

ICT Enabled Collaborative Business Environments: A useful tool for extending digital opportunities to rural based SMEs in Namibia

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ABSTRACT

The globalization of supply chains has increased the complexity of logistics and supply chain management. In today's business world, geographic boundaries have become less relevant and the logistic networks now transcend borders and significantly permeate into other economies. As enterprises worldwide grapple to embrace these changes, Small to Medium Entrepreneurs in marginalized communities in Namibia are yet to reap the benefits of the ongoing logistics evolution. Instead they face a number of challenges. Issues such as the digital divide, under-developed market facilities, e.g. storage equipment, and the large distances that have to be travelled to reach economic hubs are just a few examples. Moreover the skewed income distribution between urban and rural communities and the spatial demographic locations of alternative market segments has restricted rural based SMEs to being primary service providers to disadvantaged people. In this paper we critically examine the state of logistics in the Namibian rural market. We provide anecdotal illustrations of how existing public and private sector ICT infrastructure may be mobilized and effectively applied to the entire supply chain. We furthermore highlight the importance of IT applications in supply chain management and its impact on profitability to rural based enterprises. In the end we conclude by providing a generic conceptual model that will facilitate the participation of rural SMEs on the robust global supply chains.

Keywords

Infrastructure, ICT, Namibia, Business, Rural area, Industry collaboration, education, framework.

INTRODUCTION

Fierce competition, the need to reduce costs, and of late the diversification of

consumption patterns, has increased the complexity of supply chain management in Namibia. Although supply chains have existed since time immemorial, the impact of globalization on them today, is far greater than it was before. Since the mid 1990s, supply chains have experienced tremendous and rapid changes (Murphy and Wood 2008). Issues such as rising standards of living, multinational trade alliances and the advent of new technology have all contributed to the intricacy of supply chains. In today's business world, geographic boundaries have become less relevant and the logistic networks now transcend borders and significantly permeate into other economies. Consequently as enterprises worldwide grapple to embrace these changes, focus has been shifted to techniques and management tools that optimize the use of the distribution networks. Contemporary tools currently in use include cloud computing, enterprise resource planning systems, electronic commerce and computer supported collaborative systems.

PROBLEM STATEMENT

While enterprises worldwide exhibit heavy reliance on the use of new supply chain management techniques, Small to Medium Entrepreneurs in marginalized communities in Namibia are yet to adapt to the ongoing logistics evolution. Instead they have to some extent remained far isolated from the events occurring in global supply chains. According to Emongor (2008), although significant levels of adaptation have been recognized in urban based firms, such success has not been replicated in rural based enterprises. Several factors seem to have influenced things in this direction. Mkandawire (2009) cites issues such as the digital divide, under-developed market facilities e.g. storage equipment, large distances that have to be travelled to reach trade centers, and the high overheads emanating from inefficient procurement systems as having all contributed to the current deficit in rural supply chains. Moreover the use of ubiquitous middle men as a strategy to mitigate some of these challenges has proved expensive and at times alienated some entrepreneurs from mainstream supply chains. While most of these challenges are blamed on lack of adequate infrastructure, we argue that this is not entirely true. Our preliminary investigation revealed the availability of public and private sector structures that could be mobilized to eradicate these challenges.

In this paper we critically examine the state of logistics in the Namibian rural market. We draw on a comprehensive literature review and enumerate how existing private and public sector infrastructure maybe mobilized and applied to the entire supply chain. We furthermore highlight the importance of IT applications in supply chain management and its impact on liquidity to rural based enterprises. In the end we conclude by providing a conceptual logistical model that will facilitate the participation of rural SMEs on the robust global supply chains.

CONTEXT

Conceptual and empirical research on Small to Medium Enterprises has long indicated the complexities of researching on this sector (Pasanen 2005). To start with, there is no universally agreed definition of the term SME (Felix 2010), while on the other hand the definitions provided by different scholars at times overlap each other and may have different meanings in different countries (Sten 1998). As a consequence of this semantic pluralism, comparisons of results from studies conducted in different contexts are thus subjective and difficult to aggregate. In light

of this and as our point of departure we will begin by giving brief definitions of key terms that will be used throughout this research.

