe which are all developed markets, or supplying the local South African market.

In conjunction with this, the report will also set out to establish whether or not the types of innovation can vary depending on the environment in which the firm operates. More specifically if the firm in question is classified as an exporter, does this firm have a greater inclination toward process innovation and conversely, if the firm is considered purely a domestic supplier into only the local South African market, does this firm have an inclination toward purely product based innovations.

1.1 Locality of Innovation

Firms can innovate based on market demand from consumers. These innovations are usually product based innovations, because by and large consumers tend to think down the lines of new and improved products rather than new and improved manufacturing processes which could then improve the products. Consumers, as such, allow the innovations in the processes to be driven by the manufacturers and retain the responsibility of product development ideas to be pushed from consumer demand back up into the innovation chain.

Alternatively firms can choose to export their product to customers in North America and Central, Western or Eastern Europe, herein referred to as a developed context. When this is the case, these firms are often somewhat distant from customers and typically innovate their processes in order to comply with regulations stemming from these developed nations.

Specialised institutions for food safety regulations control the manufacturing practices of the food producers. These institutions vary from continent to continent, for example in the European Union (EU) the European Food Safety Authority (EFSA) founded recently in 2002 by the council of the EU and the European Parliament (Leibovitch, 2008), regulates all imports into the EU member states.

In North America the Food and Drug Administration (FDA) in collaboration with the United States Department of Agriculture (USDA) inspects domestic and imported food products as well as local and international food-processing plants. The USDA inspects all meats, poultry, eggs, and the respective processing plants for these

products, and the FDA inspects the remaining food groups and their associated processing plants. (Yasuda, 2010)

This study does not focus directly on these regulatory bodies mandated roles and responsibilities, due to the fact that this study forms part of a larger study namely the Impact of Networks, Globalisation, and their Interaction with EU strategies (INGINEUS). This study therefore is only concerned with the impact these bodies can have on the manufacturing principals of exporting agro processing manufactures.

For firms which export large portions of their product, whether processed or not, complying with international food regulations can be a burden in the form of new processing requirements or new product specifications. This often results in the producer having to invest large sums of capital in ensuring that the manufacturing firm can continue to export its product, failing which it will have to either look for markets which are less compliant or discontinue production. (Buckley & Reid, 2010). However, compliance is essential to access these large and potentially lucrative markets.

1.2 Nature of Innovation

The long term fiscal growth of a nation is reliant on the creation of an environment which is conducive to innovation. Traditionally, investment in R&D which has led to the formations of various types of innovations has been regarded as one of the key strategies to secure economic growth in a country.

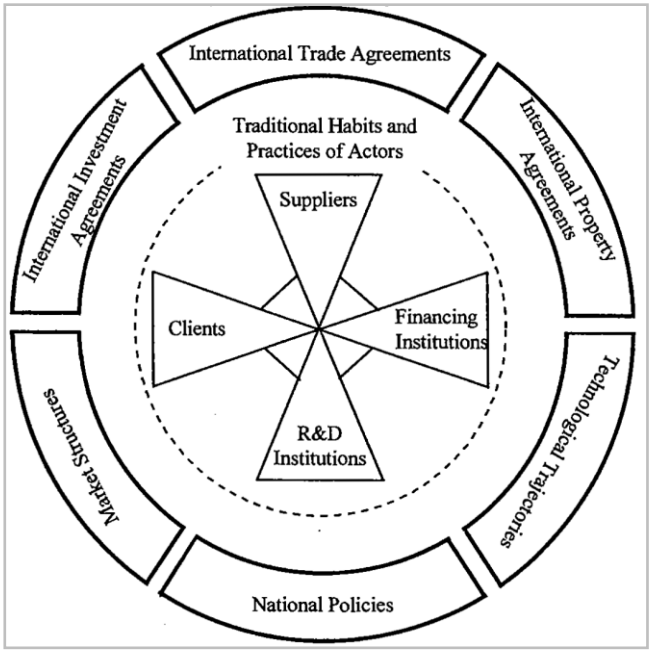
Bilbao-Osorio & Rodriguez-Pose (2004) propose that investment in R&D increases the possibility of achieving a higher standard of technology in firms and in regions, which allows them to introduce new superior products and/or processes, which results in higher levels of income and therefore economic growth.

Porter (1990) suggests that a nation's competitiveness depends on the capacity of its industry to innovate and upgrade. He continues to comment that the competitiveness of a nation depends on its ability to be productive and or have high levels of productivity. Further to this Porter (1990) adds that sustained productivity growth requires that a nation must "upgrade itself" and by virtue of this the nation needs to have capacity to innovate.

Porter (1990) discusses innovation at a macro level which supports the competitive advantage and overall economic growth of a nation at large. However the innovation that this research is focussed on is the micro levels of innovation taking place at a firm level within their own products or processes. It's important to distinguish between the two as capacity at the macro level stimulates innovation at the micro firm level, and vice versa.

From a systems perspective, innovation consists of a network of economic agents together with the institutions and policies that influence their innovative behaviour and performance (Mytelka, 2000). Reviewed as a conceptual framework an innovation system is a interative process whereby firms interact with one another, such as large industry R&D associations, playing a role in bringing new products and new processes into economic use (as illustrated in Diagram 1.2).

Diagram 1.1: Innovation Systems



(Source: Adapted from Mytelka, 2000, p.17)

1.3 Triggers of Innovation

The triggers of innovation can vary greatly. In some instances when a new product enters the market uncertainty exists about how the users intend on deriving the greatest benefit from the product. As such, firms enter the market and start producing/offering various forms of the original product, forcing those firms into a product innovations cycle (Klepper, 1996).

Klepper (1996) continues to suggest that over time, as a standard product begins to emerge the ability to innovate the product further, starts to decrease to a point where no further product innovation can take place. At this point in time firms begin to focus their attention towards the manufacturing process of the product in order to identify what potential process innovations can take place in order to either

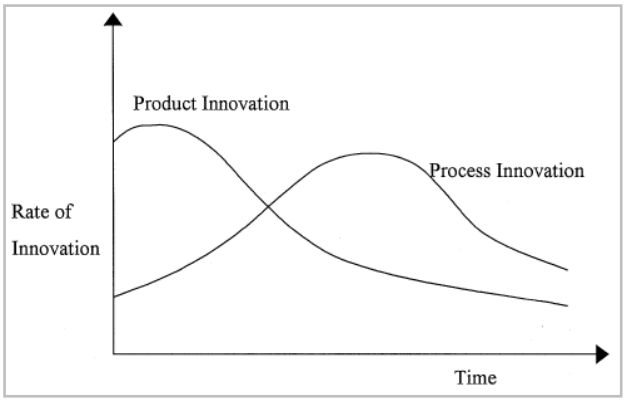
improve the plants operational efficiencies or create further opportunity for additional product innovation.

Utterback and Abernathy (1975) in their seminal work when trying to model product and process innovation suggest that product innovation is a new technology or combination of technologies that is introduced in order to commercially meet a user or a new market need.

From a process perspective Utterback and Abernathy (1975) suggest that production processes develop over time, moving toward levels of improved output productivity. The production process itself becomes more capital intensive, labour utilization improves, the flow of materials within the process is rationalized, and the product design becomes more standardized. The end result of which is the production process scale becomes larger, more specialised and highly efficient.

Adner and Levinthal (2001) argue that the technology life cycle best describes the dynamics of product and process innovation. Diagram 1.3 below shows the flow over time between product and process innovations:

Diagram 1.2: Dynamics of Product and Process Innovation



(Source: Adapted from Adner & Levinthal, 2001, p.614)

Porter (1983, p.22) provides a concise review of the central explanation for this behaviour.

"Initially, …product design is fluid, and substantial product variety is present. Product innovation is the dominant mode of innovation and aims primarily at improving product performance. Successive product innovations ultimately yield a "dominant design" where the optimal product configuration is reached. Process innovation is initially minor in significance, and early production processes are characterized by small scale, flexibility, and high labour skill levels. As product design stabilizes, increasingly automated production methods are employed and process innovation to lower costs takes over as the dominant innovation mode. Ultimately, innovation of both types begins to slow down."

With this background in mind this research project sets out to establish within the South African context what the triggers for innovation are from an agricultural processing perspective. This project argues that it is not just the maturity level of the industry that matters, but also the nature of the customer.

Thus South African agricultural processing firms selling their products only into the local domestic market innovate based on market demand from their customers along product lines.

In conjunction with this, these South African agricultural processing firms also innovate their actual operating processes in order to comply with international regulations and standards and thereby allowing them to further innovate their products. This is often the case when dealing with a mature industry like the agro

processing industry in South Africa which has seen large quantities of innovations over its maturity life cycle.

From a manufacturers perspective two customers exist, either the importing regulator or the final consumer, both of whom demand innovation in various forms.

1.4 Research Motivation

The motivation for this research is to explore the nature of innovation for firms which export into developing nations, as described in earlier chapters, and firms that only sell into the local South African market. Does either group engage in greater product based innovations, or process based innovations, or both?

Recent research on export behaviour of certain firms indicates superior performance of the exporting firm in comparison to non-exporting firms with regards to productivity, capital intensity, wages and size (Damijan, Kostevc & Polanec, 2010)

Further to this and in their research Damijan, Kostevc & Polanec (2010) established evidence to suggest that exporting increases the probability of becoming a process rather than product innovator, and that overall, exporting leads to greater productivity improvements.

Contrary to this Cassiman & Martinez-Ros (2007) suggest that product innovation linked to demand, rather than process innovation linked to production efficiency, could be the basis of increased productivity and, thus, entry into export markets.

In conjunction with the above this research attempts to understand the impact networks have on firms operating within the South African agro processing industry and their ability to innovate in order to increase supply.

Miles and Snow (1992), in their seminal work on *the causes of failures of networked organisations*, compartmentalises the evolution of the networked firm into four categories. Firstly they discuss the *functional organisation*, which is identifiable by a firm primarily designed to provide products to a growing domestic market, as an example Wal – Mart during its birth. Next they discuss the *divisionalised organisation,* this organisational structure allowed products to be tailored to a specific target market. The third organisational form was the *matrix organisation*; this combined both the functional and the divisional firm into one. This new organisation combines global product divisions with geographically placed marketing departments to serve the market. The *networked organisation* bought the world closer, bringing the firm back to its core and making it far more competitive. Firms moved away from vertical integration and sought out alliances with suppliers, clients, logistics providers, and the like. As such collaborative networks were born, all the stakeholders in the supply chain were linked together through agreements whereby all firms had to bring new innovations to the network for the greater good of all stakeholders.

One of the motivations of this research is to understand in the South African context whether or not the local agro processing industry has advanced to a networked organisation creating an environment of mutually reinforcing innovation.

1.5 Research Objectives

The primary objective of this research is to understand within the South African context what the triggers for innovation are in the agro processing industry. The secondary objectives of this research is to establish whether a greater portion of firms exporting to a developed context innovate their processes in order to comply with regulations when compared to firms which do not export into a developed context and only sell their products on the local market. As such this research should be able to infer whether or not product/process innovations are mutually exclusive or mutually reinforcing when considering which market to serve.

2. Literature Review

2.1 Triggers of Innovation

The ability to innovate and commercialize new products and processes, shifting the technology frontier ahead of rivals is how firms in the modern economy sustain a competitive advantage over the long term (Porter & Stern, 2001). Porter & Stern (2001) comment that increasing the rate of innovation can improve productivity and growth.

Innovation is associated with the application of new knowledge. In broad terms, innovation refers to the creation of new products, services, processes and organisational methods, or adaptations of those that exist, based on new knowledge (Wolf, 2006).

Innovation in the context of a neoclassical economic setting is technological change that focuses on cost reduction (Weaver, 2008). Atkinson & Wial (2008) put forward that a growing number of economists suggest that innovation is key to long term economic growth. Atkinson & Wial (2008) continue to suggest that when properly conceived, innovation encompasses new products, new processes, and new ways of organizing production.

Weaver (2008) describes innovation in terms of “push innovations” and “pull innovations”. Push innovations come in the form of competition, driving the firm to find ways to reduce its cost through its fixed resources, this is largely achieved through product innovations. Weaver (2008) describes “pull innovations” as a new

variety of innovation that focuses on the innovation of processes within the organisation.

To the point innovation refers not only to productive processes (which reduce costs) and products (with better performances), or organizational processes (more effective ways to organize) but also to marketing approaches with new effective ways to approach existing or new market segments. (Dinis, 2006)

Thus from the above it is fair to conclude that innovation is, but not limited to, the development of new products and new processes.

2.1.1 Developed Nations Regulation Driven Innovation

Compliance regulations can be both a source of innovation and barrier to innovation. Herman (2009) suggests that the Novel Food Regulation (NFR) has emerged as a serious, albeit unintended, non-tariff trade barrier to imports from the developing world into the European Union. The regulation has discouraged investment in supply chains and market development and has thwarted any growth in product based innovations.

Falck, Heblich & Kipar (2009) established, in their study on innovation and market entry that, firms entering new export markets, will threaten the incumbent's market proportion of product/process innovation. They find that the entry into the incumbent's domestic market has a negative effect on product innovation, which is a strong indication of the new entrants' comparative advantage, and overall a positive effect on the incumbent's process innovations. The study was done in

Germany which is considered a developed nation by world standards. Therefore developed worlds tend to have a higher proportion of process innovation when threatened by imports, this could go some way to explaining some literature in terms of how large multinationals are able to off shore their process innovations to operations in a less developed context.

Food regulatory bodies continually push food producers to innovate new technologies to ensure the prevention of product contamination and to protect consumers within their shores from potential food contamination from imported products or products which do not comply with the regulatory body standards. (Fischetti, 2007)

Taylor, Rubin & Hounshell (2005) suggest that the dominant view point with regards to regulation and innovation is that it supports economic incentives, for example, instruments such as emissions trading and taxes will induce innovation to a greater extent.

Stuart (1981) proposes that regulation affects market innovation in four ways:

“1. By imposing technical constraints on firms;

2. by forcing firms to make additional expenditures or outlays;

3. by causing uncertainty

4. by causing delay.” (p.1279)

Millstone (1994) illustrates how the US canning industry in the late eighties recognised that the use of lead in the seaming of cans was under regulatory scrutiny. Before the respected regulatory industries could introduce a regulation

restricting the use of lead in the seaming of cans, the canning industry took it upon themselves to develop/innovate a technology that does not require the use of lead. Millstone (1994) comments “the US canning industry was able to introduce canning methods which did not rely on lead-based solders, before rapidly shifting to seamless canning techniques which require no solder whatsoever” (p.330) illustrating that firms recognise regulations as a major source of innovation for new technologies.

Millstone (1994) later postulated that the vast majority of process innovations have occurred for reasons which have little or nothing to do with regulations. He argued that typically they have been introduced to lower production costs and that the regulatory policy-makers have generally been indifferent to the majority of the processing developments.

However, it is generally fair to conclude that compliance with EU based regulations forces firms in emerging economies to innovate their processes such that they are able to conform to the required regulations, some manufacturers may view these regulations as non trade barriers. Nevertheless the advantage of compliance with the regulator is that it gives the firm the necessary status as an exporter.

For firms operating in South Africa this is a major departure from local regulatory requirements and is very onerous in terms of the burden it places on the finances of the firm and the manufacturing operation of the firm.

2.1.2 Local Market Driven Innovation

Brewin, Monchuk & Partridge (2007) explain that the incentive for the individual firm to innovate is mainly a desire to increase profits which occurs through either new process innovations that lower costs and/or through new product innovations which increase demand resulting in increased revenues from the final product.

In their study Brewin, Monchuk & Partridge (2007) concluded that the relationship between product and process innovation was stronger when both types of innovation were developed with the firm. Innovations that are developed within the firm can either come from a recent innovation in a new process or a recent development in a new product. In their study these tended to occur internally within the firm as opposed to externally from within the market.

Interestingly Brewin, Monchuk & Partridge (2007) added that their finding could pave the way for policy makers to adopt new policies specifically aimed to encourage product and process innovation. As such a firm would be better positioned to capture innovative spill overs that result from developing innovations within the firm.

Guerrero et al. (2008) concluded in their study that the concept of innovation in foods can be defined by five main headings namely:

1. Novelty and Change: mainly through the modification of ingredients

2. Variety: the demand for an increase in the variety of options available to the consumer.

3. Processing and technology: the application of new technologies to driving both product and process innovations.

4. Origin and ethnicity: the consumer interest in foreign cultures which is linked to the food that culture consumes for example, the global demand for Sushi.

5. Convenience: the practical advantages gained from consumer oriented easy foods for example ready to eat meals and microwave foods.

To sum up, the word innovation associated with food could be defined as ‘‘the addition of new or unusual ingredient, new combinations of product, different processing systems or elaboration procedures including packaging, coming from different origin or cultures, being presented and/or supplied in new ways, and always having temporary validity’’ (Guerrero et al., 2008, p349)

2.2 Innovation in a developing country

When reviewing innovation in a less developed country the assumption is that the firm operating in that less developed country is at a disadvantage when trying to access markets in developed nations. This is partly due to the fact that the developing nation has limited innovation creating capability.

To a large extent the technological innovation in developing countries, used in dealing with particular challenges, consists primarily of incremental change rather than advancing the technology frontier. (Wamae, 2009)

Mytelka (2000) proposes for developing countries it would be unfair to associate innovation to invention only. Instead, in a developing context innovation is an

uninterrupted learning process that develops product designs, modifies organisation management practices, and supports modifications to the production process.

However the problem resides in the growth of real innovation capacity in developing economies which continue to rely on inputs from the industrially advanced economies. These inputs are often inappropriate to the needs of the low-income consumers and operating environments with poor infrastructure. (Kaplinsky et al.2009)

Bell (2007) discusses three forms of technological capabilities that promote the creation, development and use of knowledge:

1. Operating or production capabilities defined as capabilities for using knowledge that is embodied in or closely associated with existing production systems and facilities
2. Design, engineering and associated management capabilities defined as those capabilities for transforming existing knowledge into new, often innovative, configurations for new or changed production systems
3. R&D capabilities defined as those capabilities for creating new knowledge and transforming it into the specifications for application and production.

Wamae (2009) further comments that the development of innovative capabilities in developing countries involves a two-stage process consisting of complementary activities, firstly the acquisition of basic technical skills and knowledge via tertiary

education and training; and secondly the subsequent learning within productive employment that adds critically important complementary skills and understanding.

Danse & Vellema (2006) confirm that the current emphasis on compliance and the strict performance requirements in the agro-food industry, for example, product safety controlled through various standards or through certification/auditing procedures, is in sharp contrast with strategies for growth in developing economies.

Danse & Vellema (2006) verify that internationally recognised voluntary standards, such as ISO 9001, ISO 14001 and EUREP GAP, have been introduced as tools to formalise the specifications of requirements from agro food processors/suppliers globally. However Danse and Vellema (2006) continue to substantiate that the prescriptive standards recommend “generic good agricultural practices” (p.40), which are ineffective for agricultural production systems in a developing environment.

Although compliance with the recognised standards can become a competitive advantage over the long term, the very nature of the standards implies a threat for the development of export oriented agro-food processors in developing nations.

2.3 Manufacturing in South Africa for local or export markets

The paradigm for local firms operating in South Africa is to manufacture and supply into the domestic market or to manufacture and supply the domestic market and

the export market. If the firm opts for the latter option and export their products they will be forced to comply with specific country based regulations.

