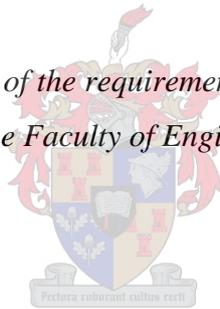


Strategic Local Manufacturing Supplier Development Roadmap as a Decision Support Tool

by
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*Thesis presented in partial fulfilment of the requirements for the degree of Master of Science
in Engineering Management in the Faculty of Engineering at Stellenbosch University*



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DECLARATION

By submitting this Thesis electronically, I hereby declare that the work contained in this thesis is my own original work and that I am the sole author of this work and that I have not previously in its entirety or in part submitted it at any university for a degree.

December 2017

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OPSOMMING

Die ondersteuning van plaaslike besighede is noodsaaklik om die groei van 'n land se ekonomie te verseker. Die Suid-Afrikaanse regering het in die besonder verskeie ondersteuningsmeganismes en -beleid geskep om die groei van plaaslike besighede te help. Die vervaardigingsbedryf beskik oor talle geleenthede vir plaaslike vervaardigingsverskaffers om te ontgin, hoewel baie van hulle sukkel om hierdie geleenthede te kapitaliseer, aangesien hulle dalk sekere vaardighede of infrastruktuur ontbreek. Weens die komplekse aard van plaaslike verskaffersontwikkelingsorganisasies in Suid-Afrika vind dit baie moeilik om die volwassenheidsvlak van 'n plaaslike vervaardigingsverskaffer (PVV) te verstaan / evalueer, relatief tot hul vereiste tegnologie / vermoë om die organisasie se verkryging of kommersialisering te behartig strategie. Die ontwikkeling van 'n PVV vereis 'n strategiese en effektiewe benadering om te verseker dat alle sleutelgebiede vir ontwikkeling aangespreek word. Organisasies streef verder om die mees geskikte PVV te identifiseer om alle bestaande ondersteuningsmeganismes of befondsingsstrukture effektief te ontwikkel en te gebruik om dit te doen.

'N Strategiese plaaslike vervaardigingsontwikkelingsraamwerk word voorgestel in hierdie proefskrif om as 'n hulpmiddel vir besluitneming gebruik te word om die mees geskikte verskaffer vir ontwikkeling te kies gebaseer op die eindgebruiker se vereistes. Ten einde die sleutelemente te verstaan, belanghebbendes, befondsingsmeganismes beskikbaar en die rede om plaaslike verskaffers te ontwikkel, is 'n deeglike literatuurstudie uitgevoer om 'n teoretiese grondslag te vestig. Daarna is die teoretiese raamwerk toegepas op verskeie gevallestudies om verdere sleutelemente, volgorde van ontwikkelingsfases, tipes ontwikkelingsprojekte en die rol van elke belanghebbende by die ontwikkeling van plaaslike verskaffers te onttrek. Eers dan kan 'n konseptuele raamwerk ontwikkel word. Daarna is die konseptuele raamwerk verder ontwikkel en gevalideer deur gebruik te maak van drie belangrike gevallestudies. Elke gevallestudie het verdere verbeteringe / insluit in die raamwerk voorgestel om 'n holistiese padkaart te vestig vir die ontwikkeling van 'n PVV, as 'n besluitnemingshulpmiddel.

Die draaiboek illustreer vier fases van die vereiste ontwikkeling van 'n PVV. Elke fase het sekere sleutelemente wat 'n ontwikkelende plaaslike verskaffer moet bereik / verseker voordat dit in die volgende fase kan beweeg. 'N Wiskundige model word geskep om die raamwerk te verteenwoordig sodat berekenings gemaak kan word op die persentasie waaraan

'n plaaslike vervaardigingsverskaffer aan sekere vereistes voldoen. Hierdie vereistes is aanpasbaar volgens 'n organisasie se behoeftes. Dit is nodig aangesien dit sal bepaal waar die verskaffer langs die padkaart van ontwikkeling lê en die ontwikkelingsverloop vir elke verskaffer kan naspur sodra die ontwikkelingsprogram ingestel is. Die uitsette van die model kan die eindgebruiker help om ingeligte besluite te neem oor die huidige volwassenheidsvlak van verskeie LMS relatief tot sy vereiste vermoë / tegnologie en bepaal die geskikste PVV om te ontwikkel. Die raamwerk vestig verder 'n duidelike prioriteitsaksieplan om 'n PVV te ontwikkel deur middel van verskeie ondersteuningsstrukture en befondsingsmeganismes, relatief tot die volwassenheidsfase.