Definition of terms:

Small to Medium Enterprise (SME)

The definition of an SME varies from region to region. The main criteria that seem to dominate the definition of an SME are the number of employees, annual turnover, and the balance sheet total (Burns 2001). For example the European Union defines an SME as an enterprise that employs less than 250 employees, with a maximum annual turnover of 40 million Euros and a maximum annual balance sheet total of 27 million Euros (Felix 2010). In Namibia, there are several definitions given to the term SME (Hansohm, 1996). But however a widely used definition of the term is given by the Ministry of Trade and Industry. They define an SME as any organization that has an annual turnover of less than N\$1 million and employs less than 10 people. They also split the definition into main two categories i.e. manufacturing and service delivery.

Table 1: Small to Medium Enterprise Definition

Sector	Employment	Turnover (N\$)	Capital (N\$) Employed
Manufacturing	Fewer than 10 persons	1,000,000	500,000
Service	Fewer than 5 persons	250,000	100,000

According to this definition the number of employees must fulfill the criterion together with at least one of the other two criteria (Annual turnover and Capital employed). It should be noted that Namibia’s definition of the SME sector differs from that of the European Union. As a result if Namibian enterprises were to be classified based on the EU definition then most of the enterprises would be small or rather micro-enterprises. In this research we will take the Ministry of Trade and Industry’s definition of an SME.

Information Communication Technology (ICT)

Techtarget (2011) defines Information and Communications Technology (ICT) as an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer networks, hardware/software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. Other similar definitions were given by the Online dictionary (2011) and Thompson (2010). In this research we will align our definition of ICT to that of Techtargget (2011).

The Country in perspective

Namibia covers 825 000 square km and it has one of the lowest population densities in the world i.e. 2.5 people per square km. According to the European Union (2010) country report, in 2009 Namibia had a total population of 2.1 million people of which

approximately 69% were based in rural areas. Emongor (2008) further explains that due to the semi-arid and fragile agro-ecological conditions, the greater part of the landscape is uninhabited and the rural populations are conspicuously concentrated near perennial rivers which form the country’s northern borders, and around flood plains and sometimes along pipelines and water systems such as the Eastern National Water Carrier, which supplies water to residents in the dry areas in eastern and central Namibia. According to the Namibian Tourism Guide (2010) the country is divided into 13 administrative regions, and the physical infrastructure within the regions is fairly developed. Pricewaterhouse (2008) estimates that 5 450 km of the roads are tarred while 37 000 km are gravel. The railway network covers 2 615 km. A few airports exist mainly in Windhoek and the other major towns, while numerous airstrips are dotted across the country.

LOGISTICS AND THE RURAL BUSINESS MODEL

In spite of the existing public and private sector infrastructure within the rural regions, logistical services such as procurement, storage, and transportation are observably expensive. In the end the pricing policies adopted in urban firms largely differ from those found in rural based firms. The First Capital Food Index (2010) demonstrates such price disparities between urban retail outlets and rural-based retail outlets. (See table 2).

Table 2: Price Analysis Urban vs. Rural firms

¹Adapted from First Capital Food Price Index

Good	Description	Average Urban Outlet	Average Rural Outlet
		Jan 2010	Jan 2010
Meat/kg	Pork/Beef	38.65	59.99
Mealie-Meal	12.5kg (Top Score)	81.99	83.99
Milk	Farm Fresh (1L)	12.74	14.99
Cooking Oil	(750ml)	12.74	14.49
Tea	Five Roses (250g)	23.89	33.89
Rice	Tastic (2kg)	38.50	48.50
Sugar	Brown (1kg)	9.98	15.60
Washing Powder	Surf (2kg)	38.50	44.90

The comparative analysis above shows that in the food industry, commodities on

average are more expensive in rural based retail outlets. This analysis substantiates our preliminary findings and we also wish to highlight that while the table above only shows price disparities in the retail food sector, in the bigger picture it depicts a microcosm of the entire rural business model. With this current business model the procurement requirements for the SMEs are serviced by ubiquitous middle men strategically situated in their environment. Furthermore almost across all the industrial sectors rural based SMEs purchase stock in small quantities and in exceptionally quick cycles so as to meet the high demand. Yet the market conditions require that they buy stock in larger volumes and minimize the procurement cycles so as to reduce transaction costs i.e. transport and effort (Merze et al 2007). On the other hand and also as a direct result of the persistent use of the current business model, the SMEs suffer from a) low financial liquidity resulting from distorted cost structures, b) lack of creditworthiness resulting from high insolvency risk, c) poor information on issues such as demand and international trends resulting from the opportunistic behavior of the ubiquitous middle men. Hansholm (2006) points out that during the majority of the transactions the SMEs contribution margins are narrowed when the overheads emanating from inefficient procurement systems are factored into costs. Following Hansholm's observation, one can conclude that the high prices witnessed in rural retail outlets are in actual fact a hallmark of an inherent logistical deficit in rural supply chain management.