Further to this those organisations which opt to export into a developed context, based on the need to comply with highly developed regulatory standards, will be forced into innovating their processes so that their products meet the criteria of the regulatory bodies concerned.

Alternatively, those firms which opt to supply into the domestic market, would only need to comply with the domestic regulations which are less onerous than those of the EFSA, FDA and USDA. As such, and given their close customer interface, these organisations tend to innovate their actual consumer products in line with domestic market demand.

Schillhorn van Veen (2003) confirms that trade regulations, such as the EFSA, limit the ability of developing countries to sell abroad. In conjunction with this Schillhorn van Veen (2003) comments that those firms in developing countries wishing to participate in global trade will have to live by international rules and consider major investments in food safety promotion and monitoring.

Schillhorn van Veen (2003) concludes that full compliance to food safety rules in developed countries by manufacturers in developing countries significantly increases costs and as such is a burden on resources. This indicates that firms which opt to sell only into their domestic market are less likely to have the burden of upgrading their processes in order to comply with an onerous international regulation.

South Africa is still considered a developing nation by international standards having emerged from decades of sanctions during the apartheid era. The agro processing firms that operate within South Africa will therefore be operating under the constraints of that of any developing nation. As such agro processing firms operating within South Africa aspiring to export into developed nations will be forced to innovate their manufacturing processes until they comply with the these nations regulatory body standards.

2.4 The Trade-Off between exporting and only supplying the domestic market

Bernard & Jensen (1999) and Melitz (2003) (as cited in Van Beveren & Vandenbussche, 2010) highlight that "only the more productive firms self-select into exporting, since only firms with an efficiency level above a certain threshold are able to overcome the fixed costs associated with entry into the export market." (Van Beveren & Vandenbussche,2010, p.3).

Van Beveren & Vandenbussche (2010) continue to comment that the link between innovation and the propensity to export has mixed results, thus indicating that there is no direct correlation between a firms need for innovation, be it product or process, and a firm's need to export.

Caldera (2009) highlights that both product and process innovation matter, although the impact of product innovation can be greater than that of process innovation.

Damijan, Kostevc and Polanec (2008) find no evidence that either product or process innovation acts as a significant driver of the export propensity of the firm. However they do provide evidence that firms engage significantly more in process innovation after entering the export markets.

Interestingly McGahan & Silverman (2001) make three assertions with regards to innovation and industry maturity; firstly industry leaders engage in the majority of their innovations during the maturity stage of their life cycle; secondly the absolute amount of innovative activity among leaders is not lower in the mature stages of the industry life cycle when compared to either emerging or declining industries; thirdly industry leaders tend to engage in a far wider range of innovations when compared to similar leaders in non mature or declining industries. Finally they comment that industry leaders will continue to innovate in a mature industry either because they need to migrate into new environments or because they need to defend their current dominant market position.

For the purposes of this study two groups have been identified that operate within South Africa as an emerging/developing economy.

Firstly those firms that export into the developed nations, who have the heavy burden of compliance, which we argue typically innovate their processes in order to comply with the developed nations regulations and standards.

And the second group of firms are those which choose not to export and as such avoid the onerous regulations. These firms are likely to innovate their products to satisfy local market demand.

2.5 Hypotheses

This leads us to two major hypotheses:

Hypothesis 1:

Manufacturer's who export have a higher proportion of process innovation when compared to manufacturers who only supply their domestic market, who are likely to have a higher proportion of product innovations.

Hypothesis 2:

Innovation is a response to environmental triggers, but those triggers can differ depending on the nature of the firm, specifically, exporters will respond to foreign triggers, and domestic-only firms, to local triggers.

3. Research Hypothesis

The focus of this research is to further understand in the agricultural processing industry within South Africa whether or not there is a trade-off between product or process innovations when manufacturing for selected markets. Furthermore this study will try to establish, given these two distinct markets, what the main triggers for innovation are, given the markets that the firms serve.

Two main hypotheses have been formulated with respect to this research question.

3.1 Hypothesis 1:

$H1_a$: The innovativeness of firms exporting to North America, Eastern, Western and Central Europe is greater than that of firms who supply only the local South African market.

The two sub-hypotheses under hypothesis 1 are as below:

Sub-hypothesis 1a and 1b:

H1a: South African agricultural product manufacturers who export to North America, Central/Western or Eastern Europe have a higher proportion of process innovations than agricultural product manufacturers that only manufacture for supply into the domestic South African market.

H1b: South African agricultural product manufacturers who supply only into the domestic South African market will have a higher proportion of product innovations than South African agricultural product manufacturers who export to North America, Central/Western or Eastern Europe.

3.2 Hypothesis 2:

H2: Innovation is a response to environmental triggers, but those triggers can differ.

H2a: South African agricultural product manufacturers who export abroad rate the requirements of foreign institutions as a trigger for innovation.

H2b: South African agricultural product manufacturers who only supply the domestic South African market rate local firms, institutions and customers as a trigger for innovation.

4. Research Methodology

4.1 Introduction

The setting for this study is firms operating in South Africa in the agricultural processing industry who either export to the North America and Western/Central plus Eastern Europe or who supply only the local South African market.

Therefore this study divides the South African agricultural processing industry into two distinct categories for comparison, those that export into a developed context, and those that opt not to export and supply only the local South African market.

Exporting firms are defined as those firms which sell any of their produce into North America, Central/Western or Eastern Europe as these firms will have to comply with the more onerous food and safety regulations than those firms which opt not to export at all.

Domestic firms are viewed as those which have zero percent exports out of South Africa and thus supply purely the domestic South African market.

4.2 Choice of Methodology:

The selection of methodology for this study is quantitative and descriptive in nature. Descriptive research describes the features associated with a population or a phenomenon (Bloomberg, Cooper, & Schindler 2005). Bloomberg et al (2005) suggests that descriptive research answers questions like who, what, when, where and how and can be based on the estimation of population proportions.

The intention of this research is twofold; initially this research will test whether there is a significant difference in innovative activities if a firm opts to export into a more developed context relative to a firm which opts to only supply its local domestic market.

Given this the second objective of this research is to establish whether there is a significant level of collaboration with certain institutions given that the firm is either an exporter or only a domestic supplier.

4.3 Unit of Analysis

The unit of analysis is the firm.

4.4 Population of Relevance

Zikmund (2003) defined the target population as the entire group of explicit population elements pertinent to the research project. In this research, any South African firm that processes agricultural products, either for sale into the domestic South African market or for export into the specified regions, are considered as the target population.

4.5 Sampling Frame and sample

The sampling frame is the listing of elements from which the sample is actually drawn. Ideally it is a complete and correct list of population members only (Blumberg et al. 2005). The sampling frame for this research was made up of firms belonging to the agricultural processing industry.

In order to reach the entire population, databases were identified that would

contain or potentially contain the latest personal contact information of the entire population. Once identified these databases were procured, the first one being an Experian database which consisted of 1096 firms. The Experian database had not been updated therefore many of the contacts were redundant. From the 1096 firms listed only 325 were contactable and agreed to have the survey mailed to them, 84 responses were received.

In order to raise the sample size several other sources were used to construct an additional database in order to raise the number of respondents. A further 24 responses were elicited with this approach.

Below is a list of the databases that were used to identify the firms belonging to the agro processing industry in South Africa:

1. Experian

   Is a global information services company, they provide data and analytical tools to clients in more than 80 countries. They assist businesses in managing credit risk, preventing fraud, with target marketing offers and with automated decision making.

2. Go Organic

   Go-Organic.co.za is South Africa's premier organic website, directory and marketing company. They trade locally and internationally in bulk organic products and set up growing projects and off-take contracts. They source and trade in all mainstream and niche market, certified organic and wild-harvested products from retail fresh to industrial to processed. The directory

lists people involved in the South African organic industry, from certifiers to consultants to shops and markets and producers

3. Tradepage

Tradepage commenced business with the objective of enabling businesses to benefit from the Internet. Their objective is to offer a comprehensive range of internet products and services. Tradepage is a dedicated Internet Service Provider (ISP) offering a range of internet services relating to Business on the Internet, enabling businesses throughout South Africa to benefit from internet access.

4. Search za

SearchZA Search Engine provides only one result per website but every result links to a Content Profile with organized links to all key internal pages within that site. SearchZA fills a need in South Africa for a comprehensive directory of .ZA sites that is not being met by other providers. SearchZA.com is designed not only for South Africans but for people around the world to search all of South Africa's websites.

5. The Food World

A very broad based database of all food importers and exporters globally divided up into categories of meat, meat products, milk products, cereals, grains, flours, olives, olive oil, sugar, honey, sweeteners, bakery products, non alcoholic beverages, ready meals, convenience products, mushrooms, fruit, fruit products, poultry meat, poultry products, oilseeds, oilseed

products, condiments, Spices, herbs, coffee, Tea, cacao, chocolate Products, Candies, Sweets, Snacks, desserts, wine, food ingredients, mayonnaise, Dressings, seasonings, vegetables, Vegetable products, seafood, Fish products, vegetable Oils and fats, pasta, Sauces, soups, nuts, Nut products, alcoholic beverages, beer and organic products.

4.6 Sampling Method and Size

The sampling method used is a probability based simple random survey of all the potential agricultural manufacturing firms in South Africa. Blumberg et al. (2005) defined probability based sampling as a controlled procedure which ensures that each population element is given a known non-zero chance of selection. He went further to describe the simple random sample as a case in which each population element has a known and equal chance of selection.

By electronically mailing the survey out and then following up with a telephone call to the entire population within South Africa, a list of 83 responses from the South African agricultural processing industry was received from the 497 surveys sent out, giving a response rate of 16.7%.

4.7 Data Collection Instrument - Design

The data collected was based on the questionnaire developed as part of a larger international project, Impact of Networks, Globalization and their Interaction with EU strategies “INGINEUS”. This project focuses on the developed and developing worlds to determine the extent to which innovation is taking place in globally dispersed networks.

The project ran in eight European countries and four other international countries one of which is South Africa. The project covered three industries of which one is the agro processing industry.

The questionnaire was designed by all partnered stakeholders. Each partner country had to designate a leader who would then be known as the work package leader. As a point of departure each work package leader was asked to submit a document which contained the following:

- A proposed set of questions for the questionnaire;
- An explanation of which deliverables the survey questions contributed to;
- An explanation of the theoretical foundation / conceptual underpinnings / mental model informing the survey questions;
- And a description of how they saw the analysis being conducted.

The South African agro processing sector included the subsectors as outlined in Table 4.7 below:

Table 4.7: List of sub-sectors included in the agro survey

101	Processing and preserving of meat and production of meat products
102	Processing and preserving of fish, crustaceans and molluscs
103	Processing and preserving of fruit and vegetables
104	Manufacture of vegetable and animal oils and fats
105	Manufacture of dairy products
106	Manufacture of grain mill products, starches and starch products

107	Manufacture of bakery and farinaceous products
108	Manufacture of other food products
109	Manufacture of prepared animal feeds

4.8 Data Collection- Phases

A phased approach was used to in order to collect the necessary data:

Phase 1:

The first database was procured namely the Experian database. It was skewed towards larger firm sizes when compared against the population of the overall agro processing firms and thus yielded insufficient results.

Phase 2:

The absolute value of responses was deemed too low, therefore a separate database was constructed using several other data sources as described in the sampling frame

Phase 3:

In the final constructed database all the repeats from the previous database were excluded. The decision was also taken to eliminate all resellers of agro-processed products.

Phase 4:

172 additional firms were called and contacts made who gave permission for the survey to be sent to them. This garnered an additional 24 responses bringing the total number of responses for the phased approach to 83 from 497 surveys sent

out. This yielded a total response rate of 16.7%.

From the original 83 responses two were reallocated to the correct industry, yielding a final 81 useful responses. Of the 81 only 74 were statistically analyzed, the other seven were not useful as they fall outside the test population due to the fact that they cannot be considered as strictly “domestic” or strictly “exporters”, for example, the response from Earth Products had to be ignored as this organisation supplies into Africa and as such cannot be considered as purely “domestic” and also cannot be considered as an “exporter” into a developed context.

Mixed literature exists with regards to the effect of survey response rates with regards to when low response rates are acceptable and when they are unacceptable.

Krosnick (1999, p.540) emphasized in his survey on response-rates:

“…it is not necessarily true that representativeness increases monotonically with increasing response rate . . . recent research has shown that surveys with very low response rates can be more accurate than surveys with much higher response rates.”

Regardless, a low response rate is a concern as we know logically that the higher the response to a survey the higher the population sample will represent the total population and thus be completely representative.

Schalm & Kelloway, 2001 as cited by Baruch and Holtom, 2008 confirm that the level of response rate is an important, sometimes crucial, factor in assessing the value of research results. They specifically comment that when responses are

acquired from a non-random group that varies from the total population in terms of the primary variables of interest, it is possible for such differences to cause misrepresentation of the 'true' effects.

Baruch and Holtom (2008) examined the response rates for surveys used in organizational research. They analysed 1607 studies published in the years 2000 and 2005 in 17 refereed academic journals, and identified 490 different studies that utilized surveys. The idea was to examine the response rates in these studies, which covered more than 100,000 organizations and 400,000 individual respondents. The average response rate for studies that utilized data collected from individuals was 52.7 percent with a standard deviation of 20.4, while the average response rate for studies that utilized data collected from organizations was 35.7 percent with a standard deviation of 18.8.

Therefore a response rate of 16.2% for the agro processing industry is low when compared to that of 35.7% for Baruch and Holtom's study conducted above. 16.2% is also greater, although marginally, than one standard deviation from the mean.

The low response from the agro processing industry could be because of the sensitivity that exists with regards to the competitive nature of the industry and respondents not willing to disclose openly their levels of innovation and thus giving up some of their potential competitive edge. In conjunction with this developing countries typically have low levels of responses. (Harzing, 2000)

4.9 Division of Data into two groups:

The analysis is based on comparing the values of the dependent variables (listed in table 4.11 above) across two distinct groups: those companies who export, and those companies who do not export. We called these two groups “export” and “domestic”.

In order to get valuable data to use in the analysis the initial data set was reviewed for any irregularities. The following outlines the process flow to the above:

1. The initial number of responses elicited from the South African agro processing industry was 83.
2. One response was deleted that was not Agro processing and related to the information and communication technology industry.
3. There were two entries namely Garner Wafers and Kraft Foods that were marked as automotive but belong to the Agro processing industry. This was adjusted on the excel spreadsheet named data.
4. For the “No Info” responses for question 1, reviewed Q. 1.1, to check what industry the firm was in.
5. If 1.1 did not reveal something about the firm under review, then further research on the firm’s name was conducted either using the internet or publicly available directories. From this it was established that Von Geuseu and Famous Brands can be confirmed as agro processors. Stimuplant and Lindt Chocs Studio were not and as such were deleted.
6. In summary, after the above, the research was left with a total of 81

responses.

4.10 Data collection:

An online survey tool was set up with an e-mail link facility. The persons contacted who agreed to participate, were then sent the survey link electronically.

Those contacts who agreed to participate but who failed to submit their survey responses were contacted again two weeks later. If they failed to respond to this reminder a final reminder was sent again two weeks later.

Respondents were required to complete the answers to the survey electronically on the Survey Monkey website. Once completed the data was cleaned up and sent to a central statistician for assimilation into a single spreadsheet. This was necessary because the survey was conducted across numerous countries and languages for example Portuguese (Brazil) and Mandarin (China). A final dataset has been assembled with a set of reports and pivot tables based on the various levels of analysis.

A copy of the questionnaire is included in the appendix.

4.11Data Analysis:

4.11.1 Independent Variable:

The data from the questionnaire was categorized into independent variables representing the elements of the hypotheses. In lieu of this only some of the questions from the questionnaire are relevant.

The variables are identified in Table 4.10 below with a reference to the questions in the actual questionnaire.

Table 4.10: Variable Descriptions

Variable	Variable Description	Questions in questionnaire	Hypothesis to which it pertains
1	Total Innovativeness	6	1
1a	Product Innovativeness	6.1 and 6.2	1
1b	Process Innovativeness	6.3, 6.4, 6.5	1
2a	Clients local	7.1	2
2b	Clients foreign	7.1	2
2c	Suppliers local	7.2	2
2d	Suppliers foreign	7.2	2
2e	Competitors local	7.3	2
2f	Competitors foreign	7.3	2
2g	Consultancy companies local	7.4	2
2h	Consultancy companies foreign	7.4	2
2i	Government local	7.5	2
2j	Government foreign	7.5	2
2k	Local universities, research institutions, etc.	7.6	2
2L	Foreign universities, research institutions, etc	7.7	2

The variables 1, 1a and 1b were created by giving “new to the world” the highest weighting (3), “new to the industry” a score of 2, “new to the firm” a score of 1 and “none” a score of 0. The score for product innovativeness was created by adding

the scores for questions 6.1 (new products) and 6.2 (new services). The score for process innovativeness was created by adding the scores for questions 6.3, 6.4 and 6.5. Then the score for total innovativeness was created by adding the scores for product innovativeness and process innovativeness together.

For variables 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k and 2L the values of the variables were created by designating the value 1 if the respondent answered “yes” to question 7 or the value 0 if a respondent did not answer “yes” thus binary code will determine either the presence or absence of collaboration.

4.12 Data Coding

The responses to the questions needed to be statistically analysed. In order to do this a code has been developed to convert the responses into an arithmetical format.

Table 4.12 below is the summary of the codes used for the responses to the questions.

Table 4.12: Question Code Tables:

Hypothesis 1:

Question 6/6.1	
Code	New Products
0	None
1	New to the firm
2	New to the industry
3	New to the world

Question 6/6.2	
Code	New Service
0	None
1	New to the firm
2	New to the industry
3	New to the world

Agrregated Index
Q6/6.1-6.2
Product Innovativeness
0-6

Question 6/6.3	
Code	Improved Manufacturing
0	None
1	New to the firm
2	New to the industry
3	New to the world

Question 6/6.4	
Code	Improved Logistics
0	None
1	New to the firm
2	New to the industry
3	New to the world

Question 6/6.5	
Code	Improved Support
0	None
1	New to the firm
2	New to the industry
3	New to the world

Agrregated Index
Q6/6.3-6.5
Process Innovativeness
0-9

Hypothesis 2:

	Clients Local
Your Region	Yes = 1/ No = 0
Your Country	Yes = 1/ No = 0

	Clients Foreign
yes	1
no	0

	Suppliers Local
yes	1
no	0

	Suppliers Foreign
yes	1
no	0

	Competitors Local
yes	1
no	0

	Competitors Foreign
yes	1
no	0

	Consultancy Local
yes	1
no	0

	Consultancy Foreign
yes	1
no	0

	Government Local
yes	1
no	0

	Government Foreign
yes	1
no	0

	Universities Local
yes	1
no	0

	Universities Foreign
yes	1
no	0

4.12.1 Comments to data coding:

- From question 3.2 the data has been separated into two groups namely those that export and those that do not. The export market is defined by those agro processing firms which export any of their products.
- The domestic region is defined by those agro processing firms who supply only to the local South African market.
- For the three innovativeness variables (product innovativeness, process innovativeness, total innovativeness), the scores were created by giving “new to the world” the highest weighting (3), “new to the industry” a score of 2, “new to the firm” a score of 1 and “none” a score of 0. “New to the world” was given the highest weighting as it is logical that an innovation that is new to the world has greater influence than an innovation that is new to the industry and then innovation that is only new to the firm itself. A sliding scale was applied for the reason given above thus ‘no innovation’ was given a scale of zero (0).
- Two sets of aggregated indexes were created by adding the codes from the responses to the type of innovative activities the firm engaged in. For example if a firm engaged in innovative new product activities which are new to the world and also in new service activities which are new to the firm, it would have a product innovativeness score of 4 (3+1 respectively). For process innovativeness if a firm engaged in process innovations across manufacturing logistics and support which were all new to the industry it would have a value of 6 (2+2+2).