ABSTRACT

The support of local businesses is vital in ensuring the growth of a country's economy. The South African government, in particular, has created various support mechanisms and policies to assist the growth of local businesses. The manufacturing industry poses many opportunities for local manufacturing suppliers to exploit although many of them struggle to capitalise on these opportunities as they may lack certain skills or infrastructure.

Due to the complex nature of local supplier development organisations in South Africa find it very difficult to understand/asses the maturity level of a local manufacturing supplier (LMS), relative to their required technology/capability, in order to fulfil the organisation's procurement or commercialisation strategy. Developing a LMS requires a strategic and effective approach to ensure all key areas for development are addressed. Organisations further battle to identify the most appropriate LMS to develop and utilise all existing support mechanisms or funding structures effectively, in order to do so.

A strategic local manufacturing development roadmap is proposed in this thesis to be utilised as a decision support tool in selecting the most appropriate supplier for development based on the end user's requirements. In order to understand the key elements, stakeholders, funding mechanisms available and the reason to develop local suppliers a thorough literature study was conducted to establish a theoretical foundation. Thereafter the theoretical framework was applied to several case studies in order to extract further key elements, sequence of development phases, types of development projects and the role each stakeholder plays along the development of local suppliers. Only then could a conceptual framework be developed. Thereafter the conceptual framework was further developed and validated using three significant case studies. Each case study proposed further improvements/inclusions into the framework to establish a holistic roadmap for developing a LMS, as a decision support tool.

The roadmap illustrates four phases of the required development of a LMS. Each phase has certain key elements that a developing local supplier will need to achieve/ensure before it could move onto the next stage. A mathematical model is created to represent the framework such that calculations can be made on the percentage to which a local manufacturing supplier conforms to certain requirements. These requirements are customisable according to an organisations needs. This is necessary as it will quantify where the supplier lies along the road map of development and will be able to track the progress of development for each supplier once the development program has been initiated.

The outputs of the model can assist the end user to make informed decisions of the current maturity level of various LMS relative to its required capability/technology and determine the most appropriate LMS to develop. The framework further establishes a clear prioritised action plan to develop a LMS through various support structures and funding mechanisms, relative to its maturity phase.

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NOMENCLATURE

AHP	Analytical Hierarchy Process
AIDC	Automobile Industry Development Centre
ANN	Artificial Neural Networks
ANP	Analytical Network Process
BBBEE	Broad Based Black Economic Empowerment
BBSDP	Black Business Supplier Development Programme
BoP	Base of Pyramid
CIS	Co-operative Incentive Scheme
CSDP	Competitive Supplier Development Programme
CSI	Corporate Social Investment
CSIR	Council for Scientific and Industrial Research
DEA	Data Envelopment Analysis
DMR	Department of Mineral Resources
DPE	Department of Public Enterprises
DST	Department of Science and Technology
DTI	Department of Trade and Industry
ED	Enterprise Development
EDC	Enterprise Development Centre
EIP	Enterprise Investment Programme
GDP	Gross Domestic Profit
HDSA	Historically Disadvantaged South Africans
HLMSDF	Holistic Local Manufacturing Supplier Development Framework
IFC	International Finance Corporation
IFM	Institute for Manufacturing