However despite the challenges, recent studies by Emongor (2008) and the World Bank (2007) cite the remarkable resourcefulness shown by rural entrepreneurs in their endeavors to minimize costs and overcome existing structural barriers. According to these reports, the formation of cooperatives and other strategic alliances such as Group purchasing schemes (GPS) are testimony of the SMEs¹⁰ efforts to reduce operating expenses and increase revenue.

In the next section we critically assess the various activities done by SMEs in a bid to manage their supply chains. We also highlight the rationale behind some the methods we adopted during assessment of these activities.

METHODOLOGY

In analyzing the activities in rural supply chains we adopted several methods. In this context both quasi and phenomenological approaches were pursued in order to effectively analyze historical and quantitative data. Different tools such as questionnaires, literature reviews, interviews and surveys were employed selectively to achieve each research objective.

The target population was sampled from SMEs operating in Erongo, Okavango, Omusati and Kunene regions. A sample of 50 SMEs were randomly selected from these regions and interviewed. Due to the research being largely qualitative, a thematic approach was adopted. The following themes were identified and investigated.

1. State of supply chains in rural Namibia
2. The ICT landscape in Namibia

¹⁰ The results in Table 2 were adapted from the Capital Food Index and then integrated with other prices we obtained in our investigation.

3. The role of ICT in supply chain management

Also as part of our preliminary survey we investigated four industrial sectors namely small scale mining, the textile industry, carpentry, and agriculture. We chose these four industrial sectors as our target for empirical analysis, mainly for three reasons. First, we identified that these sectors were highly SME-dominated and used traditional business models that were intermediary-oriented. Secondly, we had access to a significant amount of historical data about these sectors from various sources. Third, we noticed that in a Namibian context these sectors for the past 10 years had grown faster than any other sectors in terms of SME participation and overall contribution to the Gross Domestic Product (World Bank 2010).

In the next section we discuss the state of supply chains in these four chosen sectors.

THE STATE OF SUPPLY CHAINS IN RURAL NAMIBIA

Agriculture

In analyzing the state of supply chains in agriculture Emongor (2008) revealed that, while farmers in the northern region were engaged in mixed farming activities, and produced field crops such as mahangu (millet), maize, sorghum and horticulture crops, they were forced to sell their surplus products to their immediate communities at very low prices. This was mainly due to low customer densities and a lack of immediate markets for fresh farm produce. According to Emongor, even though other markets elsewhere could offer better prices, high transaction costs i.e. cost of transportation of produce from production to consumption areas and the preservation requirements for perishable products, discouraged farmers from participating in these inter regional supply chains. Further augmenting this problem was the fact that the SMEs were poorly linked to markets and overly lacked knowledge about alternative market segments for their products. In the end they eventually produced with the hope that their products would sell. Thus harvesting would first take place, and then a frantic search for the market would follow.

In another similar study on the beef supply chain Emongor discovered that rural based SMEs seldom sold their livestock. These infrequent sales were largely influenced by the imbalance between supply and demand. On the market there was a vast amount of cattle, meaning that supply was high, while at macro-level the country's small population meant demand was low. In the end these conflicting forces of supply and demand culminated in a producer surplus which significantly lowered the equilibrium price. To further compound this problem, Emongor also discovered that due to some misconstrued commercial notions in communal areas, animals and livestock were generally considered to be symbols of social and political prestige. In this context the wealth of a farmer was measured in terms of the number of livestock and not the amount of money the farmer could obtain when disposing the livestock. As a result by comparing and contrasting the equilibrium price per beast, against the socio-cultural roles of livestock such as cattle, the SMEs were in a dilemma. Thus in the end they did not optimize the potential cash flows that could be realized over the lifespan of the animals.

Mining

In the mining sector a World Bank (2007) report highlighted that most small-scale miners' sales were principally based on a narrow product range consisting mainly of unprocessed raw materials. These raw materials were susceptible to erratic price swings on both the local and international market, thus making the operating environment dynamic and unpredictable. Such dexterity in the sector had an inhibiting effect rather than a catalytic one. To most SMEs this dexterousness ushered in pitfalls and challenges that made it difficult to manage and project key cross-functional processes such as production, marketing, sales, and distribution.