- For hypothesis H1 product innovativeness was defined by grouping the results from *new products* and *new services* to give a total aggregated view of product innovativeness i.e. question 6/ 6.1 and 6.2.
- Process innovativeness was calculated by grouping the results from *improved manufacturing, improved logistics, and improved support* to give a total aggregated view of process innovativeness i.e. question 6/ 6.3, 6.4 and 6.5.
- The above coding is applied to both data subsets those that export and those that do not. A comparison can therefore take place between those firms that export and those that do not as to whether one favours product innovations over process innovations.
- The score for total innovativeness was created by adding the scores for product innovativeness and process innovativeness.
- For hypothesis 2, the values of the "local" variables (Clients local, suppliers local, competitors local, consultancy companies local, government local and local universities, etc.) were created by considering the columns "Your region" and "Your country" for questions 7.1 to 7.6 on the questionnaire. The variable in question (eg. Clients local) was designated the value 1 if a respondent answered "yes" to question 7.1 in either of the columns "Your region" or "Your country". Similarly this variable was designated the value 0 if a respondent did not answer "yes" in either of these columns. Thus Clients

local is a binary variable denoting either the presence of absence of collaboration with local clients.

- Similarly the "foreign" variables (Clients foreign, suppliers foreign, competitors foreign, consultancy companies foreign, government foreign and foreign universities, etc.) were given values based on the columns "North America", "South America", "Western Europe", "Central and Eastern Europe", "Africa", "Japan and Australasia", "Rest of Asia" for questions 7.1 to 7.5 and 7.7. The variable in question (eg. Clients foreign) was designated the value 1 if a respondent answered "yes" to question 7.1 in either of the columns "North America", "South America", etc. Similarly this variable was designated the value 0 if a respondent did not answer "yes" in either of these columns. Thus Clients foreign is a binary variable denoting either the presence of absence of collaboration with foreign clients.
- Note that for question 7.6 (local universities/research institutions/labs) any responses other than "Your region" or "Your country" did not make logical sense, so was therefore not interpretable.
- Similarly, for question 7.7 (foreign universities, etc.), responses of "yes" in the first two columns ("Your region" and "Your country") did not make sense, so was ignored.
- This study is not concerned with the number of regions a respondent selects as this does not indicate the degree of collaboration. For example, Company X could collaborate with one client in North America, one client in South

America and one client in Western Europe. This does not make Company X's degree of client collaboration higher than Company Y who, for example, collaborates with 100 clients in North America only (and hence would only have one "yes" under North America on the survey). Hence one does not count the number of "yes" responses, but use the logical values 1 and 0 to indicate the existence or non-existence of a given collaboration respectively.

4.13 Methodology used to categorise data into "exports" or "domestic"

1. The questions used to divide the data into two groups were 3.2, 4.1 and 4.2. These were used in the most sensible order possible, the three questions acted as a double check regarding which group each respondent should be placed into, namely, either the export market or the domestic market.
2. Any respondents who answered "yes" to question 4.2, asking, "if an export market (4.1.4) was selected then please indicate the 3 most important destinations in terms of sales" therefore any of the regions North America (4.2.1), Western Europe (4.2.3) and Central or Eastern Europe (4.2.4) were grouped as "export" companies, in the dataset these respondents were designated the value 1. Fifteen firms were designated to the "export" group using this method.
3. Respondents who answered "yes" to questions 4.1.2 or 4.1.3 as "domestic" companies, were designated the value 0 in the dataset. Thirty four firms were designated to the "domestic" group using this method.
4. If the respondent answered "yes" to Africa (4.2.5) only, then although

technically this response would be disregarded, it was decided to double check these responses, as some respondents may have answered "yes" to this question thinking that South Africa is part of Africa.

Based on the knowledge of the industry, and further research on the firms, these firms were allocated to either the "export" or the "domestic" group. If the firm exported to any other African countries the response was disregarded as this research is interested in exporting into a developed context.

This step gained three additional "export" firms and three "domestic" firms.

5. For the respondents for which there were discrepancies between questions 4.2 and 3.2, we classified 17 firms as "export", 2 firms as "domestic" and disregarded 2.
6. Three responses were duplications of companies' responses and were also deleted.
7. From the dataset of 81 the responses in terms of the split, Exports = 35 and Domestic = 39 responses.

4.14 Hypotheses Testing

4.14.1 Test of difference, Hypothesis 1:

When considering innovativeness this study focuses on two groups within the South African agro processing industry namely those that export to North America, Central, Eastern and Western Europe and those firms that do not and thus only supply the local South African market.

The objective of this research is to decide if there is a difference between these two groups in terms of innovativeness whether product based or processed based and then across the total innovativeness depending on the market which the firm chooses to serve.

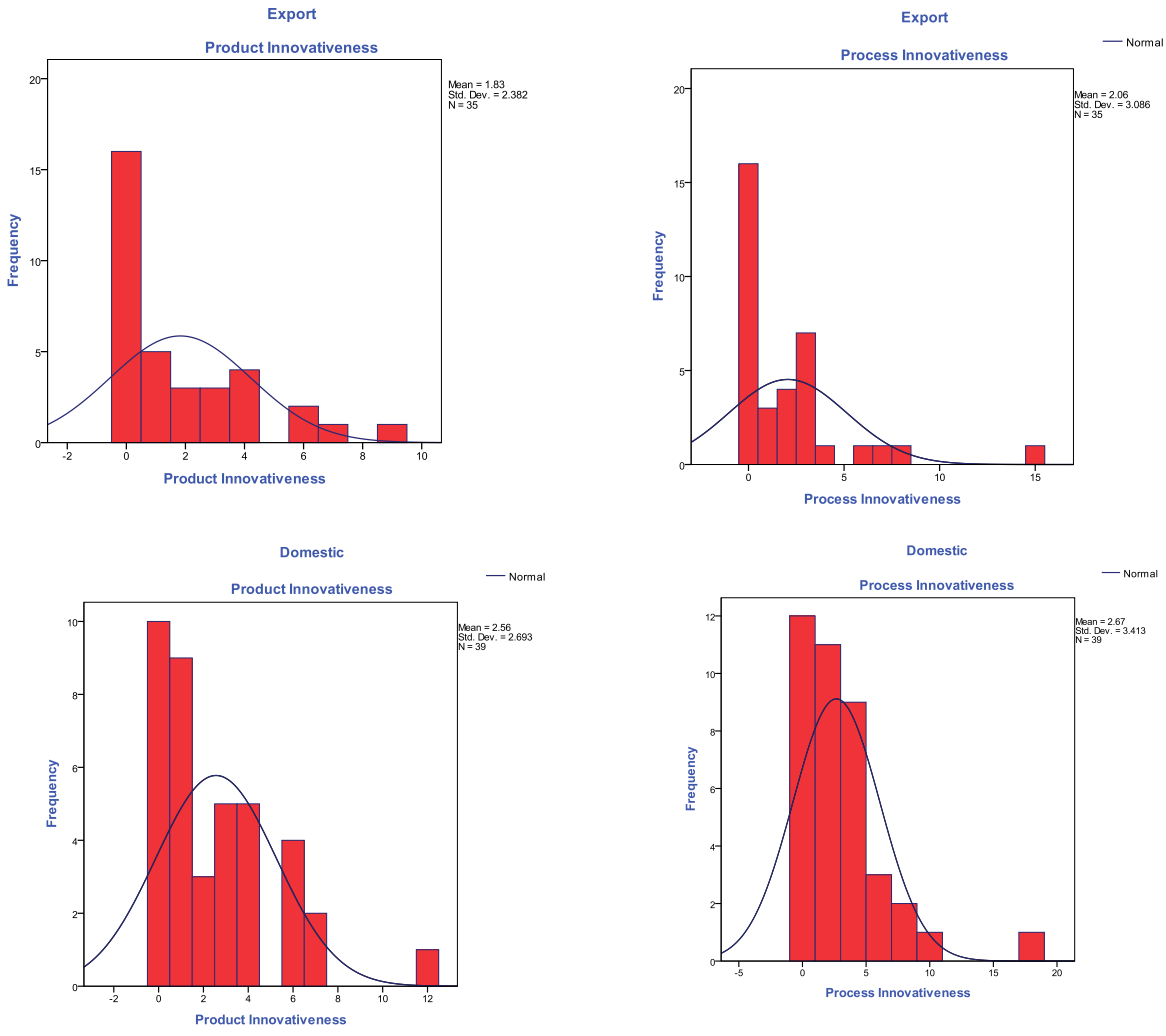
In order to achieve this, interval scale variables in the form of aggregated indices are calculated by combining the answers of the sub questions (see Table 4.11 for details). The comparison of the means of the aggregated indices between the groups will give the overall difference between the groups with respect to the sources and types of innovation.

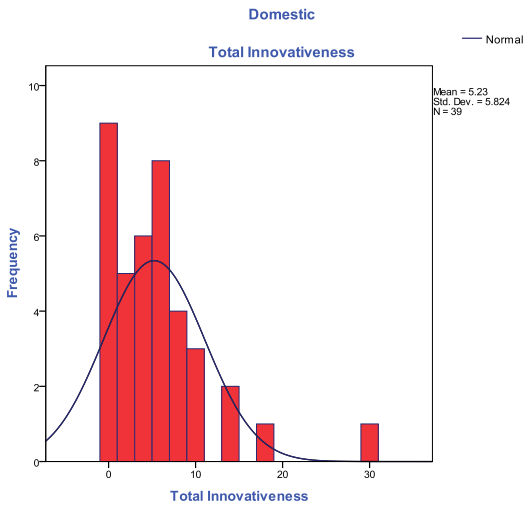
Albright, Winston & Zappe (2006) suggest the t test as a technique to measure that the mean scores on interval scaled variables are different for two independent groups. The t value specifically indicates the number of standard errors by which a sample mean differs from a population mean. In conjunction with this the t test is particularly useful when the sample size is small and the population standard deviation is unknown given a normal distribution.

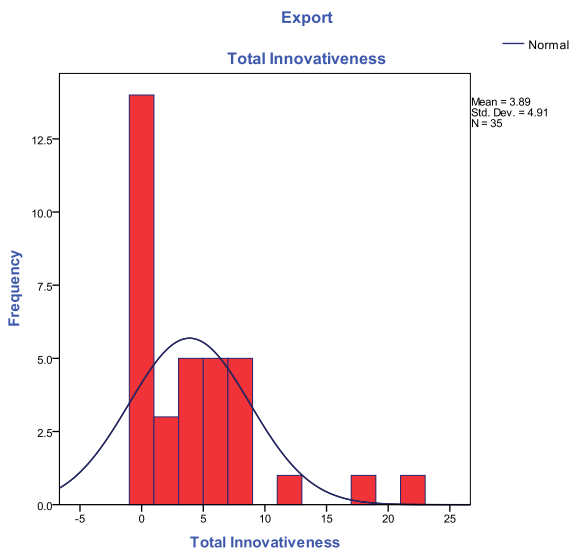
In terms of the characteristics of the sample data, the total sample size for the agro processing industry was 81, after classifying those that are local and those that export we ended up with 39 domestic firms and 35 export firms.

Both of these sample populations are greater than the recommended 30 in order for the central limit theorem to apply therefore allowing the study to assume that the samples were drawn from a normal distribution.

Diagram 4-14: Illustration of the distributions of the chosen aggregated indices for the different kinds of innovativeness for Hypothesis 1.







Tests were run to contrast the variances among the two groups. If the variances are equal between the two groups then an Equal Variance t-test will be run, otherwise Aspen-Welch Unequal-Variance t-test will be run to find the disparity between the means of the exporting firms and the domestic firms. The results of these tests will confirm whether or not we must reject or accept the null hypothesis and thereby support in deducting whether or not the two groups, being exporters and local suppliers differ significantly with regards to their innovative activities.

4.14.2 Chi Squared, Hypothesis 2

Albright, Winston & Zappe (2009, p.541) suggested using the chi-squared test for independence in situations where a population can be categorised in two different ways. The chi-squared test helps us understand whether various attributes are independent in a probabilistic sense. The null hypothesis for the chi squared test is that the two attributes are indeed independent from one another. Thus, any results

that are statistically significant will indicate some sort of dependence between the various attributes.

In order to perform a chi-squared test for independence the data must be set up in a contingency table as the data in this test consists of counts in various combinations of categories. Therefore this particular test, tests whether the counts for the row categories are probabilistically independent of the counts for the column categories. (Albright, Winston & Zappe 2009, p.542)

Therefore the chosen test of difference was the chi squared test. To run the chi-squared test firstly the contingency tables were created where the columns represented the export and the domestic firms whilst the rows represented the twelve categorical variables being client's local/client's foreign, supplier's local/suppliers foreign, competitor's local/competitors foreign, consultancy company's local/consultancy companies foreign and government local/government foreign. The cells represent the relevant frequencies.

Chi-squared tests were conducted on these 12 variables in order to test for significant differences in the distributions of the two groups (columns) across the categories of the variables (rows).

Two-sided significance chi-squared tests were conducted because as one is trying to establish which group has a higher/lower number of frequencies that the other.

This report will focus only on the Pearson chi-squared results although others were conducted and are substantively the same.

4.14.3 Mandatory Assumptions for Chi-squared test:

- The data must be from a random sample from a multinomial distribution;
- The expected frequencies for each category should be at least 1;
- No more than 20% of the categories should have expected frequencies of less than 5.

4.15 Research Limitations

Limitations based on the intended scope of the design of the research are acknowledged as follows:

The non-response rate caused the sample size to be reduced from the initial 497 surveys sent out to 84, 24 of which required a second round of contacting and requesting to complete the survey. The effect of this is a total response rate of 16.7%. Although the survey remains statistically significant, an increase in the overall response rate could have garnered greater insights. The limitation is therefore that the responses that were gathered are not necessarily reflective of the total population. However given the robustness of findings this seems unlikely.

Another limiting factor is the fact that this is the first study of its kind in South Africa. The term Global Innovation Network (GINs) is a relatively new concept when compared to Global Production Networks. Thus a limiting factor for this study is the availability of other studies done in a similar field. Again although this is a limiting factor is certainly emphasises the need for further research in a similar field.

Further limiting factors is the possibility of the respondents not completely understanding the principals of what the survey is trying to achieve or misunderstanding the actual question/questions being asked. This leads to the incorrect data being gathered, analysed and interpreted. The use of telephonic support hopefully mitigated against that limitation.

5. Results

The results section firstly reviews the characteristics of the agro processing industry in South Africa. These characteristics were discovered by interpreting various questions from the questionnaire which are outside of the questions relating to the primary hypotheses.

The particular questions of relevance are questions one, what is the firm's main area of focus; question two, what type of firm is the company itself and question three what is the size of the company based on the number of employees the company employs.

The chapter is concluded by a review of the innovation results pertaining to the agro processing industry and how these link to the two main hypotheses.

In order to test the hypotheses, the data was analysed in the following broad steps:

I. The first step was to run independent sample t-tests in order to test the absolute differences between the two groups, those being the exporters and domestic groups, for the three types of innovativeness being product, process and total innovativeness. The box plots and histograms helped to visually assess these differences. The combination of the box plots, histograms and t – test results culminate in deciding whether there is any statistical significance between the innovative behaviours of either the exporters or only the domestic suppliers.

II. The second step related to the triggers of innovation and therefore required the construction of frequency tables in order to assess the differences in responses for the 12 categorical variables related to the innovation triggers across the two groups.

III. The third step was to run chi-squared tests on these frequency tables in order to test for the significant differences in the variables across the two groups. Bar charts helped to visually assess the differences across the two groups for the different variables.

5.1 Background to the agro processing industry

The agro processing industry in South Africa is as old as South Africa is itself as those who had rights to farm on the lands would process maize and wheat for bread manufacture.

Currently the agro processing industry in South Africa contributes about 10% of the gross domestic product. It contributes 16.4% or R131.3bn to total manufacturing sales, making it the third largest manufacturing sector in South Africa. It contains about 4000 companies with the top 10 companies by market capitalization contributing to 70% of the overall industry namely Tiger Brands, Rhodes Fruit Farmers, Langeberg and Ashton Canning, Nestle Foods, Pioneer Foods and Food Corp to mention but a few.

Table 5-1 below is a summary of the demographics of agro processing industry in South Africa given the responses to the questionnaire.

Some points of interest:

- The processing and preserving of fruit and vegetables is the largest sector in this survey;
- The processing and preserving of fruit and vegetables is also the largest export sector;
- 52.7% of the useful respondents are considered domestic firms and the rest are exporters
- The processing and preserving of fruit and vegetables is also the largest domestic market, followed by the manufacture of grain/mill products. Then the manufacture of bakery and farinaceous products closely followed by the manufacture of dairy products;
- 39.2% of the responses fell into the category 108: “Manufacture of other food products”;
- 59.5% of the companies are stand alone;
- 20.3% of the companies employed 10-49 employees; 11% of the companies employed more than 1000 staff.