IP	Intellectual Property
ISP	Incubation Support Programme
KPI	Key Performance Indicator
LMS	Local Manufacturing Supplier
LMSD	Local Manufacturing Supplier Development
LMSRL	Local Manufacturing Supplier Readiness Level
LP	Linear Programming
LSD	Local Supplier Development
MCDM	Multi Criteria Decision Making
MCED	Manufacturing Competitive Enhancement Programme
MOP	Multi-Objective Programming
NCR	Non Conformance Report
OTIF	On Time in Full
SA	South Africa
SBU	Shanduko Black Umbrellas
SDP	Supplier Development Plan
SEDA	Small Enterprise Development Agency
SMART	Simple Multi-Attribute Rating Technique
SME	Small to Medium Enterprise
SOE	State Owned Entity
TLIU	Technology Localisation Implementation Unit
TLP	Technology Localisation Plan

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

We cannot predict the future, but we can create it. The 20th century could be regarded as the century of the modern joint-stock company. It was also the most economically successful century in human history – the world's population rose fourfold, and world output per capita raised six fold. This is no accident. The private limited liability company has proved to be the world's most powerful engine of innovation, large-scale organisation and transmission of expertise across frontiers (Bernstein, 2010). Since the industrial revolution in the eighteenth century manufacturing has been considered to be the main engine of economic growth and development. It contributes to the quality of life of individuals, to growth of wealth in a nation as well as power and position of a state. Manufacturing suppliers are the backbone of modern industrialised society, as it always has been cornerstone to the world's economy.

Organisations are increasingly being faced with pressures from communities in which they intend to invest, while contributing to the sustainable development of their investment destinations. This pressure comes at a time that the world is fast running out of resources with Africa and Asia becoming prominent targets for investment. The problem of global warming and related environmental preservation demands has also made the investment equation a real challenge to solve.

The Department of Trade and Industry (DTI) re-established its Broad Based Black Economic Empowerment (BBBEE) ratings in 2013. The new ratings have a higher weighting linked to local supplier development (changed from 15% to 40%) in order to encourage larger companies to support local businesses (DTI, 2013). The new Preferential Procurement Policy Framework Agreement, instituted for all state owned entities (SOE), calls for further stringent adjudication processes, during tender stages to ensure tenders 'utilise a large local supplier base. The challenge however comes from the perceived lack of capability and competence of local suppliers to conform to the necessary quality and technical requirements of larger companies' specifications.

Organisations further struggle to clearly identify the current maturity levels of suppliers in order to determine where to focus their development initiatives. In addition there is no holistic framework for developing local manufacturing suppliers that companies can utilise. Companies also run the risk of losing their current BBBEE ratings if they do not conform to the new ratings.



Thus a solution for sustaining and promoting the development of local suppliers, while ensuring the sustainability of the organisation operating within the environment, needs to be established. The ultimate goal would be if a mutually beneficial scenario existed where the local supplier could contribute to the sustainability of the organisation and vice versa. This is the goal of local development. Creating human capital that can contribute back into the economy while foreign investment boosts this growth.

The benefits for an organisation sourcing locally make sense. The benefits to the community from acquiring additional business opportunities make sense. The reasons why this is not adequately being conducted and what can be done to assist, has been the motivation for this thesis.

The author has been working in the supply chain function of organisations both in the mining and manufacturing industries since 2012. These positions include the category manager for underground equipment in Anglo American and the supply chain manager for James Howden Holdings. In both these positions the Author has been exposed to the challenges for developing local suppliers within each of these industries. The experience gained in these positions has set a definite prerequisite to motivate the topic for this research.

1.2 PROBLEM STATEMENT

Organisations are faced with inefficient and ineffective spending and support to develop competitive local suppliers. Organisations would further like to understand how to transform compliance of certain regulatory development policies into a competitive advantage. The challenge is to support and develop local suppliers as no clear and consistent development process exists (sequence of events) to align corporate social responsibility and to track the progress of all development initiatives and projects. A clear strategy is required to identify the maturity level of a local manufacturing supplier (LMS) according to its developmental requirements, what the final goal or requirements are for the LMS to achieve and then how the development will take place to ensure the conformance to these requirements.