On a different front a study by Mkandawire (2009) observed that small-scale miners especially those dealing with gemstones often sold their stones at very low producer prices. According to this study, these low prices were strongly correlated to a variety of factors such as mediocre pricing policies, inaccurate demand forecasts, and imprecise knowledge on contemporary buying trends. In an era of transient management themes, these factors eventually became autonomous variables that affected the elasticity of demand. Thus despite the price of the minerals being attractive, the volume of customers trading with the SMEs was astoundingly small. The resultant operating environment thus left the SMEs immensely vulnerable. To this end, the low customer densities coupled with financial instability meant that during the transactions, SMEs were under pressure to sell their stones and offset operating costs. As such customers were the main drivers of the price while the SMEs were passive price takers. On the other hand the security costs and the risks involved in transporting the stones discouraged the SMEs from selling their products in other markets.

In a different context, further buttressing the vulnerabilities of SMEs in this sector, was the fact that with developing global trends, buyers now preferred a significant degree of supplier diversity in their buying portfolios. Unlike in the past they no longer wanted to be overly dependent on one source. Hence by failing to produce a diversified range of products and more so by being unable to orchestrate various cross-functional processes in their supply chains, the SMEs in the end produced a narrow product range and thus missed the opportunity to increase their market share.

Textile

In the textile sector Belleza et al (2003) observed that the majority of SMEs were conspicuously scattered throughout rural areas and often worked alone or in small family units. Given this scenario and the demographic location of raw material suppliers, our preliminary survey revealed that depending on the physical remoteness of the SMEs location, there could be as many as six intermediaries between the raw material supplier and the rural based SMEs. In essence the function of each intermediary was to facilitate the transportation of raw materials to the SMEs without adding any value to the goods as they moved through the value chain. As a result the procurement costs were amplified at each supply chain node as the goods changed hands. According to Mkandawire (2009) this challenge was radically animated by the phenomenon that these middlemen due to their opportunistic attributes, did not offer the SMEs any information or advice on the availability of cheaper alternative procurement sources, nor did they attempt to directly link the SMEs with the raw material suppliers. This trend, significantly eroded the SMEs profit

margins to such an extent that it consequently degraded textile work and embroidery craft to an auxiliary source of family income for most rural based SMEs in this trade. To make matters worse, we also observed that the majority of the entrepreneurs in this sector were women whose business operations were strongly linked to their traditional livelihoods. As a result from a cultural context they found it difficult to diversify operations beyond their home regions.

To sum up Cockroft (2003) unveiled that in the textile industry a significant proportion of the problem was detected mostly by the dynamics of logistics and supply chain management. In view of this, his findings suggest that the success of these isolated SMEs was thus strongly correlated to their ability to manage upstream activities in their supply chains. Hence supply chain management and market intelligence skills invariably became normative benchmarks against which the success of these SMEs could be evaluated. Cockroft's study notably concludes by highlighting that despite most of the SMEs being in possession of the relevant skills essential to produce competitive artifacts, such skills in the end were not fully exploited due to their inability to manage activities and bottlenecks within their supply chains.

Carpentry

In the carpentry sector existing interrelated literature streams (such as Biggs et al 2010; Mukandawire 2009), suggest that small to medium entrepreneurs face relatively high production costs as a result of small volume production. In this regard the industry does not take advantage of economies of scale, nor does it exploit the enhanced capitalization that come with increased production. In our endeavors to trace and establish the cause of this scenario we identified that for most handicrafts producers in Namibia, the investment costs of setting up a new factory were enormous and prohibitive. While on the other hand the coordination of small handicraft producers to supply as a group was complicated especially when considering the stringent quality requirements of large-scale commercial companies which buy in bulk. In the final analysis after opting to supply as a group, the challenge was that each of these small scale enterprises produced different items in terms of quality and product specifications. This brought about additional overheads as far as conformity monitoring and quality assurance was concerned.

Mkandawire (2009) also observed that the carpentry sector as a whole was plagued by huge lead times and possible shortages of raw materials as most of the inputs were procured from other regions. Furthermore he noted that this sector was also heavily dependent on tourism and in recent times the international customers were showing growing concern on issues such as environmental conservation. Thus initiatives and programs to conserve the ecosystems were now part of the marketing mix. The absence of such programs within the SMEs marketing portfolios, mainly due lack of information greatly disadvantaged entrepreneurs in this industry.