Table 5.1.2: Summary of demographics:

1. Question 1.1: Main area of Focus

Main Area of Focus	#	domestic	export	Total
101. Processing and preserving of meat and production of meat products	Count	4	0	4
	% within export vs domestic	10.30%	0.00%	5.40%
	% of Total	5.40%	0.00%	5.40%
102. Processing and preserving of fish, crustaceans and mollusks	Count	1	0	1
	% within export vs domestic	2.60%	0.00%	1.40%
	% of Total	1.40%	0.00%	1.40%
103. Processing and preserving of fruit and vegetables	Count	6	9	15
	% within export vs domestic	15.40%	25.70%	20.30%
	% of Total	8.10%	12.20%	20.30%
104. Manufacture of vegetable and animal oils and fats	Count	1	0	1
	% within export vs domestic	2.60%	0.00%	1.40%
	% of Total	1.40%	0.00%	1.40%
105. Manufacture of dairy products	Count	3	1	4
	% within export vs domestic	7.70%	2.90%	5.40%
	% of Total	4.10%	1.40%	5.40%
106. Manufacture of grain mill products, starches and starch products	Count	4	1	5
	% within export vs domestic	10.30%	2.90%	6.80%
	% of Total	5.40%	1.40%	6.80%
107. Manufacture of bakery and farinaceous products	Count	2	1	3
	% within export vs domestic	5.10%	2.90%	4.10%
	% of Total	2.70%	1.40%	4.10%
108. Manufacture of other food products	Count	14	15	29
	% within export vs domestic	35.90%	42.90%	39.20%
	% of Total	18.90%	20.30%	39.20%
No Info	Count	4	8	12
	% within export vs domestic	10.30%	22.90%	16.20%
	% of Total	5.40%	10.80%	16.20%
Total	Count	39	35	74
	% of Total	52.70%	47.30%	100.00%

2. Question two: Type of Company

Type of Company	Catagory	domestic	export	Total
2.1 A standalone company	Count	25	19	44
	% within Type of company	56.80%	43.20%	100.00%
	% within export vs domestic	64.10%	54.30%	59.50%
	% of Total	33.80%	25.70%	59.50%
2.2 A subsidiary of a MNC	Count	8	2	10
	% within Type of company	80.00%	20.00%	100.00%
	% within export vs domestic	20.50%	5.70%	13.50%
	% of Total	10.80%	2.70%	13.50%
No Info	Count	6	14	20
	% within Type of company	30.00%	70.00%	100.00%
	% within export vs domestic	15.40%	40.00%	27.00%
	% of Total	8.10%	18.90%	27.00%
Total	Count	39	35	74
	% of Total	52.70%	47.30%	100.00%

3. Question three: Size of Company based on the number of full time employees

Size of Company (number of FTE employees)	#	domestic	export	Total
3.1.1 Fewer than 10 FTE employees	Count	5	3	8
	% within Size of Company	62.50%	37.50%	100.00%
	% of Total	6.80%	4.10%	10.80%
3.1.2 10 to 49 employees	Count	6	9	15
	% within Size of Company	40.00%	60.00%	100.00%
	% of Total	8.10%	12.20%	20.30%
3.1.3 50 to 249 employees	Count	7	4	11
	% within Size of Company	63.60%	36.40%	100.00%
	% of Total	9.50%	5.40%	14.90%
3.1.4 250 to 999 employees	Count	9	3	12
	% within Size of Company	75.00%	25.00%	100.00%
	% of Total	12.20%	4.10%	16.20%
3.1.5 1000 or more employees	Count	6	2	8
	% within Size of Company	75.00%	25.00%	100.00%
	% of Total	8.10%	2.70%	10.80%
No Info	Count	6	14	20
	% within Size of Company	30.00%	70.00%	100.00%
	% of Total	8.10%	18.90%	27.00%
	Count	39	35	74
	% of Total	52.70%	47.30%	100.00%

5.2 Test for differences in the 12 categorical variables across the two groups

In order to establish if there are triggers for innovation between those firms that export and those that only supply the local South African market, contingency tables were created to test these comparisons. Chi square tests were run to test the levels of significance across the twelve categories.

For the purposes of this study the following significance levels/ p-values were used, this is consistent with those commonly used in most statistical interpretations:

- $p>0.1$ not significant
- $0.05<p<0.1$: moderately significant
- $0.01<p<0.05$: significant
- $p<0.01$: highly significant

5.3 Types of Innovations

The primary objective of this research is to find how the salient features of innovation differ between those that are considered exporters and those that solely supply the local domestic market within the agro processing industry in South Africa. As such this section describes these features of innovation given the results from the various statistical tests run as described in chapter four.

The major types of innovation considered in this research were either product or process based innovations. New products and new services were considered the components of product innovation whilst improved methods of logistics, improved

methods of manufacturing, and new or improved supporting activities were considered to be the components of process innovation.

Given these components innovation could be considered as either “new to the world”, “new to the industry” or “new to the firm”. As described in chapter four each of these categories was given a different weighing based on the absolute impact the innovation had on the overall industry.

Analysis of these statistical results indicates that there is little difference between the firms who export compared to those firms which are purely domestic when reviewing their respective levels of product or process innovations.

The following section describes the results of the statistical tests:

5.3.1 Test for differences in product, process and total innovativeness across the two groups.

In order to establish if there was a difference between the two groups, domestic or exporters, so far as either product/process or total innovativeness is concerned comparisons of the distributions were made using histograms, box plots and finally the resulting t-tests.

5.3.1.1 Product Innovativeness

From diagram 5.2.1.1 histograms, it is evident that the two groups follow a similar distribution across product innovativeness, although the frequency (number of firms) with regards to export product innovativeness is slightly greater than that of

the domestic product innovativeness. This frequency pattern is repeated when comparing the process innovativeness of the two groups.

Diagram 5.2.1.1: Histograms of Domestic and Export Product Innovativeness:

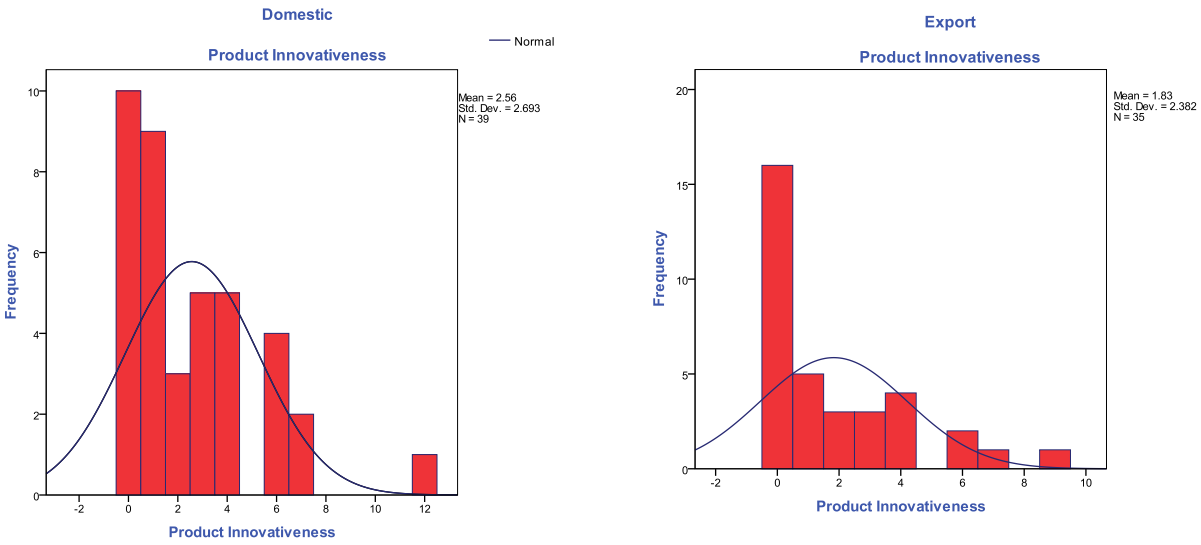


Diagram 5.2.1.2, the box plots for product innovativeness across the two groups, further emphasizes the remarkable similarity between the two groups. The distance from the 1st to the 3rd quartile is very similar, indicating that the spread of respondents is analogous. The distance from the 3rd quartile to the upper whisker for both groups is again very similar, further indicating that the two groups are very closely related. It is noted the presence of mild and extreme outliers in the box plot, this will be reviewed in a subsequent section to understand if the outliers have any impact. Given the below distinct similarities this is unlikely.

Diagram 5.2.1.2: Box Plot of Domestic and Export Product Innovativeness:

From box 5.2.1.1 below, the t-test results for product innovativeness, it is clear that the mean value for the domestic group (2.56) is higher than that of the export group (1.83). This suggests, although only fractional, that the domestic group could have a slightly higher level of product innovativeness when compared to the export group.

The corresponding p-values are significantly higher than 0.05 thus concluding that the differance between the two groups in not statistically significant when comparing their product innovativeness. Therefore one is unable to reject the null hypothsis.

Box 5.2.1.1: T-Test results for Product Innovativeness:

Product Innovativeness						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Domestic	39	2.56	2.693	.431	1.719	3.409
Export	35	1.83	2.382	.403	1.039	2.618
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	72	.736	.594	-.449	1.920	
Unequal	71.988	.736	.590	-.441	1.912	
T-test Results						
Null Hypothesis	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ¹ 0	equal variances assumed	1.238	.220	No	Cannot reject equal means
		equal variances not assumed	1.247	.217	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.372	.544	No	Cannot reject equal variances	

From Box 5.2.1.2 below it is clear that the removal of the outliers has had little impact on the overall results. With the exception that the p-value has crept fractionally closer to 0.05 however the values are still significantly higher than 0.05 and as such we still cannot reject the null hypothesis.

Box 5.2.1.2: T-Test Report for Product Innovativeness – Removed Outliers

Product Innovativeness (excluding outliers)						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Domestic	38	2.32	2.231	.362	1.60635	3.025
Export	34	1.62	2.060	.353	0.92524	2.310
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	70	-.698	.508	-1.711	.315	
Unequal	69.924	-.698	.506	-1.707	.311	
T-test Results						
Null Hypothesis (H0)	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ¹ 0	equal variances assumed	-1.374	.174	No	Cannot reject equal means
		equal variances not assumed	-1.380	.172	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.495	.484	No	Cannot reject equal variances	

5.3.1.2 Process Innovativeness

From diagram 5.2.1.3 histograms, it is evident that the two groups follow a similar distribution across process innovativeness, both distributions are normally distributed around the mean. The domestic process innovativeness however has a higher frequancy when compared to that of the export process innovativeness. This could indicate that more domestic firms are inclined to be process innovative compared to those firms that only export.

Diagram 5.2.1.3: Histogram Process Innovativeness

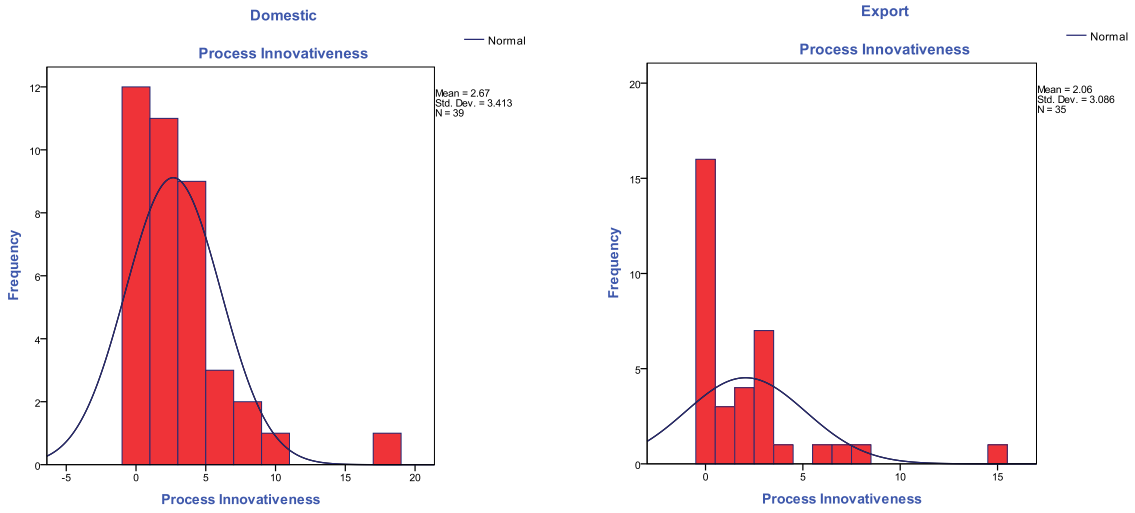
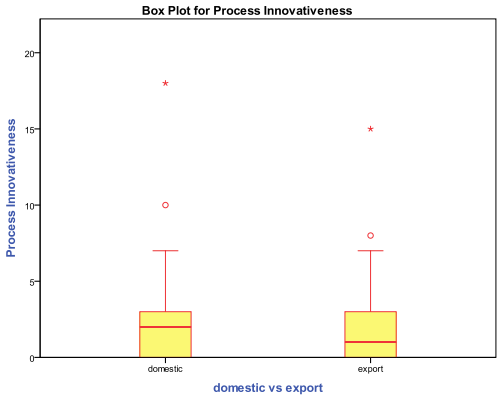


Diagram 5.2.1.4 the box plots for process innovativeness across the two groups further emphasizes the remarkable similarity of the two groups. The distance from the 1st to the 3rd quartile is very similar indicating that the spread of respondents is analogous. The distance from the 3rd quartile to the upper whisker for both groups is again very similar further indicating that the two groups are very closely related.

It is noted the presence of mild and extreme outliers in the box plot, this will be reviewed in a subsequent section to understand if the outliers have any impact. Given the below distinct similarities this is unlikely.

Diagram 5.2.1.4: Box Plot Process Innovativeness.



From box 5.2.1.3, the t-test results for product innovativeness, it is clear that the mean value for the domestic group (2.67) is higher than that of the export group (2.06). This suggests, although only fractional, that the domestic group could have a slightly higher level of process innovativeness when compared to the export group.

However the corresponding p-values are significantly higher than 0.05 thus concluding that the differance between the two groups is not statistically significant when comparing their product innovativeness. Therefore one is unable to reject the null hypothsis.

Box 5.2.1.3: T-Test Report for Process Innovativeness

Process Innovativeness						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Domestic	39	2.67	3.413	.547	1.5955	3.738
Export	35	2.06	3.086	.522	1.0346	3.080
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	72	.610	.760	-.905	2.124	
Unequal	71.994	.610	.756	-.897	2.116	
T-test Results						
Null Hypothesis	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ¹ 0	equal variances assumed	.802	.425	No	Cannot reject equal means
		equal variances not assumed	.807	.422	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.028	.867	No	Cannot reject equal variances	

From Box 5.2.1.4 below it is clear that the removal of the outliers has had little impact on the overall results. With the exception that the p-value has almost halved from its original value indicating that the outliers were having an impact on the overall results. However the final p-values are still significantly higher than 0.05 and as such we still cannot reject the null hypothesis.

Box 5.2.1.4: T-Test Report for Process Innovativeness, removed outliers

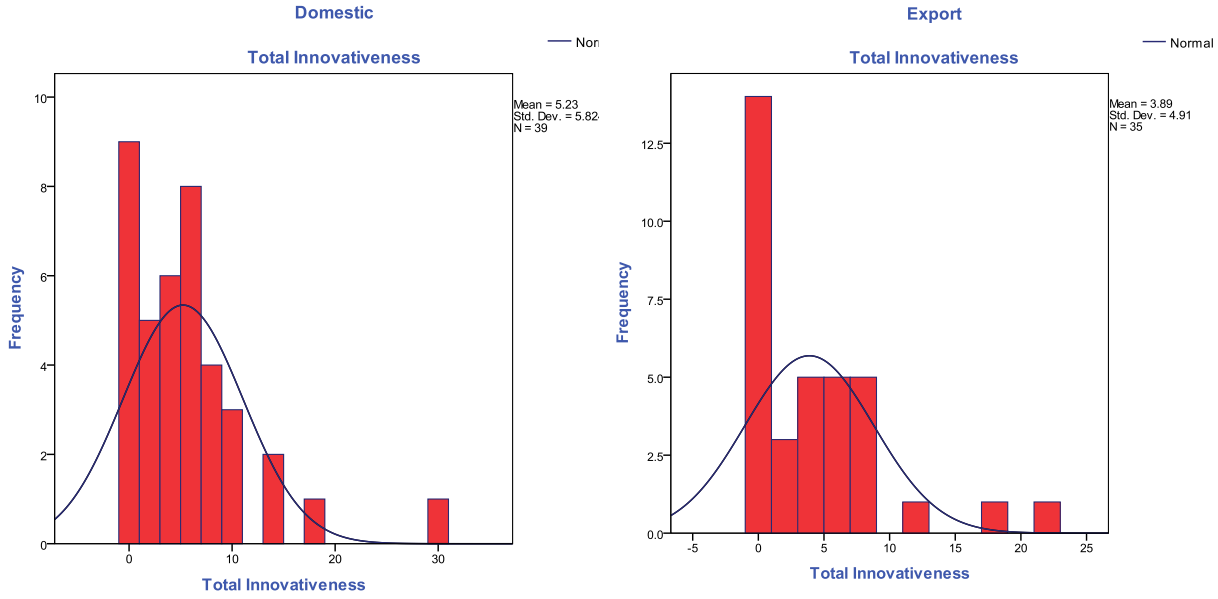
Process Innovativeness (excluding outliers)						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Export	33	1.48	1.856	.323	0.85158	2.1181
Domestic	37	2.05	1.971	.324	1.41888	2.6892
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	68	-.569	.459	-1.486	.347	
Unequal	67.788	-.569	.458	-1.482	.344	
T-test Results						
Null Hypothesis (H0)	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ¹ 0	equal variances assumed	-1.239	.219	No	Cannot reject equal means
		equal variances not assumed	-1.244	.218	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.000	.996	No	Cannot reject equal variances	

5.3.1.3 Total Innovativeness

When combined to answer the question with regards to total innovativeness the overall cumulative indices were formed by adding the codes from the responses of the firms towards the different product and process types of innovation.

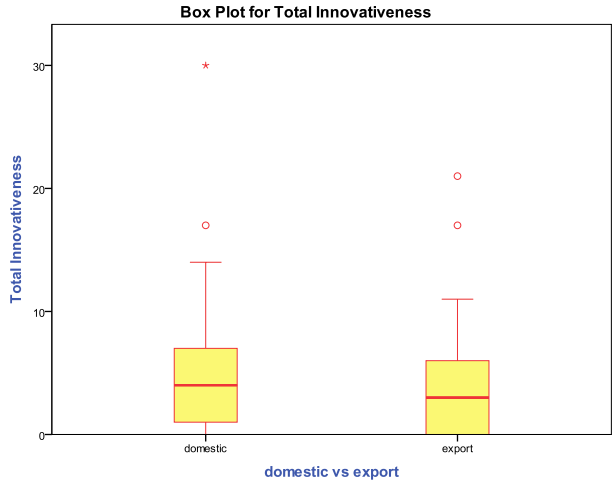
The following pages details the descriptive statistics and the individual t-test run on the combined indices to establish if there was a difference between the two groups with regards to total innovativeness of the respective firms.

Diagram 5.2.1.5: Histograms Total Innovativeness two groups



The above histograms in diagram 5.2.1.5 give us further indication that the innovativeness of the domestic group is remarkably similar to that of the export group. Both curves follow a very similar distribution pattern.

Diagram 5.2.1.6: Box Plot Total Innovativeness



It is even more apparent from the above box plot in diagram 5.2.1.6 that the two groups are very similar. The distance between the 1st and 3rd quartiles for both

groups is almost the same. The medians are almost indistinguishable; the lower and upper whiskers are both very similar. The presence of an extreme outlier is observed for the domestic group, the export group has two mild outliers.

From the t-test report below (box 5.2.1.5) it is observed that the mean value for the total innovativeness of the domestic group (5.23) is higher than that of the export group (3.89). However this difference is not statistically significant as the p-value is greater than 0.05 and it has a corresponding t-value of 1.068 indicating that the sample mean is only 1.068 standard errors above the population mean and are thus for practical purposes the same.