1.3 RESEARCH QUESTIONS

In order to address the above problem certain questions needed to be asked during the research to ensure the full scope of the problem was identified. These questions were posed during the literature review and research to ensure empirical answers were given to support the development of the roadmap and decision support tools. The proposed questions are as follows:

- What are the corporate benefits and business case (relevance) for LMS development and would it link into corporate strategies to create value?
- What are the key elements and their sequence for a local supplier development roadmap and what are the current limiting factors relating to efficiency and effectiveness.
- What is the typical support and funding mechanisms utilised in such a local supplier development roadmap?
- Who are the key stakeholders, what is their involvement and how do they contribute during the different stages of LMS development?
- How can organisations track the progress of developing local manufacturing suppliers in order to achieve their required capability or technology levels?

1.4 RESEARCH OBJECTIVES

The objectives of the research was to understand the key elements required in order to construct a strategic local supplier development road map to assist end users to make informed strategic decisions on the most appropriate supplier to develop. These objectives included the following:

- Understand the corporate business case for local supplier development
- Understand the key elements, stakeholders, funding and support mechanisms and typical projects to ensure efficient and effective local supplier development.
- Study local supplier development case studies to identify the reasons for local supplier development, related initiatives and projects, the alignment link and sequence of these key elements, the stakeholders, funding and support mechanisms and typical projects.
- Develop a conceptual framework based on the theoretical understanding and case studies evaluated to highlight the key phases of local supplier development and the requirements to fulfil in each stage before progressing successfully to the next phase.
- Validate the conceptual framework with manufacturing case studies and interviews with local supplier development specialists

1.5 RESEARCH SCOPE

The scope of the research involved understanding the various phases of local supplier development and what the key elements in each stage were to ensure effective progression to the proceeding phase. Current local supplier development strategies and how they can be utilised to develop suppliers during their various phases were included in the scope. The outputs of the decision support tool therefore included the following:

- Identifying the maturity level of a supplier along each of the development life cycles/phases
- The development needs of the supplier in order to achieve the required objectives of the organisation
- A detailed action plan to develop a local supplier with prioritised developmental needs along its life cycle. This will include which support programmes and funding mechanisms could be utilised at the various phases.
- Tracking the progress of the development of the local supplier.

To ensure the research was focused on achieving the described objectives and desired outcomes, the following was excluded in the decision tool:

- Assessment to determine whether a supplier will be economically successful or not
- Details regarding the business benefits for LMS development
- A generic roadmap for all industries and businesses- The main focus is on Manufacturing suppliers
- Assessment in ensuring the sustainability of the supplier.

1.6 RESEARCH METHODOLOGY

The methodology of the research entailed four phases to develop the final Strategic LMS development roadmap. The first phase of the research included understanding the key constructs and elements of LMS development from the literature review and evaluation of case studies through the grounded theory approach. The second phase entailed developing a conceptual framework from the key elements identified in the previous phase. The conceptual framework was then validated in the

third phase by correlating its relevance to industry related case studies. Iterative improvements to the framework were made after evaluating each case study to ensure that the final framework included a holistic development road map with relevant decision support tools. Feedback from industry related personnel regarding the relevance and effectiveness of the framework was also sought to ensure its validation. The research methodology is detailed in Chapter 3 of this Thesis.



CHAPTER 2: LITERATURE REVIEW

2.1 GLOBAL VALUE STREAMS

The topic of this research involved developing a local manufacturer supplier development framework through analysing the current challenges in local enterprise development, investigating current strategies/case studies in developing local suppliers and understanding the value proposition for businesses to develop local suppliers. It is important to note that when referring to “local” suppliers in this regard, within a South African context, it means businesses who are more than 50% black owned and will achieve BBEE levels of 4 or less as in accordance to the Department of Trade and Industry’s (DTI) legislated requirements (DTI, 2013)

For local economic development to be a success it needs to be approached utilising a framework of inter- firm relationships, productive and technological capabilities, and the role of certain institutions to offer support and governance. In this approach there are processes of cumulative causation driving the returns to firms from location decisions, but it is important to understand the position of firms in terms of their vertical and horizontal relationships, and the role of large firms in governing the value chains (Kaplinsky, 2000).