In summary the studies cited above tend to substantiate the outcome of the World Bank (2007) report which concluded that most of the challenges faced by Namibian rural entrepreneurs seem to be centered on logistics service delivery and its underlying external factors such as physical remoteness, and the use of a business model that is intermediary-oriented. To reinforce this notion a synopsis of case studies conducted on other environments that faced similar challenges, e.g. those

cited by Mwirungi (2009) not only come to the same conclusion, but surprisingly reveal another peculiar aspect. According to Mwirungi's findings, the majority of rural based SMEs relied on casual walk-in customers who in most cases had no tangible allegiance to the enterprises. This meant the SMEs were merely serving a common pool of clients who could be served by anybody at any time. As a result there were no meaningful relationships between the enterprise and the customer, meaning the enterprises did not benefit from issues such as constructive criticism and advice that usually stem from a committed relationship.

In order to vividly describe this situation, Vorley et al (2009) provides a kaleidoscopic view of the rural business scene. They visualize on one hand an environment which is characterized by numerous and widely dispersed producers, who serve a common pool of customers, have diversified livelihoods, operate in the informal sector, have low access to services such as finance, information and ICT infrastructure, and on the other hand a downstream industry that operates in a concentrated formal economy, with large-scale standardized procedures which are highly risk averse. According to Vorley's conceptual view, a thick layer of ubiquitous middle men then interfaces the two environments. In this analogy the thick interface acts as a semi-permeable membrane that allows diffusion between the two industrial sectors. It is clear that whichever way one looks at it, Vorley et al's highly abstract but encompassing description not only provides an important conceptual archetype, but it also introduces a useful mnemonic that can be employed to analyze the dynamics of the rural business environment.

In synthesizing the various submissions above and also taking into consideration Vorley's conceptual view, we therefore argue that the present set of challenges experienced by rural based SMEs in Namibia can be solved by applying ICT in rural supply chain management. In this regard ICT will provide a more efficient link between the upstream and downstream activities of rural supply chains. In light of this in the next section we will review the ICT landscape in Namibia and also undertake a comprehensive study of how ICT may be integrated into rural supply chain management and whether it will be able to cope and sustain this proposal.

THE ICT LANDSCAPE IN NAMIBIA

According to Sherbourne and Stoke (2010), the country has a good infrastructure establishment consisting of modern GSM 900/1800, GPRS, 3G HSDPA telecommunication systems and a widespread ICT network. The urban telecommunication system and rural communication services are equipped with microwave radio relay links. Connections to other populated places are done using open wire and automated digital network. According to the Telecom Namibia (2010) there are over 160,000 fixed telephone lines rationing approximately 10 people per telephone. On the mobile telephone system, Sherbourne and Stoke estimate that there are 1,637,530 active SIM cards in circulation and the mobile cell phone subscriber base is approximately 1.6 million. At the moment Namibia has roaming agreements with 142 countries (Telecom 2011). Subscribers on both the fixed and mobile network have direct dialing facilities to 240 countries. On the other hand MTC the country's leading mobile phone service provider is currently extending its coverage to include all major roads. At the moment it has 80 base stations set up around the country. These are able to cater for remote areas (e.g. farms) by using an extended cell feature which allows transmission of signals within a 100 km radius of

the base station. The internet speeds are relatively fast with a threshold bandwidth of 4-10Mbps per second (Sherbourne and Stoke 2010).

THE ROLE OF ICT IN SUPPLY CHAIN MANGEMENT

According to Felix (2010), “*the process by which an organization adopts and implements technological inventions is influenced by the technological context, the organizational context, and the environmental context*”. In a Namibian context, based on the prevailing ICT infrastructure, Sherbourne and Stoke argue that the current strategic gap in the development of viable rural business systems can be filled by mobilizing the current ICT infrastructure. According to Rohita (2009) the broad strategic aspects which need to be supported by ICT in a rural context are the crashing of lead times, reduction of turnaround time, improved customer relations, proper inventory management and the removal of middle men. Apart from the strategic aspects, Ajay and Maharaj (2010) also introduce the concept of an emerging ICT enabled information supply chain. They explain that first, by applying ICT in information sharing, compelling customer value propositions can be personalized within the enterprise’s product range and thereby increase the SMEs market share. Secondly by applying ICT in information sharing the various activities in the supply chain can be properly synchronized thereby allowing vertical linkages between domestic and multinational enterprises.

However before ICT may be introduced in rural supply chain management, we feel that it is imperative to temporarily shift attention to places that once had similar challenges and then review how they dealt with them.