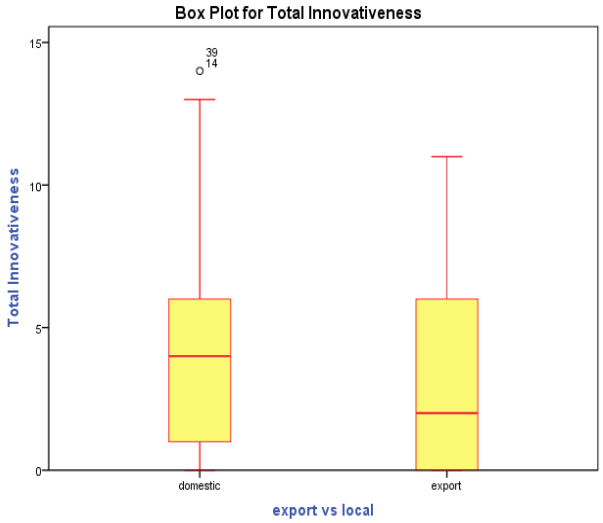
Box 5.2.1.5: T Test Report for Total Innovativeness

Total Innovativeness						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Domestic	39	5.23	5.824	.933	3.4029	7.0586
Export	35	3.89	4.910	.830	2.2592	5.5122
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	72	1.345	1.260	-1.167	3.857	
Unequal	71.736	1.345	1.248	-1.144	3.834	
T-test Results						
Null Hypothesis	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ¹ 0	equal variances assumed	1.068	.289	No	Cannot reject equal means
		equal variances not assumed	1.077	.285	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.161	.690	No	Cannot reject equal variances	

When removing the outliers, as performed earlier for product and process innovativeness, but now for total innovativeness, the box plot remain the same as illustrated by diagram 5.2.1.7. The median for the domestic group increases, however the attributes remain remarkably similar.

From the t-test report, box 5.2.1.6, the mean for the domestic group (4.24) still remains much greater than that of the export group (2.97), continuing to indicate that possibly the domestic group tends to innovate more than the export group. However, the resulting p-value is still significantly greater than 0.05, although having reduced somewhat. The results therefore are still not statistically significant and we thus cannot reject the null hypothesis.

Diagram 5.2.1.7: Box Plot Total Innovativeness, removed initial outliers.



Box 5.2.1.6: T Test Report for Total Innovativeness, removed outliers

Total Innovativeness (excluding outliers)						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Export	33	2.97	3.197	.556	1.8791	4.060308
Domestic	37	4.24	3.730	.613	3.0414	5.445045
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	68	-1.274	.835	-2.941	.393	
Unequal	67.902	-1.274	.828	-2.926	.379	
T-test Results						
Null Hypothesis (H0)	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ≠ 0	equal variances assumed	-1.524	.132	No	Cannot reject equal means
		equal variances not assumed	-1.538	.129	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.361	.550	No	Cannot reject equal variances	

5.4 Test for robustness for hypothesis 1

Given the interpretations from the literature, the above results come as a surprise as the results contradict what was seemingly expected. As such in order to ensure that there are no abnormalities in the data an overall test for robustness of the data was performed.

In order to test for robustness the definition of what was considered in terms of innovativeness was reviewed. From the methodology it is noted that the score for “product innovation” was calculated by aggregating the scores achieved for “new

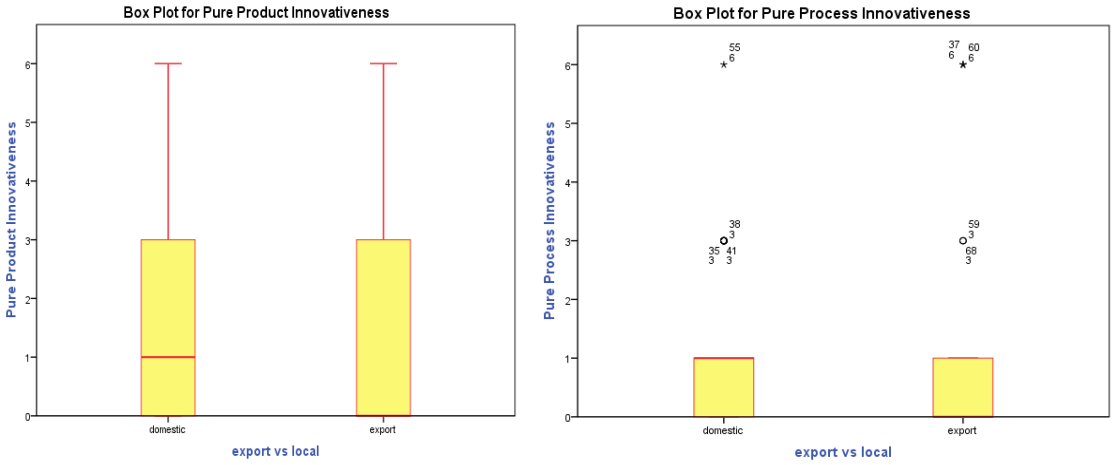
products" and "new services", likewise with "new processes" the score achieved was calculated by aggregating "improved methods of manufacturing", "improved logistics" and " improved supporting activities."

For the test for robustness of the data and the overall results, "new products" was tested completely independently with no aggregation to give a score on its own for "product innovativeness." As with the test for "new processes", only scores for "improved methods of manufacturing" were used. As such we calculated results for what has been called "pure product" or "pure process" innovativeness.

5.4.1 T – test results for, test of robustness, H1:

From the data below it is evident that when testing for "pure product" and "pure process" innovativeness the results did not change. We can still therefore only conclude, but now with more certainty than ever, that when comparing the innovativeness of firms in the agro processing industry, dependent on whether they export or not, there is no difference.

Diagram 5.3.1: Box Plots for "Pure Product" and "Pure Process" Innovativeness



Box 5.3.1: T- test results "Pure Process Innovativeness"

Pure Process Innovativeness						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Domestic	39	1.13	1.380	.221	0.695123072	1.561287185
Export	35	.97	1.740	.294	0.394883878	1.547973265
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	72	-.157	.363	-.881	.568	
Unequal	64.749	-.157	.368	-.892	.578	
T-test Results						
Null Hypothesis (H0)	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ¹ 0	equal variances assumed	-.431	.667	No	Cannot reject equal means
		equal variances not assumed	-.426	.671	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.124	.726	No	Cannot reject equal variances	

Box 5.3.2: T- test results "Pure Product Innovativeness"

Pure Product Innovativeness						
Descriptive Statistics						
Variable	**Count**	**Mean**	**Std. Deviation**	**Std. Error of mean**	**95% LCL of Mean**	**95% UCL of Mean**
Domestic	39	2.00	2.065	.331	1.35199	2.64801
Export	35	1.37	1.880	.318	0.74859	1.99427
Confidence-Limits of Difference						
Variance Assumption	**DF**	**Mean Difference**	**Std. Error difference**	**95% LCL of Mean**	**95% UCL of Mean**	
Equal	72	-.629	.461	-1.547	.290	
Unequal	71.982	-.629	.459	-1.543	.286	
T-test Results						
Null Hypothesis (H0)	**Alternative Hypothesis**	**Variance Assumption**	**t-value**	**p-value (2-tailed)**	**Reject H0 at 0.05 level**	**Decision**
difference of means = 0	difference of means ≠ 0	equal variances assumed	-1.364	.177	No	Cannot reject equal means
		equal variances not assumed	-1.371	.175	No	Cannot reject equal means
Test of Assumptions						
Assumption	**Test**	**F-value**	**p-value**	**Reject assumption at 0.05 level**	**Decision**	
Variances equal	Levene's Test for Equality of Variances	.695	.407	No	Cannot reject equal variances	

In summary therefore, it is noted that there is no statistical difference for firms which belong to the export category or the domestic category when comparing their respective levels of product innovation, process innovations or total innovativeness. Although there was suggestive evidence that the mean scores for the domestic group was indeed higher than that of the export group, the statistical evidence did not provide significant evidence to conclude that the two groups are different across product innovativeness, process innovativeness and total innovativeness.

5.5 Triggers of innovation across the two groups

The triggers for innovation can vary depending on whether or not you supply the local South African market or export into a developed context. In order to ascertain if there is a difference in the triggers of innovation between the exporters and those firms which supply purely to the domestic market, the extent of collaboration was tested across the categories clients, suppliers, competitors, consultancy companies, government, local universities and foreign universities.

It must be noted that the word “collaboration” can be misinterpreted depending on the context in which it is used especially in the current South African context given the sensitivities surrounding irregular tender appointments and fair competition. For example it is considered good practise to collaborate with one’s suppliers as this can improve overall efficiency in operations, reduce lead times which increases volume through put. The result of which is an increase in business and hopefully material savings which can be passed on to the consumer. As such collaboration with one’s supplier is viewed as positive to the over value chain.

On the other side of the spectrum is collaboration with one’s competitors, this can be constituted as an illegal practise which if proved by the competition commission can result in large fines being imposed on the firms. The recent price fixing scandal between Pioneer Foods and Tiger Brands is testimony to this.

In short therefore candidates can and will be sensitive when answering yes to types of collaboration and as such one can expect to see more firms responding

"no" to collaboration than "yes" in certain of the categories. This needs to be born in mind when reviewing some of the results.

5.5.1 Clients local

Given diagram and table 5.5.1 with associated descriptive statistics it is clear that domestic firms collaborate more with local clients than do export firms. Out of the thirty two firms which stated that they collaborate with local clients, twenty one of them were domestic firms, a resounding total of 65.6%.

Box 5.5.1 shows the corresponding degrees of freedom, chi square values and the associated probability. Although the p values for the client local category is greater than 0.05, it's fractional. Thus strictly speaking the results are only moderately significant, however close enough to significantly conclude that, domestic firms collaborate more with local clients than do export firms and as such local clients are considered a greater trigger for innovation to domestic agro processing firms that to exporters.

Diagram 5.5.1: Histogram Local Clients, Domestic vs. Export

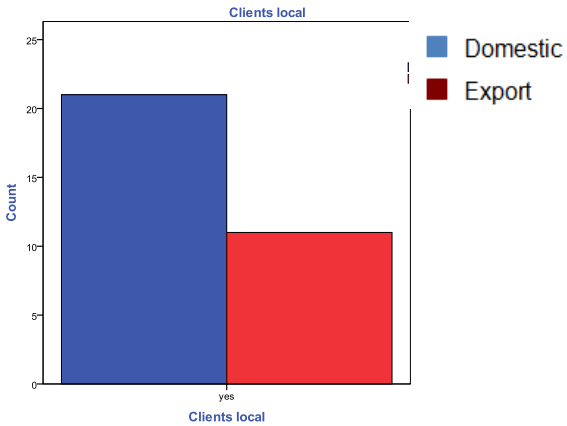


Table 5.5.1: Domestic vs. Export Cross tabulation, Clients Local

Clients local * Domestic versus Export Cross tabulation					
			domestic	export	Total
Clients local	no	Count	18	24	42
		% within Clients local	42.9%	57.1%	100.0%
		% within export vs domestic	46.2%	68.6%	56.8%
		% of Total	24.3%	32.4%	56.8%
	yes	Count	21	11	32
		% within Clients local	65.6%	34.4%	100.0%
		% within export vs domestic	53.8%	31.4%	43.2%
		% of Total	28.4%	14.9%	43.2%
Total		Count	39	35	74
		% within Clients local	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.1: Chi Square results Clients Local

Chi-Square Tests Results					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	**3.777**[a]	**1**	**.052**		
Continuity Correction[b]	2.919	1	.088		
Likelihood Ratio	3.822	1	.051		
Fisher's Exact Test				.063	.043
Linear-by-Linear Association	3.726	1	.054		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.14.
b. Computed only for a 2x2 table

Result Clients Local:

Assumptions met; p-value moderately significant.

5.5.2 Clients foreign

In regard to collaboration with foreign clients across the two groups, based on the information from diagram 5.5.2 and table 5.5.2 exporters tend to collaborate more with foreign clients than domestic firms. This would seem only sensible as domestic firms have none to little engagement with foreign firms.

More importantly if one reviews table 5.5.2, 58 of the total 74 firms confirmed that they do not collaborate with foreign clients, which is over whelmingly more than the sixteen firms who answered yes to collaboration with foreign clients.

When reviewing the chi squared test results, box 5.5.2, for significance, although the chi squared test assumptions have been met the p value is greater than 0.1 which indicates that the test is not significant at all, therefore one cannot conclude statistically that a high degree of collaboration exists with foreign clients regardless of whether or not one belongs to the domestic or export group.

Diagram 5.5.2: Histogram Clients Foreign, Domestic vs. Export

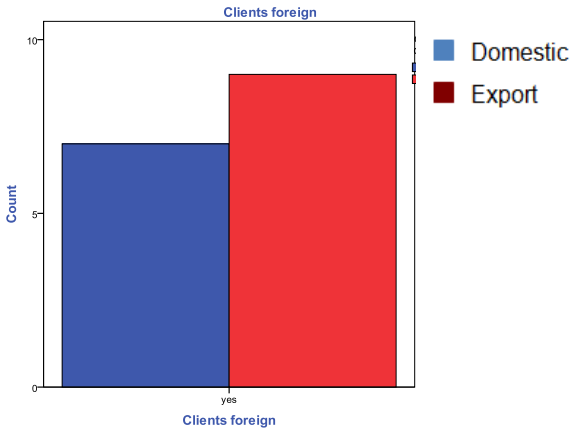


Table 5.5.2: Domestic vs. Export Cross tabulation, Clients Foreign

Clients foreign * domestic versus export Cross Tabulation					
			domestic	export	Total
Clients foreign	no	Count	32	26	58
		% within Clients foreign	55.2%	44.8%	100.0%
		% within export vs domestic	82.1%	74.3%	78.4%
		% of Total	43.2%	35.1%	78.4%
	yes	Count	7	9	16
		% within Clients foreign	43.8%	56.3%	100.0%
		% within export vs domestic	17.9%	25.7%	21.6%
		% of Total	9.5%	12.2%	21.6%
Total		Count	39	35	74
		% within Clients foreign	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.2: Chi Square results Clients Foreign

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.656[a]	1	**.418**		
Continuity Correction[b]	.278	1	.598		
Likelihood Ratio	.656	1	.418		
Fisher's Exact Test				.573	.299
Linear-by-Linear Association	.648	1	.421		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.57.
b. Computed only for a 2x2 table

Result Clients Foreign:

Assumptions met but p-value not significant.

5.5.3 Suppliers Local

From diagram 5.5.3 and table 5.5.3 it is clear that domestic firms collaborate far more with local suppliers than do export firms. Twenty three of the 42 respondents who confirmed that they collaborate with local suppliers were from the domestic group, a total of 71.9%. However it's interesting to note that forty two of the 74 respondents confirmed that they do not collaborate at all with local suppliers indicating that there is a great quantity of those that don't collaborate than those that do.

Reviewing the chi square results from box 5.5.3 all the basic assumptions for the test were met and the p value is less than 0.05. This confirms that from a statistical perspective the results are highly significant allowing us to conclude therefore that domestic firms collaborate more with local suppliers than do export firms.

Diagram 5.5.3: Histogram Suppliers Local, Domestic vs. Export

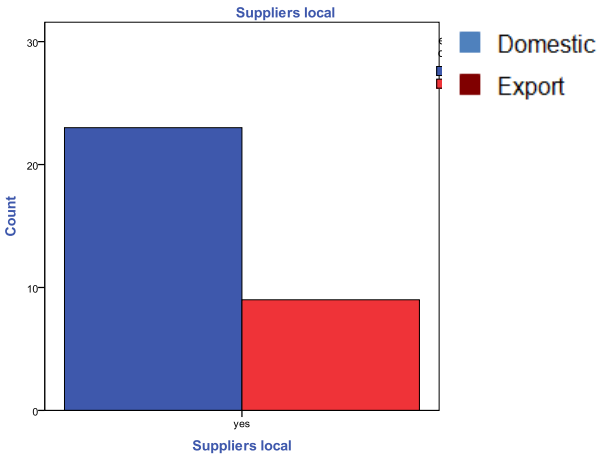


Table 5.5.3: Domestic vs. Export Cross tabulation, Suppliers Local

Suppliers local * domestic versus export Cross tabulation					
			domestic	export	Total
Suppliers local	no	Count	16	26	42
		% within Suppliers local	38.1%	61.9%	100.0%
		% within export vs domestic	41.0%	74.3%	56.8%
		% of Total	21.6%	35.1%	56.8%
	yes	Count	23	9	32
		% within Suppliers local	71.9%	28.1%	100.0%
		% within export vs domestic	59.0%	25.7%	43.2%
		% of Total	31.1%	12.2%	43.2%
Total		Count	39	35	74
		% within Suppliers local	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.3.1.3: Chi Square results Suppliers Local

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.314[a]	1	**.004**		
Continuity Correction[b]	7.014	1	.008		
Likelihood Ratio	8.525	1	.004		
Fisher's Exact Test				.005	.004
Linear-by-Linear Association	8.202	1	.004		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.14.
b. Computed only for a 2x2 table

Result Suppliers Local:

Assumptions met; p-value highly significant.

5.5.4 Suppliers Foreign

Interestingly based, on diagram 5.5.4 and table 5.5.4, a greater portion of domestic firms collaborate with foreign suppliers than do export firms. It must be noted however that of the 74 firms that responded to the questionnaire, 52 of them stated that they do not collaborate with foreign suppliers be it either domestic or export firms. This indicates that there is an inclination toward less foreign supplier collaboration rather than toward more foreign supplier collaboration.

When reviewing the chi square test results from box 5.5.4, although all the assumptions have been met, the p value is greater than 0.1 and as such the results are not significant and are therefore cannot conclude that domestic firms collaborate more with foreign suppliers than do export firms

Diagram 5.5.4: Histogram Suppliers Foreign, Domestic vs. Export

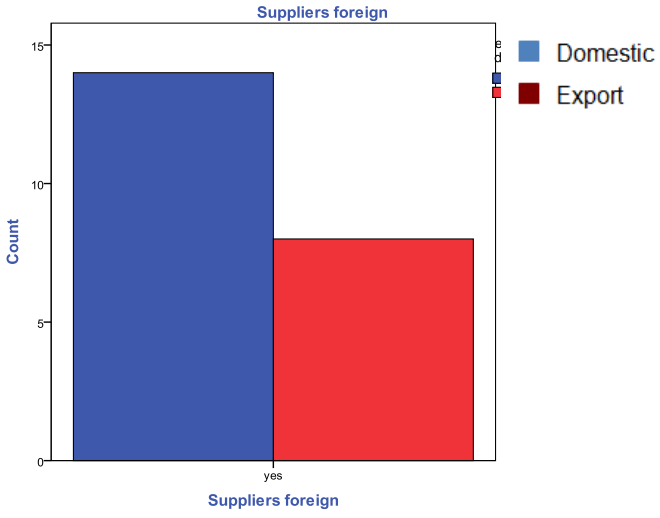


Table 5.3.1.4: Domestic vs. Export Cross tabulation, Suppliers Foreign

Suppliers foreign * Domestic versus Export Cross tabulation					
			domestic	export	Total
Suppliers foreign	no	Count	25	27	52
		% within Suppliers foreign	48.1%	51.9%	100.0%
		% within export vs domestic	64.1%	77.1%	70.3%
		% of Total	33.8%	36.5%	70.3%
	yes	Count	14	8	22
		% within Suppliers foreign	63.6%	36.4%	100.0%
		% within export vs domestic	35.9%	22.9%	29.7%
		% of Total	18.9%	10.8%	29.7%
Total		Count	39	35	74
		% within Suppliers foreign	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.4: Chi Square results Suppliers Foreign

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.501[a]	1	**.220**		
Continuity Correction[b]	.942	1	.332		
Likelihood Ratio	1.518	1	.218		
Fisher's Exact Test				.309	.166
Linear-by-Linear Association	1.481	1	.224		

N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.41.
b. Computed only for a 2x2 table

Result Suppliers Foreign:
Assumptions met; p-value not significant.