Technological capabilities are a central element of firms’ overall capabilities (Phele, Roberts, & Steuart, 2004). Indeed, a major body of the literature argues that how enterprises manage the process of mastering, adapting and improving upon existing technologies, it is the single most important determinant of industrial development (Lall, 2003). This in turn is an outcome of firms’ decisions and wider strategic orientation.

Srai, Christodoulou, and Harrington (2014) define global value networks as “*the total chain of activities that adds value in delivering products and services, including all contributing players distributed around the world.*” The traditional model of activities integrated vertically within a company’s processes has drastically changed over the last 30 years. This model has exploded to form a complex interaction of activities spread across more narrowly focussed companies, housed within the greater firm but distributed across mature and emerging markets (Srai, Christodoulou, & Harrington, 2014). Figure 2-1 graphically represents the above mentioned model.

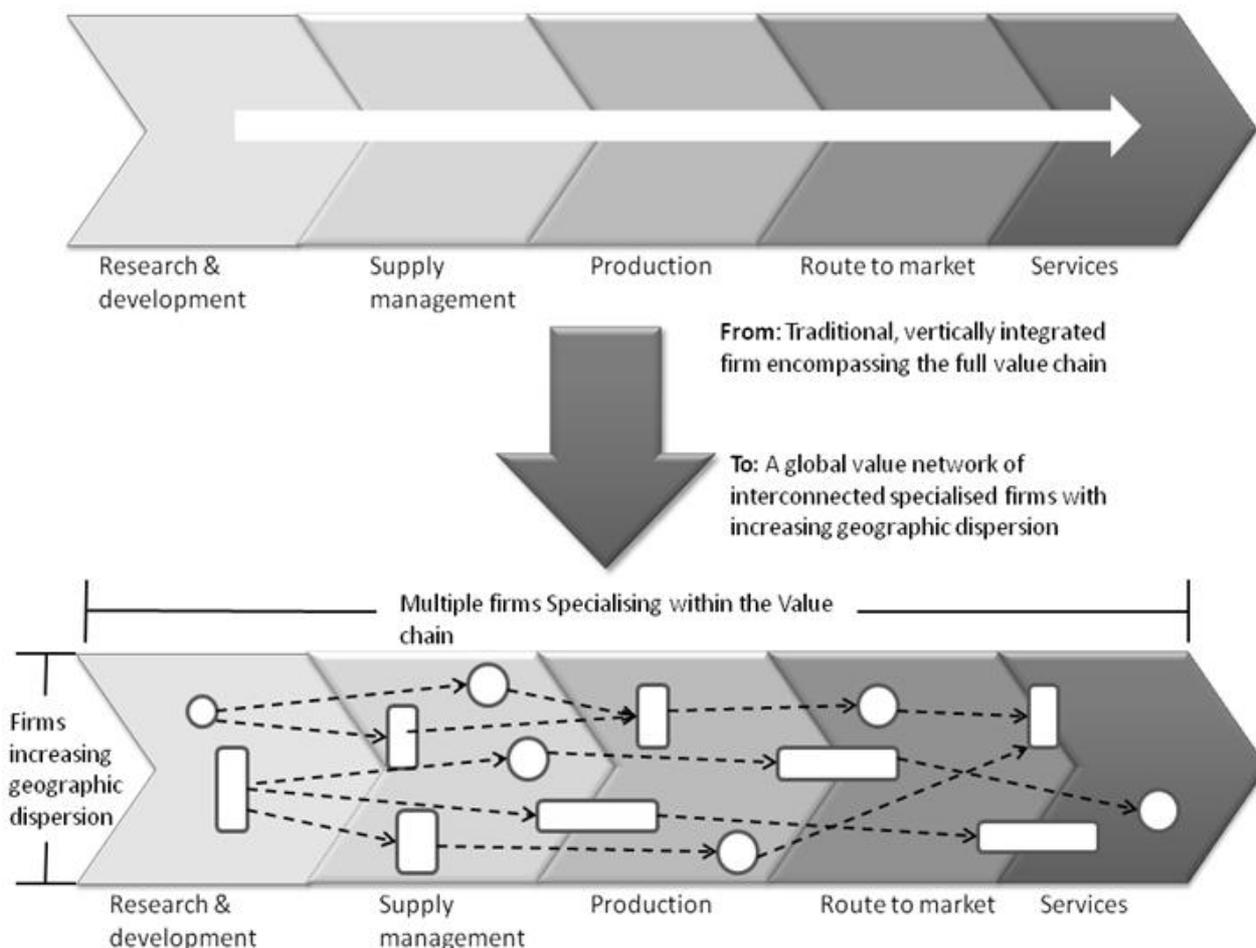


Figure 2-1: Evolution of a firm's value chain (Srai, Christodoulou, & Harrington, 2014)

The University of Cambridge's institute for manufacturing states that globalisation of a company's value stream has the potential cost saving benefit of up to 45 percent by utilising effective supply chain networks to develop footprints in developing countries (IFM, 2007). There are however various constructs to consider during the establishment of effective and sustainable global value streams for companies which will now be identified as well as the potential benefits.

The Institute for Manufacturing (IfM) in partnership with the University of Cambridge have established four strategic approaches and five emerging themes for global value networks as highlighted in Figure 2-2. The strategic approaches are as follows:

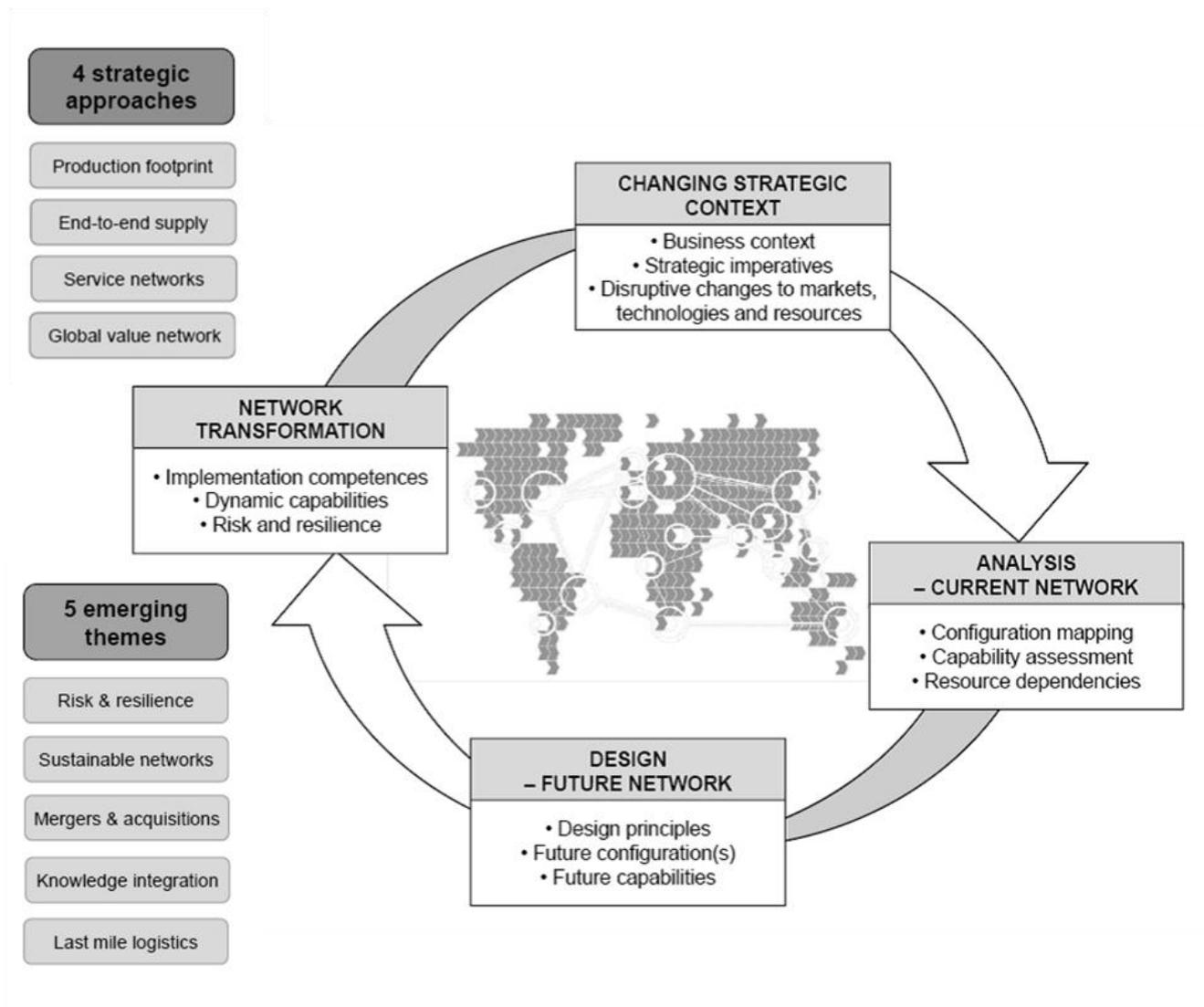


Figure 2-2 Overview of Modular strategic approach in implementing Global value streams (IFM, 2007)

1. **Establishing a production footprint-** understanding what to make and where. The key factors to consider during this step are; Road mapping evaluation (understanding business imperatives and technology trends within the organisation and other countries), Make or Buy decisions (focussing on what the strategic importance of the products to be manufactured are and alternative suppliers effectiveness), Global network design (roles of plants, scenario testing and network synergy) and manufacturing mobility (defining executable projects and transferring production).
2. **End to end supply-** coordinating a multitier network of upstream and downstream partners distributed globally. The capability of each supply network needs to be aligned to the end users requirements.

3. **Service networks-** Supporting networks that act as a business function of the enterprise which needs to be standardised. These services include Engineering, R&D, Human resources, Information management etc.
4. **Global value network-** Configuring global value networks comprises of three related activities; Mapping, design and integration. The process involves mapping out the firms current strengths in sourcing, manufacturing and market position and identifying gaps that could be alleviated through the redesign of these processes. This entails identifying partnerships with alternative suppliers and ensuring the sustainable integration of them into the value chain.

The five emerging themes establish the key focus areas to ensure successful implementation of a global value chain i.e.:

1. **Risk and resilience-** This entails identifying and quantifying the; events (both internal and external that can adversely affect the value chain), vulnerability (rigidity of supply network or inability to adapt), Risk (network failure), risk mitigation (Actions for minimising impact and chances of network failure) and resilience (ability to recover from network failure).