CASE STUDY AND KEY LEARNING POINTS

The paragraphs below provide synoptic narrations of how South Africa, a country that once had similar challenges addressed them. In our view apart from merely highlighting the prevalence of the problem, the case study below provides some insights into how Namibia may best resolve its current rural logistic challenges. In order to limit the discussion, we arbitrary review and extract key learning points from experiences encountered in the Sekhukhune Rural Living Lab in South Africa.

The Sekhukhune Rural Living Lab

Background

The Sekhukhune Rural Living Lab was launched in 2006 under the auspices of SAP research (Cunningham and Herselman, 2012). Being part of the ambitious Lisbon agenda, its main aim was to provide incubator services which would foster entrepreneurship and enhance retail supply chain management in rural areas and remote regions in the Limpopo province (Merz et al, 2009). Prior to the launch of this pilot project, a study by De Louw & Dörflinger (2009) revealed that in South Africa, as in most emerging economies, rural based SMEs experienced challenges mainly related to lack of adequate infrastructure, disconnection from economically strong markets, relatively high transport and transaction costs due to long distances from economic hubs, low supply chain volumes, limited economies of scale, inadequate managerial skills, non-awareness of business opportunities, financial instability and

lack of credit worthiness. The Sekhukhune Rural Living Lab project was thus launched as a technological response to these challenges.

Methodology

In order to accomplish the objectives of the living lab, a mobile enabled e-procurement prototype was developed (Merz,C et al, 2009). The prototype consisted of a virtual buying application that could enable entrepreneurs to procure stock via low cost mobile phones through text message (De Louw & Dörflinger 2009). From a functional perspective, a typical process in the prototype was triggered at the rural retail outlet (Spaza shop) with an order placement via a structured text message. To achieve structured text messaging, shop owners were given a username, unique id, and provided with a paper based product catalogue. On this catalogue each product was assigned a unique product code. In this context a valid structured text message consisted of a “username” “unique ID” “product amount x product code”. The structured text message was then forwarded to a remote SMS-C (SMS centre) server where all orders were stored until an Infopreneur logged into the GIS procurement application to synchronize the order list. An Infopreneur was basically a middle man who linked the SMEs to the various suppliers. The Infoprenuer’s main task was to manage and forward order requests to the suppliers. The GIS procurement application of the prototype allowed the Infopreneur to manage the Spaza shops’ business data and geographical information, while on the other hand it also made it possible for suppliers to deliver products at the SMEs doorsteps (Merz et al, 2009).

This mobile-enabled procurement system went live in January 2009, involving about 30 Spaza shops and 2 Infopreneurs responsible for the Sasko delivery route in Kgautswane. The live trial run comprised of a product catalogue with 9 products. During the live trial run Infopreneurs provided further feedback regarding the ability of the application to track orders and the effectiveness of the submission of bulk orders to the suppliers (Merz et al, 2009).

Evaluation and Impact assessment of the living lab

The Sekhukhune Living Lab went through all four different phases of the living lab lifecycle, making it possible to assess and validate the impact of the project (Friedland et al, 2010). According to the results of the pilot project as cited by Merz et al (2009), during the test period, SMEs experienced an increase in turnover. The number of actively ordering Spaza shops on a regular basis increased. The system proved to be stable in a 24 hour, 7 days a week live operation. The participating Infopreneurs made an extra salary of approximately between 200 to 500 ZAR per month, depending on their performance, while suppliers experienced a 2% increase in sales.

From a managerial perspective, the live operation showed that regular change management and end user interaction were most important for the sustainability of the business and technology models. The introduction of a combination of different measures such as information intermediaries, technological innovations, and a franchise-like organizational structure demonstrated the potential of reducing procurement costs on the SMEs side coupled with a radical compression of the order lead time. Beyond that, a systematic analysis by Merz et al (2009), revealed that despite some of these noted successes, challenges such as low literacy levels,

erratic network coverage, low bandwidth, and unreliable infopreneuers were identified during the pilot phase.