5.5.5 Competitors Local

Diagram 5.5.5 illustrates from a collaboration perspective that domestic firms engage more with local competitors than do export firms. However from table 5.5.5, it must be noted that almost 80% of the firms confirmed that they do not collaborate at all with competitors when it comes to innovation in their organisations. As noted in the opening paragraphs, this could be due to certain respondents being reluctant to indicate that they are involved in collaborative arrangements.

From box 5.5.5 we note that the p – value for this test is 0.073, which is greater than 0.05 but less than 0.1. Therefore statistically speaking the results are only moderately significant thus allowing us to deduce with some certainty that domestic firms collaborate more with local competitors than do export firms.

Diagram 5.5.5: Histogram Competitors Local, Domestic vs. Export

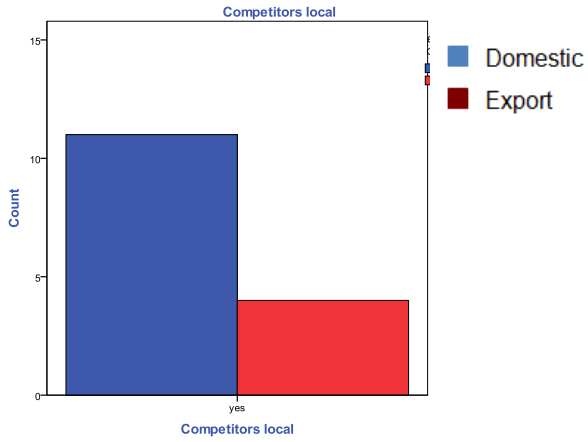


Table 5.5.5: Domestic vs. Export Cross tabulation, Competitors Local

Competitors local * Domestic versus Export Cross tabulation					
			domestic	export	Total
Competitors local	no	Count	28	31	59
		% within Competitors local	47.5%	52.5%	100.0%
		% within export vs domestic	71.8%	88.6%	79.7%
		% of Total	37.8%	41.9%	79.7%
	yes	Count	11	4	15
		% within Competitors local	73.3%	26.7%	100.0%
		% within export vs domestic	28.2%	11.4%	20.3%
		% of Total	14.9%	5.4%	20.3%
Total		Count	39	35	74
		% within Competitors local	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.5: Chi Square results Competitors Local

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.212[a]	1	**.073**		
Continuity Correction[b]	2.258	1	.133		
Likelihood Ratio	3.333	1	.068		
Fisher's Exact Test				.089	.065
Linear-by-Linear Association	3.169	1	.075		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.09.
b. Computed only for a 2x2 table

Result Competitors Local:

Assumptions met, p-value moderately significant.

5.5.6 Competitors Foreign

Statistically the assumptions for the chi squared test have not been met for this particular category, “Competitors Foreign”. As such the results are not noteworthy for the purposes of this research. More than likely the reason for this could be the fact that almost 95% of the respondents said “no” to any form of innovative collaboration with foreign clients.

Diagram 5.5.6: Histogram Competitors Foreign, Domestic vs. Export

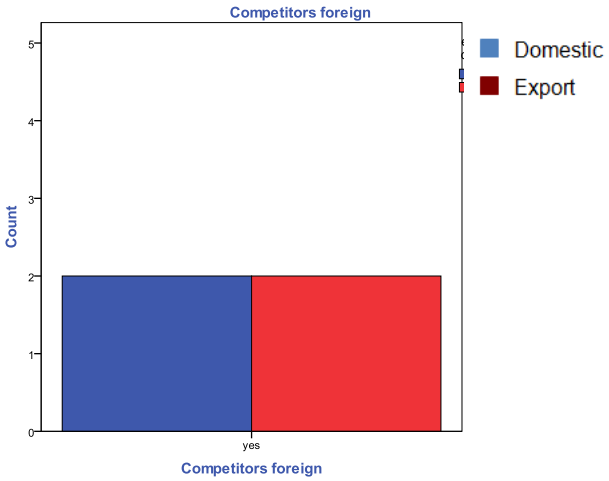


Table 5.5.6: Domestic vs. Export Cross tabulation, Competitors Foreign

Competitors foreign * Domestic versus Export Cross tabulation					
			domestic	export	Total
Competitors foreign	no	Count	37	33	70
		% within Competitors foreign	52.9%	47.1%	100.0%
		% within export vs domestic	94.9%	94.3%	94.6%
		% of Total	50.0%	44.6%	94.6%
	yes	Count	2	2	4
		% within Competitors foreign	50.0%	50.0%	100.0%
		% within export vs domestic	5.1%	5.7%	5.4%
		% of Total	2.7%	2.7%	5.4%
Total		Count	39	35	74
		% within Competitors foreign	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.6: Chi Square results Competitors Foreign

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.012[a]	1	.911		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.012	1	.911		
Fisher's Exact Test				1.000	.651
Linear-by-Linear Association	.012	1	.912		
N of Valid Cases	74				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.89.
b. Computed only for a 2x2 table

Result Clients Foreign:

Assumptions not met, test is not valid.

5.5.7 Consultancy Companies Local

From diagram 5.3.1.7 and table 5.3.1.7 it is clear that more domestic firms collaborate with local consultancies for their innovations than do export firms. 75% of those who answered “yes” to collaborating with local consultancies are domestic firms. Therefore from a frequency perspective, it is more than apparent that domestic firms are collaborating to a far greater extent than exporters when it comes to collaborating with consultancy companies for innovation.

Statistically these results are highly significant as the p value is less than 0.05.

Diagram 5.5.7: Histogram Consultancy Companies Local, Domestic vs. Export

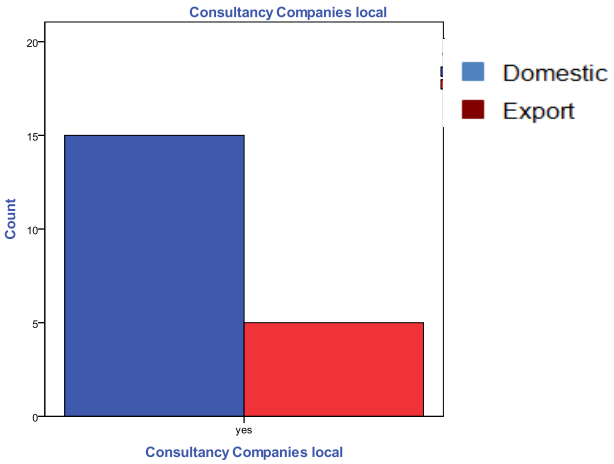


Table 5.5.7: Domestic vs. Export Cross tabulation, Consultancy Companies Local

Consultancy Companies local * Domestic versus Export Cross tabulation					
			domestic	export	Total
Consultancy Companies local	no	Count	24	30	54
		% within Consultancy Companies local	44.4%	55.6%	100.0%
		% within export vs domestic	61.5%	85.7%	73.0%
		% of Total	32.4%	40.5%	73.0%
	yes	Count	15	5	20
		% within Consultancy Companies local	75.0%	25.0%	100.0%
		% within export vs domestic	38.5%	14.3%	27.0%
		% of Total	20.3%	6.8%	27.0%
Total		Count	39	35	74
		% within Consultancy Companies local	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.7: Chi Square results Consultancy Local

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.466[a]	1	.019		
Continuity Correction[b]	4.309	1	.038		
Likelihood Ratio	5.684	1	.017		
Fisher's Exact Test				.035	.018
Linear-by-Linear Association	5.393	1	.020		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.46.
b. Computed only for a 2x2 table

Result Consultancy Companies Local:

Assumptions met p-value highly significant.

5.5.8 Government local

From table 5.5.8 and diagram 5.5.8 below, it is apparent that domestic firms collaborate far more with local government for their innovations than do export in firms. Unfortunately however only 16.2% of the respondents actually answered the question, the remaining 83.8% did not respond. We are therefore only left to assume that the high level on none response is a confirmation of no levels of collaboration.

Statistically the results for this test are highly significant as the p value for the test is less than 0.05. Confirming therefore that domestic firms collaborate more with local government than export firms do.

Diagram 5.5.8: Histogram Government Local, Domestic vs. Export

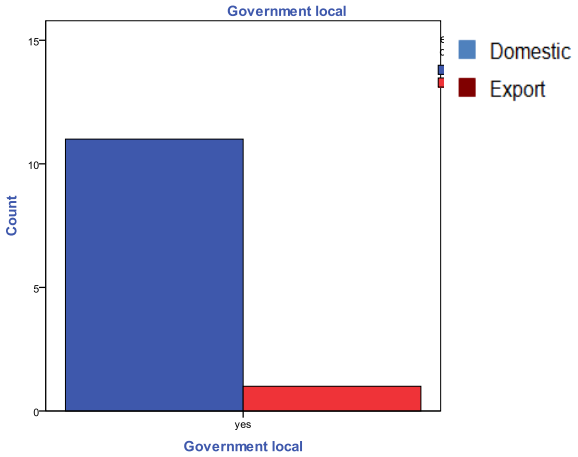


Table 5.5.8: Domestic vs. Export Cross tabulation, Government Local

Government local * Domestic versus Exports Cross tabulation					
			domestic	export	Total
Government local	no	Count	28	34	62
		% within Government local	45.2%	54.8%	100.0%
		% within export vs domestic	71.8%	97.1%	83.8%
		% of Total	37.8%	45.9%	83.8%
	yes	Count	11	1	12
		% within Government local	91.7%	8.3%	100.0%
		% within export vs domestic	28.2%	2.9%	16.2%
		% of Total	14.9%	1.4%	16.2%
Total		Count	39	35	74
		% within Government local	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.8: Chi Square results Government Local

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.723[a]	1	**.003**		
Continuity Correction[b]	6.957	1	.008		
Likelihood Ratio	10.117	1	.001		
Fisher's Exact Test				.004	.003
Linear-by-Linear Association	8.605	1	.003		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.68.
b. Computed only for a 2x2 table

Result Government Local:

Assumptions met; p-value highly significant.

5.5.9 Local Universities

Given table 5.5.9 and diagram 5.5.9 it is clear that the domestic group collaborates more with local universities than does the export group. Overall 72% of the respondents were from the domestic group, the rest being exporters.

From a statistical point of view all the test assumptions have been met and the results are significant as the p value is 0.18.

Therefore in summary it is fair to confirm that more domestic firms collaborate with local universities than do export firms with regards to their respective innovations.

Diagram 5.5.9: Histogram Local Universities, Domestic vs. Export

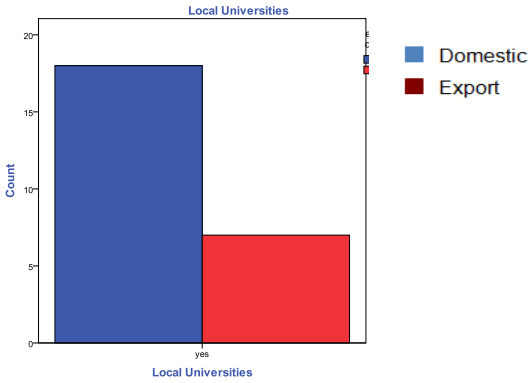


Table 5.5.9: Domestic vs. Export Cross tabulation, Local Universities

Local Universities * domestic versus Cross tabulation					
			domestic	export	Total
Local Universities	no	Count	21	28	49
		% within Local Universities	42.9%	57.1%	100.0%
		% within export vs domestic	53.8%	80.0%	66.2%
		% of Total	28.4%	37.8%	66.2%
	yes	Count	18	7	25
		% within Local Universities	72.0%	28.0%	100.0%
		% within export vs domestic	46.2%	20.0%	33.8%
		% of Total	24.3%	9.5%	33.8%
Total		Count	39	35	74
		% within Local Universities	52.7%	47.3%	100.0%
		% within export vs domestic	100.0%	100.0%	100.0%
		% of Total	52.7%	47.3%	100.0%

Box 5.5.9: Chi Square results Universities Local

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.640[a]	1	**.018**		
Continuity Correction[b]	4.532	1	.033		
Likelihood Ratio	5.797	1	.016		
Fisher's Exact Test				.026	.016
Linear-by-Linear Association	5.564	1	.018		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.82.
b. Computed only for a 2x2 table

Result Local Universities:

Assumptions met, p-value significant.

5.5.10 Foreign Universities

Although it is clear from table 5.5.10 and diagram 5.5.10, that more domestic firms collaborate with foreign universities for their innovations. It must be noted that only 15% of the respondents actually confirmed that they are engaged in collaborative innovations. The remaining 85% indicate that they do not engage in any form of collaborative innovation regardless of whether or not they export or only supply the domestic South African market. Still this remains interesting as one would naturally expect the exporting firms to be far more inclined to collaborate abroad than local domestic firms.

Statistically speaking all the assumptions for the tests have been met however the p value is greater than 0.1 and as such these results are not significant to

statistically confirm that domestic firms collaborate more with foreign universities than export firms for their respective innovations.

Diagram 5.5.10: Histogram Foreign Universities, Domestic vs. Export

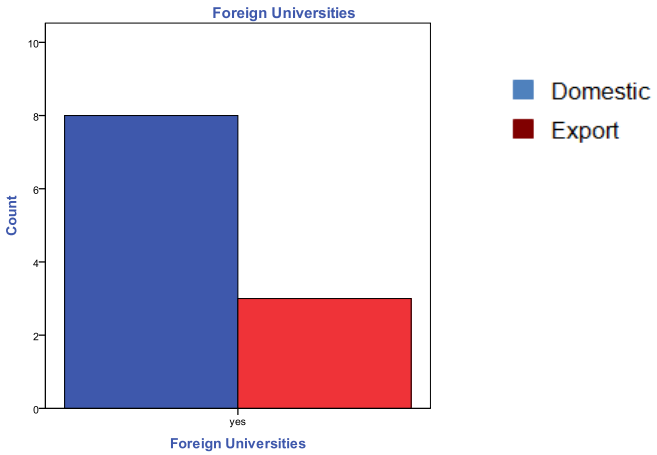


Table 5.5.10: Domestic vs. Export Cross tabulation, Foreign Universities

Foreign Universities * Domestic versus Export Cross tabulation					
			domestic	export	Total
Foreign Universities	no	Count	31	32	63
		% within Foreign Universities	49.2%	50.8%	100.0%
		% within export vs domestic	79.5%	91.4%	85.1%
		% of Total	41.9%	43.2%	85.1%
	yes	Count	8	3	11
		% within Foreign Universities	72.7%	27.3%	100.0%
		% within export vs domestic	20.5%	8.6%	14.9%
		% of Total	10.8%	4.1%	14.9%
Total		Count	39	35	74
		% within Foreign Universities	52.7%	47.3%	100.0%

	% within export vs domestic	100.0%	100.0%	100.0%
	% of Total	52.7%	47.3%	100.0%

Box 5.5.10: Chi Square results Universities Foreign

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.078[a]	1	**.149**		
Continuity Correction[b]	1.242	1	.265		
Likelihood Ratio	2.158	1	.142		
Fisher's Exact Test				.198	.132
Linear-by-Linear Association	2.050	1	.152		
N of Valid Cases	74				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.20.
b. Computed only for a 2x2 table

Result Foreign Universities:
Assumptions met but p-value not significant.

5.5.4 Summary of Results:

Table 5.5.4: Summary of Results

Summary Level Of Collaboration							
	Domestic		Export		P Value	Level of Significance	Results
	Total = 39	%	Total = 35	%			
Clients Local	21	53.8%	11	31.4%	0.52	Moderately Significant	"Domestic" firms collaborate more with local clients than "Export" firms
Clients Foreign	7	17.9%	9	25.7%	0.418	Not Significant	We cannot infere that there is a statistical differance in the collaboration between domestic vs export firms with regards to foreign client
Suppliers Local	23	50%	9	25.7%	0.04	Highly Significant	Domestic firms collaborate more with local suppliers than "Export" firms
Suppliers Foreign	14	35.9%	8	22.9%	0.22	Not Significant	We cannot infere that there is a statistical differance in the collaboration between domestic vs export firms with regards to foreign suppliers
Competitors Local	11	28%	4	11%	0.073	Moderately Significant	Domestic firms collaborate more with local competitors than "Export" firms
Competitors Foreign	2	5.1%	2	5.7%	0.911	Assumptions not met, test not statistically significant	assumption not satisfied, therefore cannot make statistical inferences
Consultancy Local	15	38.5%	5	14.3%	0.019	Highly Significant	Domestic firms collaborate more with local consultancy companies than "Export" firms
Consultancy Foreign	6	15.4%	3	8.6%	0.371	Assumptions not met, test not statistically significant	We cannot infere that there is a statistical differance in the collaboration between domestic vs export firms with regards to consultancy companies foreign
Government Local	11	28.2%	1	2.9%	0.003	Highly Significant	Domestic firms collaborate more with local government than "Export" firms
Government Foreign	2	5.1%	3	8.6%	0.556	Assumptions not met, test not statistically significant	assumption not satisfied, therefore cannot make statistical inferences
Local Universities	18	46.2%	7	0.20	0.018	Significant	Domestic firms collaborate more with local universities than "Export" firms
Foreign Universities	8	20.5%	3	8.6%	0.149	Not Significant	We cannot infere that there is a statistical differance in the collaboration between domestic vs export firms with regards to foreign universities

In summary, given the results as described above, it is fair to conclude that the domestic group collaborates more with local clients, suppliers, competitors, consultancy companies, government and local universities than does the export group for their innovations.

In respect of foreign clients, suppliers, competitors, consultancy companies, government and foreign universities the test results were either not applicable, as the test assumptions were not met, or not significant. Either way we can only conclude that little or no innovative collaboration exists in the agro processing industry with foreign institutions, regardless of whether or not you export into a developed context or supply only the local South African market.

Table 5.5.4 below is a summary of the statistical results for hypothesis 2. The table is split into the two primary groups namely domestic and exporters, with respective p-values and resulting level of significance. For example 21 of the possible 39 domestic respondents answered “yes” to collaboration with “clients local” which is a total of 53.8% of the available respondents. When compared to the export category only 11 of the possible 35 respondents answered “yes” to collaboration with “local clients”, a total of 31.4% of the available respondents. The corresponding p-value for this test is 0.52 which is moderately significant, although border line highly significant. As such we can conclude that more domestic firms collaborate with “local clients” than do export firms.

6. Interpretation of Results

From the literature it is safe to conclude, at a high level, in a manufacturing environment innovation is primarily either product based or process based or the two forms of innovation are intertwined with one another. When the firm in question engages in product innovation it goes without saying that the firm will also engage in process innovation (Mytelka, 2000; Klepper 1996). Further more, the literature indicates, that if the firm is an exporter into a developed context then the firm will engage in process based innovation, and if the firm is not an exporter and only supplies its domestic market then the firm engages purely in product based innovations.

This resonates more when one considers the context within which the firm is operating. For example, if the firm in question is operating in a developing country and exporting into a developed country then the firm must, if it has not already, improve its manufacturing processes to ensure compliance with the regulations of the developed country into which it wishes to export. It has been noted in the literature that these regulations can, whether intentional or not, act as a barrier to trade for the firm which does not comply with the regulatory bodies requirements. For the firm which only wishes to supply its domestic market, whether developed or not, this firm engages in product based innovations which are driven through market demand or consumer demand up the supply chain to the manufacturer. As such the literature conclusively points that the firm which supplies only its domestic

market will have a higher proportion of product based innovation and the exporting firm will have a higher proportion of process based innovation.