Learning points from the Pilot Phase

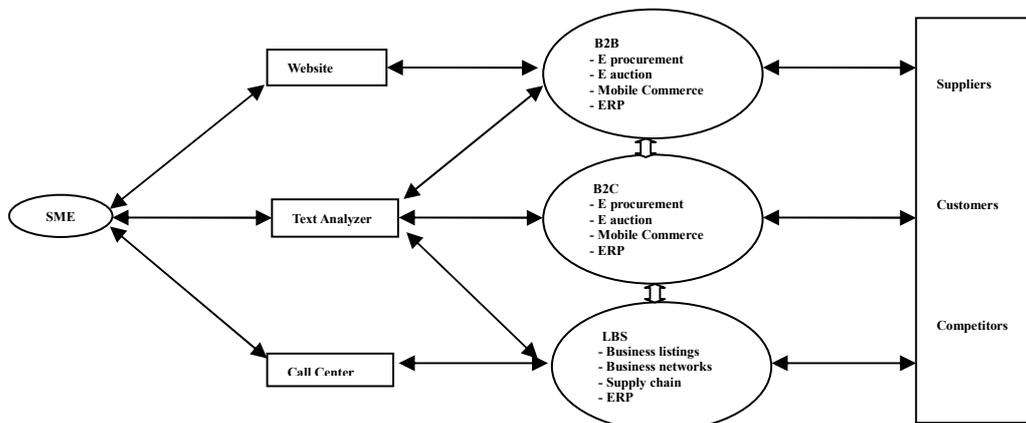
According to Merz et al (2009) the pilot phase highlighted that for the project to be sustainable improvements were needed in the field of network coverage and bandwidth enhancement. The provision for more training to those Spaza shop owners and infopreneuers who had little education was still essential. Also there was need to reduce the 2 SMS that were needed to finish the ordering process to 1 SMS due to a lack of airtime. In addition due to popular demand, the language of the SMS messages was to be changed into Sepedi, a local dialect.

In the next section we consider the key learning points drawn from the Sekhukhune Living Lab and propose a logistical solution suitable for the Namibian rural context.

PROPOSED SOLUTION

In this study we adopt and extend the Sekhukhune Rural Living Lab idea. We acknowledge that while this digitally enabled SAP living lab proposal has ushered in both operational and strategic benefits to rural based SMEs in South Africa, its scope is rather limited and piecemeal. In this study we provide a more encompassing supply chain and business management model. In our context we propose a mobile enabled prototype that will consist of three platforms i.e. an Access link, an Automated broker, and an Online Business Repository. The diagram below illustrates an overview of the proposed model.

Proposed model overview



Access Link Automated Broker Online Business Repository

Diagram 1. Conceptual Model overview

In the next few paragraphs we comprehensively elaborate on the functionality of the model.

Functional summary

The model will consist of two sales portals i.e. a B2B and a B2C Sales portal. The SMEs will use low cost mobile phones to access these portals. The portals will link the SMEs to a virtual community comprising of customers, suppliers, competitors and news groups. A Location based service module in the model will provide the SMEs data and information about activities occurring in their supply chains, and more so it will help the SMEs identify the exact location of these activities. On the other hand the Location based service module will aid suppliers and customers to establish the location of the SMEs during transactions such as purchasing and delivery. All the services of this proposed model will be accessible via low cost mobile phones. The main components of the model will be the Access link, the Automated Broker and the Online Business Repository.

Access Link

The Access link will provide a mobile enabled interface between the SMEs and the system. It will primarily consist of three modules i.e. a Website, a Text Analyzer, and a Call Center. The functionality of each module is discussed in depth below.

Website

The website will enable the SMEs to logon to the sales portals via their mobile phones. Through the sales portals, the SMEs will be able to browse and trigger transactions with the virtual community. The website will also facilitate communication amongst the SMEs themselves.

Text Analyzer

The Text Analyzer will primarily function in instances where the SMEs opt to access the system through text message. The text analyzer will receive the message, analyze it and then route it to the appropriate sales portal. If the analyzer fails to decode the text message it will forward the message to the call center.

Call Center

The call center will comprise of a switchboard where SMEs can call and submit requests. The call center will also from time to time receive and track un-decoded messages from the text analyzer. Upon receipt of an un-decoded message, the call center will track the source of the messages and then call and establish the needs of the SME and if need be then link the SMEs to the appropriate sales portal.

Automated Broker

The Automated broker will provide a digital environment where the SMEs will meet other buyers and sellers. It will network and facilitate trade between rural based SMEs and other enterprises of similar size in terms of liquidity and general corporate demands and thus foster equality during trade and negotiation. It will consist of three modules. A B2B sales portal, a B2C sales portal and a Location based service.

B2B Sales portal

The B2B Sales portal will enable the SMEs to purchase inputs and products from

suppliers and get the best value for money. The B2B sales portal will consist of the following sub modules

E-Procurement

This sub-module will enable SMEs to procure materials online. It will also facilitate the attainment of the best price for products from suppliers.

E-Auction

This sub-module will provide an online bidding facility that will allow the SMEs to bid or submit bids for products. This tool will allow the SMEs to sell their products to customers bidding with the highest price.

Mobile Commerce

This sub module will focus on marketing strategies that will bring the message directly to the customers at the point of need. It will also allow the SMEs to embark on wireless advertising.

ERP

This sub module will enable chronological order tracking and will facilitate the optimization of inventory through better demand forecasts, better decision making, improved response times to queries and better customer goodwill.

B2C

This module will allow the SMEs to access global markets and hence sell their products to more customers. Beyond that, it will also avail opportunities for disintermediation, resulting in lower product prices.

Location Based Service

This module will provide information and data to the SMEs based on their geographical position. For instance if an SME is looking for used wheels to purchase, by sending a text message with this request to the Location Based Service, the service will return a map showing all suppliers selling the requested product, within the SMEs proximity.

Online Business Repository

The Online Business Repository will primarily consist of the virtual community, suppliers, customers and competitors. To the SMEs, this module will open up new lines of communications with customers and suppliers in a manner that is mutually beneficial.

BENEFITS OF PROPOSED SYSTEM

It is envisaged that the conceptual model suggested in this paper will unbundle information from the traditional value chain and provide a coherent cooperate strategy, which will manage upstream and downstream relationships within the supply chain. Given today's markets where the proactive role of the customer is

gradually changing; the bidirectional features in the model will enable it to adapt to the environmental dynamics. In essence the model will be functional in markets characterized by volatile demand and high variety of consumer tastes, and also in markets where demand is predictable and the product variety is low. By systematically adapting to the environment the model will enable rural based SMEs to reduce costs appropriately through activities such as strategic sourcing, lean manufacturing i.e. “doing more with less”, and the use of a just-in-time purchase and supply approach.

From analysis, the underlying logic of the model conceptualizes products and services as being most valuable when brought to the right production complex at the right time and in the right quantities. This thought process when applied to the status quo results in the fusion of supply chain management with market intelligence. Through this fusion the SMEs will be able to link existing supply chains with the relevant customer segments and then personalize their value propositions into the product range. Ultimately in so doing the SMEs will enhance customer satisfaction and subsequently increase the market share. Furthermore by continuously focusing on efficient supply chain management which tends to be cost oriented, major cost savings accrued from the production cycle will be translated into greater contribution margins. Notably as the market share increases and the cost structures improve, the profitability of the SMEs is also greatly enhanced.

Seen from a broader rural economic development perspective, the model will facilitate the mobilization of existing ICT and logistics infrastructure. Once in operation the model will coordinate the use of facilities such as airstrips, computer networks, and market infrastructure. As the model becomes fully functional the training of SMEs in aspects such as ICT will be intensified. Such initiatives will go a long way in trying to mitigate the effects of the existing economic structural barriers such as the digital divide.

From a social perspective, the model will promote the collaboration of SMEs into strategic alliances such as Group Purchasing Schemes. These alliances will enable SMEs to get greater discounts by buying inputs in bulk. Moreover such business alliances will give SMEs greater bargaining and negotiating power during transactions. Also by forming alliances, information sharing will be simplified. The traditional barriers that discourage the seamless flow of information such as lack of trust, poor communication infrastructure, and information poverty will resultantly be overcome.

FUTURE RESEARCH

While this research has primarily focused on developing a conceptual model for rural supply chain management, future research should focus on developing the applications that will run on mobile devices and allow SME to use voice and text messages to initiate business processes and transactions. In future we feel that this research should also be extended to involve the design of a Web/SMS based application that will integrate supply chain management and produce reports such as income statements, balance sheets, cash flow statements etc for rural based SMEs.

CONCLUSION

This research has highlighted that the expedient movement of goods through the supply chain can greatly increase the profitability of rural based enterprises. On the other hand while modern information technology provides new cost effective ways of supply chain management, such technology has not been adopted by the majority of rural based SMEs in Namibia. This has culminated in distorted cost structures and inefficient procurement systems. Rural based SMEs therefore need to be assisted in order to embrace the benefits of the ongoing logistics evolution. The conceptual model suggested in this research will be an influence towards establishing a new era of ICT enabled collaborative business environments for rural based SMEs in Namibia and beyond.

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