This study, however, does not support the overall literature as stated above. In fact overwhelmingly this research indicates that there is little to no evidence that the two groups differ at all with regards to product based innovations, process based innovations or total innovativeness. We can only therefore conclude that within the South African agro processing industry there is no difference in the levels of innovation whether product based or process based for firms which either only supply the South African market or only export into a developed context.

It important at this point to contextualise the South African agro processing industry, and also given the nature of this research, how the South African agro processing industry compares to its developed international counter parts.

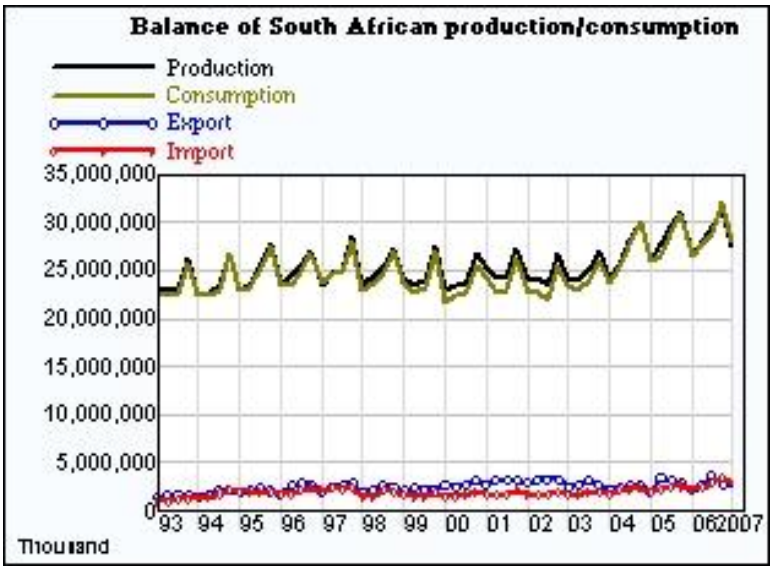
The South African agro processing industry contributes about 3.2% to the total GDP of the country; the main industries in South Africa are chemicals and mining industries. The industry itself contributes about 4% to the countries total exports valued at about R24 billion. (The Department of Trade and Industry; 2011)

At a global level South Africa is not a natural agro processing country. Generally speaking our cost to manufacture one ton of wheat, maize, flour, pasta, rice, vegetables is far higher than that of other nations in the world. The broad environmental conditions in South Africa are not conducive to farming, be it the correct soil conditions, the availability of water and or the cost of labour.

Comparatively when compared to the rest of the world for example, Brazil, China, North America, South Africa is not competitive in terms of both cost to produce a ton of raw materials and also the respective yields gained from one hectare of available production.

As such the willingness of the manufacturers and the overall ability of the manufacturers to innovate in this sector is dampened. When the domestic agro processing manufacturers opt into the export market, they do so with the knowledge that they are competing against nations with excess capacity where supply far exceeds demand and as such have a greater propensity or willingness to innovate. Given this generally speaking South Africa tends not to export great quantities of its agro processing output and consumes majority of the value added agro processing foods domestically. This is evidenced from Diagram 6 below where it is apparent that, as a nation, South Africa more or less consumes what it produces. It is also apparent from this diagram that exporting makes up a small portion of what is produced nationally.

Diagram 6: South African Agro Processing Industry Production vs Consumption



(Source www.thedti.gov.za)

Given that the South African agro processing industry is dominated by local consumption, this could indicate why, when reviewing the data, the export group did not differ from the domestic group as the domestic group sets the standards for the entire industry in respect of levels of innovation. Manufacturers which would be excluded from the above are those that export specialised products unique to the South African industry, for example South Africa is the only producer of the tea crop, Rooibos, and as such exports great quantities of this abroad.

Further to the above, this study investigated what the sources of innovations are for the two groups in question. The results of this research overwhelmingly indicate that the domestic group differs considerably from the export group in terms of the development and sources of innovations.

Overwhelmingly this research concluded that domestic firms collaborate far more with local institutions than do the export firms for their innovations. Further to this the export firms engage in very little innovative collaboration with international institutions, contrary to what one might expect given that this group is supplying its products off shore. Thus it is fair to conclude that a small quantity, certainly not statistically significant, indicate some form of collaboration with their clients abroad, however for the purposes of this research it is fair to surmise that exporters in the South African agro processing industry collaborate at a micro level with international institutions for innovations.

6.1 Do exporting firms have a higher proportion of process based innovations when compared to non exporting firms?

It is at the firm level that decisions about the commitment of resources to innovations and the innovative strategy of the firm are made (Wakelin 1998) thus the firm itself enjoys or harvests the benefits of innovation and as such needs to tailor its behaviour to innovation. The behaviour of exporting firms certainly tends to differ from those firms which opt not to export. (Damijan, Kostevc & Polanec, 2010; Bernard & Jensen, 1999).

Further to this, exporting increases the probability of becoming a process rather than product innovator (Damijan, Kostevc & Polanec, 2010). Another view point is that process innovation linked to production efficiency, could be the basis of increased productivity and, thus, entry into export markets. (Cassiman & Martinez-Ros, 2007).

Bergfors and Larsson (2009, p262) define process innovation "...as development driven by internal production objectives. Such objectives may be reduction of production costs, higher production yields, improvement of production volumes and product recoveries ...."

The overall literature certainly suggests that the propensity to export, can and will, lead to a change in the behaviour of the firm. This change in behaviour is focused on the ways in which the firm can innovate its processes with a desire to increase capacity for exporting or to meet the importing nation's regulations. This indicates that firms which opt to sell only into their domestic market are less likely to have the burden of upgrading their processes in order to comply with onerous international regulations (Schillhorn van Veen, 2003).

As such exporting is an important determinant of the firm's ability or capability to innovate and the firm's export performance can be measured by its own ability to innovate. Empirical research done by Hirsch and Bijaoui (1985), as cited by Wakekin (1998), considered the relationship between export behaviour and R&D expenditure. The authors confirmed that innovation is an important feature in explaining the exporting firm's ability to innovate; they noted that while basic firm size is required to export, beyond that, firm size is not a major factor.

Conclusive evidence from this research finds that the innovativeness of the South African exporters is no greater than that of the firms which supply only the local South African market across product, process and total innovativeness. Therefore this study does not concur with the literature of Schillhorn van Veen (2003) and

Bernard & Jensen (1999) and Melitz (2003) that exporting firms tend to engage in more process based innovations when compared to their domestic counter parts.

One may need to look at the nature of these exporting firms to establish whether or not they are linked to major international multinationals and as such are able to glean innovative information from counter parts in a foreign country. For example Nestle one of the larger food producers in South Africa has no need to engage in collaborative innovations with its suppliers, customers, competitors or other institutions in export countries as Nestle itself has its own internal international innovation department namely “Nestec” which provides all the required innovations to the operating units worldwide. Similarly, South African Breweries (SAB), one of the world’s largest breweries, who have a presence in practically every continent is able to stream innovations from one business unit to the other and as such is able to standardise its manufacturing practices across its operations, within SAB global unit heads will define this as their latest “best practice” and as such will be rolled out internationally.

From the descriptive data it is noted that only two of the 35 exporting firms were multinationals, as such we can only comment that these are the only firms that are able to leverage off a dense innovation network, the remaining firms would have to collaborate with other institutions for their innovations be they local or international.

Further research could be done to investigate where the stand alone South African exporting agro processing firms, who do not have access to dense innovation networks as would a large multinational, obtain their innovations from.

6.2 Do firms, in a developing context, who supply only into their local market, have a higher proportion of product based innovations?

For firms operating domestically in developing countries, innovation is considered an uninterrupted learning process that develops product designs, modifies organisational management practices and supports modifications to the production process. (Mytelka, 2000). Certainly when considering product innovation in a developing context, strictly speaking, product development will over shadow process development as the emerging country looks for new products to better their current life styles (Chandra & Neelankavil, 2008). This statement indicates that developing nations would have a higher proportion of product innovations over process based innovations.

Bergfors and Larsson (2009, p262) define product innovation "...as development driven by a desire to improve the properties and performance of finished products. Objectives of product innovation may be to develop new products, improve product properties, improve product quality, etc."

Certain literature indicates that in developing economies, innovation is usually about working out how to produce existing goods profitably, through improved processes rather than developing entirely new products (Clark, 2011). A corresponding view to this is in a developing context like South Africa that the incentive for the individual firm to innovate is mainly a desire to increase profits which occurs through either new process innovations that lower costs and/or

through new product innovations which increase demand, resulting in increased revenues from the final product (Brewin, Monchuk & Partridge, 2007).

In this study, the results contradicted those views stated above, in so far as in the South African agro processing industry, firms who only supplied into the South African domestic market did not have a higher proportion of product based innovations when compared to those firms who exported into a developed context. The evidence overwhelmingly suggested that there is no difference between the two groups on any of the parameters be it product innovativeness, process innovativeness or total innovativeness at a regional country level. The results do not quantify the level of innovation between product and process merely that in the South African agro processing industry the level of product and process innovation is the same regardless of the nature of the firm in so far as its propensity to market its products either domestically or internationally through exports into the developed nations.

Again this could be attributed to the fact that the South African agro processing industry is dominated by local consumption and as such those firms which opt to export will not differ vastly from the local manufacturing practices and standards. In conjunction with this the local industry is also dominated by a few large key role players, 70% of the industry is controlled by 10 manufactures (The Department of Trade and Industry, 2006). Given this macro environment, it is no wonder that the export group does not differ considerably from the domestic group with regards to either product or process innovations.

6.3 Do the triggers for innovation differ depending on the environment in which the firm operates?

For this study the environment in which the firm operates relates directly to whether the firm exports abroad or supplies only into its local market i.e. the local South African market. Thus agro processing firms which operate in South Africa will be subjected to various levels of innovation through a variety of sources, be it internal to the firm through its own marketing department or external to the firm through third parties for example clients, suppliers and external R&D departments. In this research we refer to these third parties as institutions, these can either be local institutions which reside in South Africa or foreign institutions which reside in the developed context into which the exporting firms deliver.

The environment in which the firm operate is paramount as this environment, can either foster innovation, or it can be a hindrance to greater levels of innovation. For example regulations can induce environmentally friendly innovations with export potential for a countries domestic industry (Jaffe, Newell and Stavins 2002). In this way governments can get actively involved in supporting the generation of new ideas and innovations (Beise & Rennings, 2001). Adding to this, innovations that are driven by regulations, which are environmental, are generally imposed by a national body (institutions) to meet specific needs of the host nation's requirements. However this does not necessarily mean that these innovations are suited to any other nation, even the domestic nation in which the innovation was born. (Beise & Rennings, 2001).

Even within the environment itself the types of innovation could be prioritised, be it market demand innovations, commonly known as product/pull innovations, or technological innovations, referred to in this study as process or technological push innovations. However empirical research has shown both to be relevant (Porter, 1983)

A relationship therefore exists between innovation and the environment in which the firm operates. This environment can cause innovations to be pushed down the line to the firm, by demand from consumers, or it could be internal to the firm with the desire to improve its own operating procedures and efficiencies. Agro processing manufacturers are constantly on the look-out for new products which consumers demand and can thus create some form of competitive edge in the market. As such these manufactures are constantly innovating their products, although the competition shortly follows that manufacturer has captured the market for a certain period which has created greater brand awareness for a period of time.

This research found conclusive evidence that the environment, as described above, in which the firm operates is a trigger for innovation and those triggers can vary across this environment.

6.4 Exporters rate the requirements of foreign institutions (the environment) as a trigger for innovation.

The environment, into which the exporting firm must deliver, differs vastly from the environment in which the domestic firm operates (Van Beveren & Vandenbussche,

2010; Schillhorn van Veen, 2003). In the context of this study this is even more prominent as these firms are operating in a developing context and exporting into a developed context. Further to this current literature is unable to link a firm's quest for innovation and the propensity to export. Cassiman and Martinez-Ros (2007) fail to find a significant link between firm-level R&D (innovative effort) and the probability of the firm to start exporting (Van Beveren & Vandenbussche, 2010). What is becoming increasingly apparent is that a firm's propensity to export is having a significant impact on its innovative capability (Kastelle & Steen, 2010)

In conjunction with the above we find conclusive literary evidence, that institutions in developed countries, which have high levels of import regulation, to have a positive impact on the exporting nation's levels of innovation. Copley (1998) in his seminal work on innovation and regulation discovered that regulation can promote more innovative behaviour on the part of the exporting firm; if the firm is exporting from a developing context then this has the added benefit of stimulating the local economy through increased levels of employment as the innovation drives increases in productivity.

This study did not go into the depth of discovering whether or not or to what degree an exporting firm has access to foreign universities, foreign government, foreign R&D, or opportunities to share knowledge with the host nations suppliers and competitors. The virtue of the fact that they have successfully exported one can only conclude that the network or the ability to access the innovation network is there. For example the exporter can access competitor products in the market

place and reverse engineer them if need be. As such competing in foreign markets allows local firms to amass market and technological information which allows them to respond to economic signals in their domestic market (Salomon, 2002)

The results of this study support this claim in so far as firms operating in the agro processing industry in South Africa exporting into a developed context do not show a significant propensity to engage with foreign institutions for their innovations. At a broad average only 13.3% of the exporting firms responded “yes” to engaging in innovative activities with foreign institutions. By far the majority of exporters responded to engaging more with their “local clients” for their innovations than any other institution, this was closely followed by the exporting firms collaborating with foreign clients next.

Therefore the study cannot confirm that exporters in the South African agro processing industry engage with foreign institutions for their innovations. Does this mean that exporting firms are not innovating in South Africa? No it doesn’t, all that we can deduce is that exporting firms do not look abroad for their innovations and thus we can only infer that should they be innovating they can only be looking within the local domestic market or gaining their innovations through their multinational links.

6.5 Do agro processors in South Africa who only supply the domestic market rate local institutions as a trigger for innovation.

The common view is that developing countries, like South Africa, rely on the developed countries for their innovations (Kaplinsky et al.2009). Further to this a

developing country is characterised by institutional (government/universities) inefficiencies and these inefficiencies can roll over to the market itself (Niosi, 2002). As such firms in developing nations could be forced to look to foreign institutions for their innovations or simply copy those innovations which have been released into the market through reverse engineering. Therefore it could be argued that in developing nations like South Africa innovation in its pure form can potentially be missing or severely challenged. One of the main reasons why firms engage in collaborative supply chain networks is to increase the possibility of new product innovations, which leads to improved product quality, new product developed and hopefully improved revenue. (Cassivi, Hadaya, Lefebvre, E, & Lefebvre, L. 2008).

Thus firms in developing countries appreciate that innovations which are not easily copied can create a sustainable competitive advantage over those innovations which are easily reverse engineered and remarketed. These innovations are generally process based innovations and can lead to a reduction in the unit cost of manufacturing the final product which then gives the local firm a competitive advantage in its own industry domestically and potentially in other export industries.

This study found conclusive evidence which overwhelmingly suggests that local firms supplying only the domestic South African market collaborate intensively with local institutions for their innovations. These institutions were categorised into clients, suppliers, consultancies, government, universities and local competitors. Across all these categories domestic firms overwhelmingly collaborated more with

these institutions than did those firms which export. As such it is only reasonable to conclude that agro processing firms operating only in a local context rely heavily on local institutions for their innovations. As such a strong network must exist between local firms supplying only into their domestic environment and the respective institutions which operate in that environment. Thus the findings in this study do not support the overall literature that firms in a developing context, like South Africa, must rely on institutions in a developed context for their innovations. In fact the results overwhelmingly point to the fact that the local environment is very enabling to innovation. Given that majority of the food processed is consumed locally it is fair to deduce that the South African consumer is conscious of what he/she buys and therefore demands from local manufactures in terms of food innovations.

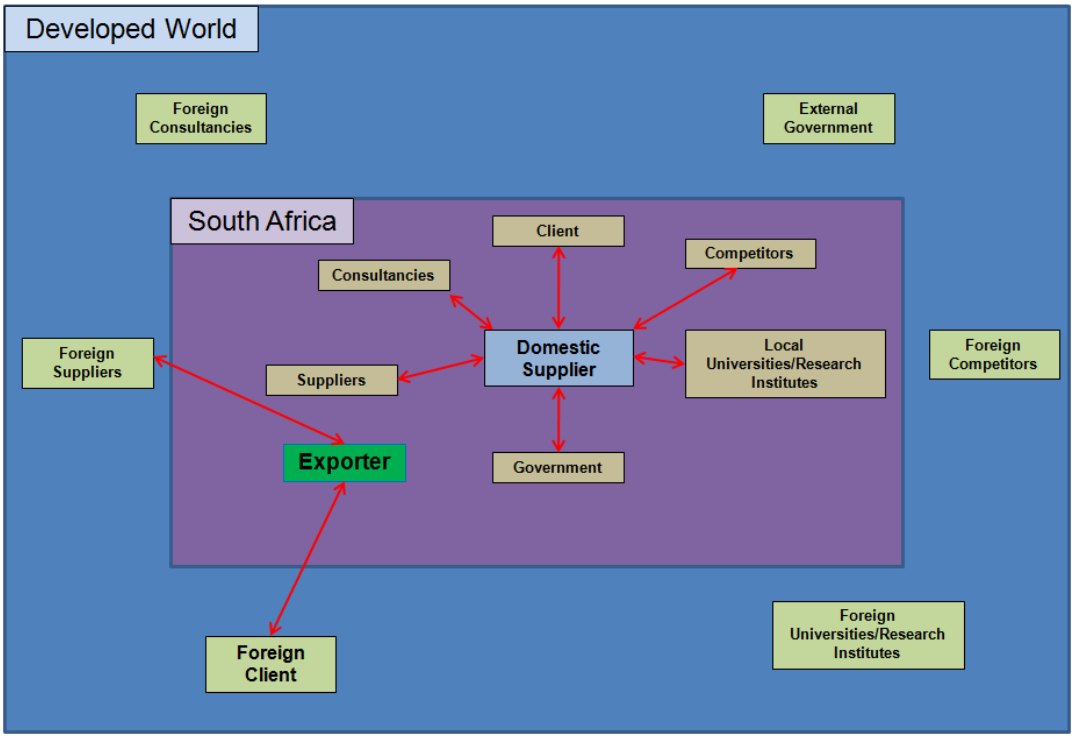
6.6 Innovation, innovation networks and its impact on the South African agro processing industry

“One way of understanding innovation processes is to view innovation as the result of connections.” (Kastelle & Steen, 2010, pg 75).

The above definition links innovation to networks, in so far as networks help drive innovations. These innovations or the innovative requirements of firms build connections between people, which in turn develop new technologies. These technologies can result in an increase in the firm’s levels of production which have been spurred on by the development of new processes. These new processes can create the capacity and capability to produce new products which in turn creates new knowledge.

The innovative network in this study looked at the link between South African agro processing industry, and its ability to supply new products into its regional market relative to its propensity to export into the developed nations and the resultant impact on the industries level of process innovations. As illustrated by diagram 6.6, the results predominantly found that the levels of product/ process innovation between exporters and regional suppliers was the same, indicating that the network gained through exporting, from a South African perspective, does not have an impact on the innovativeness of the firms. However this the study did establish that the firms which supply only into the local market have higher levels of collaborative behaviour with local institutions when compared to their export counterparts.

Diagram 6.6: South African Agro Processing Collaborative Networks Export vs. Domestic.



As can be seen from diagram 6.6 the stakeholders in this network are the agro processors clients, suppliers, competitors, or local/regional universities and finally local or foreign government. For the agro processor the impact of this study is to understand and interpret how their respective networks, as highlighted above, can be improved or enhanced. The objective of this is to develop a strategy around the available network in order to increase their respective total innovativeness, which includes an increase in the firm's ability to innovate its product and its processes regardless of whether the firm exports or only supplies its regional market.

For the purposes of this study it is fair therefore to conclude that the domestic agro processing manufacturers have developed collaborative networks with their various stakeholders to a greater extent than have their export counterparts. However, when it comes to overall innovativeness, defined as a combination of product and process innovativeness, the export firms and the domestic firms are equally innovative.

7. Conclusion and Recommendations:

7.1 Conclusion

Innovation is seen as one of the key drivers in today's ever-growing time-sensitive environment for a firm's sustainable competitive survival. Schumpeter emphasised the role of the market as a dominant force for the firm's innovation activities. Thus confirming the direct link between the market place, how it is divided, and its impact on the firm's types of innovation, and for the purposes of this study, the innovative impact the market can have on whether the firm exports or only supplies domestically.

One of the key drivers of an organisation is its ability to innovate in order to enter new markets and to grow its current market share within the market in which it currently operates. In order to achieve this, organisations must invest capital in R&D, which results in further fixed asset capital expenditure. In short, innovation is not cheap; however the opportunity cost of not innovating is greater than that of innovating. Given today's highly competitive environment the option of not innovating is simply not an option if the firm's vision is to operate sustainably into the future.

What drives an organisation to innovate can depend, but is not limited to, on whether the organisation is being pushed by consumers to develop new and improved product features or organisations can be forced to innovate should they wish to penetrate new markets, thereby increasing competition, which in turn

forces other manufacturers into innovating to survive and so the wheel of innovation begins.

Further to this networks play an integral role in terms of how organisations innovate. Network researchers believe that the more connected a firm is to its network the greater will be its ability to innovate and transfer knowledge to where it is most valuable (Kastelle & Steen, 2010). Logic prevails therefore, that network connected firms are able to solve problems faster as they have the ability to tap into a significantly deeper knowledge base from collaboration with technology partners, clients, suppliers, governments and research institutions. The result of which is inter-organizational collaboration, which enhances knowledge generation, creates an environment where risks can be shared between the collaborators, assets can be used for the greater good of all, and potentially centralisation allowing for further economies of scale. Thus networks play a key role in driving collaboration, bringing all stakeholders considerably closer to one another, stripping out unnecessary supply chain costs, thereby creating an innovation conducive environment, whose outcome could be a new product a new service or an innovative means of manufacturing.

This study attempted to establish whether or not the nature of the innovation can vary depending on the environment in which the firm operates. More specifically if the firm in question is classified as an exporter does this firm have a greater inclination toward process innovation and conversely, if the firm is considered purely a domestic supplier into only the local South African market, does this firm

have a greater inclination toward purely product based innovations? The central argument is that firms which opt to export, operate in a distinctly different environment compared to those which opt only to supply domestically. It is argued that exporters, specifically in the agro processing industry, are subjected to greater scrutiny by regulators who protect their local industry from inferior products. As such, South African agro processing exporters need to invest innovative time in their manufacturing processes, either to improve the quality of their output, or to increase the capacity of their plants. Either way it was argued from the literature that exporting agro processing firms invest innovative capacity in improving their processes as opposed to their final products.

Keeping the above theory in mind, this study also set out to establish whether those firms which opted not to export and as such were not exposed to institutional regulations, tended to invest innovative capacity in their market demand requirements and as such invested organisational time and effort into developing new products to satisfy said market demand. The central argument from the literature supported this claim that those firms which opt into purely supplying their domestic markets tend to invest greater effort into product innovations. The results of this study did not establish any evidence which supported the greater literature for both premises. As such no evidence could be found from the results which would allow us to conclusively state, that where the South African agro processing industry is concerned, there is a difference in innovative focus depending on whether the firm in question is defined as an exporter or a regional supplier.

Therefore for the purposes of this study we can only conclude that the levels of innovation, regardless of whether product focused or process focused, do not vary at all given the fact that the firm in question is either a exporter or only supplies its domestic market.

Given the above this study also attempts to describe how the triggers for innovation can vary depending on the environment in which the firm is operating, the environment being defined as either the export market or the domestic market. As such this study attempted to establish whether the two groups differed vastly with regards to where they looked for innovations. This research verified that domestic firms definitely collaborated far more with local institutions than did the export firms. Initially indicating that although exporters do obtain some of their innovations from local institutions it is far less when compared to the domestic agro processing firms. Unfortunately the results did not show any statistical significance when comparing the collaborative behaviour of exporting firms and domestic firms to foreign institutions. As such we can still only infer that domestic agro processes have greater levels of collaboration with local institutions. Further studies could be done on who exporting firms collaborate with for their innovations.

7.2 Recommendation to Stakeholders

The following describes the various recommendations to the stakeholders given the finding of this research.

a) The agro processing manufacturers

It's paramount given that South Africa is a developing nation in desperate need to drive employment figures that firms understand how and where they are able grow and leverage off innovative opportunities. As such South African agro processing firms may want to investigate whether or not further opportunity exists to grow exports if greater ties are built with international institutions. This may well require that the exporter break away from the grip of the domestic manufacturing practises and invest capital in their manufacturing processes creating the opportunity to export.

It is recommended that the local agro processing industry engage more with the global network that exists in order to try and capture some of the innovations taken place in the international arena. One way of doing this is to attend as many of the global agro processing expos as possible, for example Anuga. This alone will create networks with other manufacturers of a similar nature in the international arena. Manufactures could pool their purchases to create one large procurement arm and as such gain volumetric discounts from suppliers. For example, the South African bean canning industry is dominated by one large manufacturer and followed up by a host

of smaller micro manufacturers. If all the micro manufacturers combined all their raw material requirements into one pool they will be able to drop the input cost of their raw materials and have the opportunity to compete with the larger role player.

Local manufacturers should also as far as possible try to develop greater bonds with the department of trade and industry, DTI, this could mean or lead the creation of a public private partnership. The important point is that government has the necessary funding to either promote greater exports on the world market and or further protect the domestic industry.

Further to this it is highly recommended that both domestic agro processing suppliers and export suppliers understand how they can improve the levels of innovative collaboration with foreign institutions. This research tends to indicate that agro processing firms tend only to engage with regional institutions for their innovations, this in itself creates a very thin network and a small world view. As such agro processors need to start to actively develop formalised innovation structures with foreign institutions be it foreign clients, suppliers and even potential competitors. With the advent of technology and social networks the world continues to get smaller and smaller. Networking and the ability to leverage off dense networks will help create a sustainable competitive platform for any organisation who wishes to compete on a global or local platform for the foreseeable future.

Organisations which opt to ignore collaborative networks do so at their own peril.

b) The agro processing industry bodies

The agro processing industry is represented by many institutions focusing on each particular sector of the industry. These institutional bodies have a responsibility to the industry to understand how local organisations are able to leverage off the latest technologies in order to improve their efficiencies and overall profitability. Unfortunately this type of innovation can and generally does lead to a reduction in labour, which given the current South African government's mandate is a reasonably sensitive issue. Given this, local government does not support the investment in modern means of processing, and as such the South African agro processing industry runs the risk of being excluded from the market due to being uncompetitively priced. The result of not investing in new modern more efficient technology can cause an industry to collapse and over time the supplier will continually be unable to fulfil its orders efficiently when compared to its counterparts in the industry. Therefore, although not aligned to the overall political domestic drivers, the institutions which manage the various facets of the agro processing industry need to be pushing innovations down the line to a firm level, such that these organisations can remain competitive and as such remain in operation for longer. It is recommended therefore that the industry specific bodies within the agro processing industry significantly improve their

respective collaboration in international networks in order to harvest off improvements in operational abilities, improvements in supply chain efficiencies and potentially leverage off global economies of scale.

7.3 Recommendation for further research

The recommendations for future research are:

a) It is recommended that future research be specifically done on exporting firms in order to establish firstly the actual levels of innovation for the exporters, when compared to similar institutions in other nations, secondly to understand in greater detail whether or not, if the South African agro processing exporters innovated more along process lines, could they gain a greater share of the developed world's export market?

b) It is also suggested that further research be done with regards to how South African agro processing firms can develop deeper innovation networks in order to leverage off greater collaborative efforts to improve the local product development standards and the standards of agro processing industry in South Africa as a whole. This will raise the level of awareness of the local industry on the international export platforms. The South African agro processing industry needs to be perceived in the international market as starting to add greater value to local resources rather than exporting consumer food commodities, like fruit, in bulk, and having then third parties adding the value abroad.

c) It would be interesting to perform research on the agro processing firms in other developing countries like China, Brazil and India to compare results and see if other developing countries also do not differ with regards to where they focus their innovative efforts. As an example given China's propensity to export, one might assume that it is heavily focused on innovating along processes as opposed to products, as such further research could take place to test whether the trends are the same as the South African industry as reported in this study and to conclude given the new results whether or not there could be any specific learning's for the South African agro processing industry.

d) It would also be interesting to extend this research into other sectors of the South African economy to establish if similar patterns of innovation exist in other industries within South Africa and as such what can or could be done at a trade and industry level to enhance the image South Africa has on the international trade platform in terms of its perception as an innovator. For example, it is common knowledge that India is seen as a global super power with regards to its levels of innovation and innovative ability, a prime example would be the Tata group, and from this example, South Africa needs to start to emerge in the global market as being seen as a global super power of innovations should it wish to sustain growth for its people for the long term.

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Appendix 1:
Questionnaire:

- Answer by placing a cross in the relevant box, except where a written comment is needed.
- Answer for your specific enterprise e.g. stand-alone firm or specific subsidiary etc.
- Answer all questions as they relate to your enterprise in 2008.
- Where data for three previous years are requested, include 2006, 2007 and 2008.
- The abbreviation 'MNC' is used for 'multi-national corporation' throughout the survey.

1. Please briefly describe your enterprise's main product (goods or services)

1.1	Agro-processing	
1.2	ICT	
1.3	Automotive	

1.1.Main areas of focus (agro-processing)

101	Processing and preserving of meat and production of meat products	
102	Processing and preserving of fish, crustaceans and molluscs	
103	Processing and preserving of fruit and vegetables	
104	Manufacture of vegetable and animal oils and fats	
105	Manufacture of dairy products	
106	Manufacture of grain mill products, starches and starch products	
107	Manufacture of bakery and farinaceous products	
108	Manufacture of other food products	
109	Manufacture of prepared animal feeds	

1.2. Main areas of focus (ICT)

26:30:00	Manufacture of communication equipment	
62:01:00	Computer programming activities (This class includes the writing, modifying, testing and supporting of software)	
62:02:00	Computer consultancy activities	
62:03:00	Computer facilities management activities	
62:09:00	Other information technology and computer service activities	

1.3.Main areas of focus (automotive)

25241	Manufacture of technical parts and accessories of plastic	
28408	Pressing, stamping and roll forming	
2914	Manufacture of bearings, gears, gearing and driving elements	
3161	Manufacture of electrical equipment for engines and vehicles	
343	Manufacture of parts and accessories for motor vehicles and their engines	
74205	Engineering activities for projects in specific technical fields	
	Others	

Others (please indicate)

2. Are you:

2.1	A standalone company?	
2.2	A subsidiary of an MNC?	
2.3	The headquarters of an MNC?	

3.1. How many full-time equivalent (FTE) employees does your enterprise have?

3.1	Fewer than 10 FTE employees	
3.2	10 to 49 employees	
3.3	50 to 249 employees	
3.4	250 to 999 employees	
3.5	1000 or more employees	

3.2. Does your enterprise have a significant share of sales activity abroad?

YES		
NO		

3.2.1. If you answered 'Yes' to the question above then please provide the percentage (%) of total sales derived from export.

%	

3.3. Do you have significant R&D activity?

YES		
NO		

3.3.1. If you answered 'Yes' to the above then please estimate the number of full time equivalents employed in R&D.

4.1. In geographical terms, is your enterprise's largest market?

4.1.1	Internal to your enterprise	
4.1.2	A regional market (local region in your country)	
4.1.3	Domestic market (rest of the country)	
4.1.4	An export market	

4.2. If an export market (4.1.4) was selected then please indicate the 3 most important destinations in terms of sales.

4.2.1	North America	
4.2.2	South America	
4.2.3	Western Europe	
4.2.4	Central and Eastern Europe	
4.2.5	Africa	
4.2.6	Japan & Australasia	
4.2.7	Rest of Asia	
4.2.8	The rest of the world (developing)	

5. Which is the most important source of technology for your enterprise (including hardware, software and knowledge)?

5.1	We produce most technological inputs in-house	
5.2	We buy most of our inputs from other branches of our own MNC	
5.3	We buy most of our technological inputs from non-MNC firms	
5.4	We buy most of our inputs from MNCs with which we are not formally connected	
5.5	We buy most of our inputs from public-sector organisations, e.g. research institutes, universities etc	

6. Please indicate if your enterprise experienced innovation in the past 3 years (2006-2008) in any of the following. You may tick more than one option.

		New to the world	New to the industry	New to the firm	None
6.1	New products				
6.2	New services				
6.3	New or significantly improved methods of manufacturing or producing				
6.4	New or significantly improved logistics, distribution or delivery methods for your inputs, goods and services				
6.5	New or significantly improved supporting activities for your processes (e.g. purchasing, accounting, maintenance systems etc.)				

7. Regarding the development of the most important innovation of your firm in the last 3 years: who did you actively collaborate with and in which geographical location? Region refers to a sub national area, please select all that apply.

		Your Region	Your Country	North America	South America	Western Europe	Central & Eastern Europe	Africa	Japan & Australasia	Rest of Asia
7.1	Clients									
7.2	Suppliers									
7.3	Competitors									
7.4	Consultancy companies									
7.5	Government									
7.6	Local Universities/Research Institutions/Labs									
7.7	Foreign Universities/Research Institutions/Labs									
7.8	Other									

8. Has your enterprise developed formal/informal linkages (e.g. research relationships) with the following kinds of foreign organizations? (*Informal* implies no written contract or financial obligation exists)
Please tick all relevant boxes.

		Yes, formal	Yes, informal	No
8.1	Clients			
8.2	Suppliers			
8.3	Competitors			
8.4	Consultancy companies			
8.5	Government			
8.6	Foreign universities/research institutions/labs			
8.7	Other			

Other (please specify)

9.1. Regarding internationalisation, does your firm offshore (or has your firm offshored) production or any R&D activities? (*Offshoring* encompasses activities both internal and external to the firm for the purposes of serving home country or global markets in a location outside the enterprise's home country)

YES		
NO		

9.2. Complete only if 'Yes' selected in Question 9.1 above.
What were the important regional factors in the decision to offshore your enterprise's production and/or R&D innovation activities into a host region(s)?
Mark all important factors.

		Offshoring of production	Offshoring of innovation
9.2.1	Availability of specialised knowledge in the host region		
9.2.2	Availability of qualified human capital at a lower cost than in your own country		
9.2.3	Access to knowledge infrastructure and services in the host region (R&D infrastructure, technical support services etc.)		
9.2.4	Access to other infrastructure, cheaper production resources and services (land, inputs or unskilled labour, ICT, electricity, roads, airports, ports etc.)		
9.2.5	Opportunity to sell existing products and achieve greater access into new markets		
9.2.6	Incentives for the location of activities in the host region (e.g. favourable regulations, special tax regimes, testing facilities and trials etc.)		
9.2.7	Efficient financial markets (including Venture Capital)		
9.2.8	The level of ethical standards and trust		
9.2.9	The enforcement of intellectual property rights		
9.2.10	Following clients who are outsourcing i.e. 'follow sourcing'		
9.2.11	Other, please specify below		

Other (please specify)

10. Please indicate how the following functions are performed by your enterprise, including different subsidiaries of the same firm. Please select all that apply.

		By your unit in your location	At subsidiaries of firm in a developed location(s)	At subsidiaries of firm in a developing location(s)	Outsourced to a partner in your country	Outsourced to a partner outside your country in a developed location	Outsourced to a partner outside your country in a developing location
10.1	Strategic Management						
10.2	Product development (research, design and engineering)						
10.3	Marketing, sales and account management						
10.4	Operations (manufacturing, service supply)						
10.5	Procurement, logistics, distribution (obtaining, storing and transporting inputs and outputs)						
10.6	Corporate governance (legal, finance, accounting, government relations)						
10.7	Human resource management						
10.8	Technology and process development (maintenance, redesign of equipment)						
10.9	Firm infrastructure (building and maintenance IT systems)						
10.10	Customers and after sales service						

11. Indicate the extent to which the following factors represented a challenge or barrier when developing a new good or service in collaboration with firms, universities or other organisations located <u>abroad</u>?
Please note only one answer may be selected per row.

		Extreme Barrier	Serious Barrier	Moderate Barrier	Small Barrier	Not a barrier at all
11.1	Finding relevant new knowledge					
11.2	Overcoming organisational barriers and gaining management acceptance					
11.3	Changing the current location of operations and the associated cost thereof					
11.4	Managing globally dispersed projects and cultural differences					
11.5	Harmonising tools, structures and processes					

12. During the PAST three years, how did your enterprise experience the following factors in the internationalisation of your innovation activities?

		Highly Negative	Moderately Negative	Moderately Positive	Highly Positive	Factor Not Experienced
12.1	Practical support from centres for the internationalisation of innovation and technology transfer					
12.2	Public incentives and economic support					
12.3	The international exposure and contacts of universities, public research and administrative structures					
12.4	Relevant labour force training and skills					
12.5	The regulations, practice and jurisprudence around intellectual property rights					
12.6	The rules and practice regarding foreign direct					

		Highly Negative	Moderately Negative	Moderately Positive	Highly Positive	Factor Not Experienced
	investment and trade policy					
12.7	The rules and practice regarding migration policy regulations for employing foreign scientists/technicians/expert					
12.8	The availability of risk capital for innovation activities with an international dimension					
12.9	The corporate governance environment (rules concerning firm ownership, shareholder's rights, etc.)					

13. Considering your future innovation activities, please assess the need for improving the following factors:

		Very high need	Moderately high need	Moderately low need	Very low need	Factor not needed
13.1	Practical support from centres for the internationalisation of innovation and technology transfer					
13.2	More public incentives and economic support					
13.3	Better access to international research networks					
13.4	Higher skills in the labour force					
13.5	More stringent regulations, practice and jurisprudence around intellectual property rights					
13.6	Better and clearer rules regarding foreign direct investment and trade					
13.7	More open and flexible migration policy regulations for employing foreign scientists/technicians/experts					
13.8	Greater availability of risk capital for innovation activities with an international dimension					

14. How have you reacted (or are planning to react) to the current global economic crisis?

14.1	Few or no changes	
14.2	Increasing efforts at innovation on your part	
14.3	A serious reduction of your innovative activities	
14.4	Relocation abroad of your innovative activities	
14.5	Relocation of innovative activities to you from abroad	

Contact information

Company	
Address	
Address 2	
City/town	
State	
ZIP/postal code	
Country	
Email address	
Phone number	

THANK YOU!