2. **Sustainable networks-** networks have to focus on energy, resource efficiencies and waste reduction. Quantitative approaches to sustainability measurements need to be incorporated into the key performance indicators of the business.
3. **Mergers and acquisitions-** Due diligence must be performed while establishing partnerships or acquisitions of companies to ensure that all core competencies of the enterprise are protected. This needs to be performed from the strategy development, selection process, assessment, negotiation through to the execution phase.
4. **Knowledge integration-** to establish a proactive and integrated knowledge management system, the various types of knowledge and how they, and the configuration of the network affect how knowledge is shared, must be understood and analysed.
5. **Last mile logistics-** The interests of the various institutional players, companies and customers' interests need to be effectively fulfilled by the consolidation and distribution service providers.

Modern outsourcing processes focus on a more systematic and continuous support, as well as on the reorganisation of company departments, regardless of their field of operation.



Figure 2-3 Risks to consider in Outsourcing production or services within an organisation

Many disapprove or are sceptic towards this new method, including both executives and workers. Their main fears relate to the lack of control and the fear of dependency generated by the outsourcing agreement (Baloh, Jha, & Awazu, 2008). In several occasions, dependency from an external vendor may lead to a standoff in cases where the cooperation has to be discontinued (Vaxevanou & Konstantopoulos, 2014). This gap will not be caused by the nature of the operation itself but by staff members who have been accustomed to outsourcing a specific service to external vendors and cannot work otherwise.

Another risk involved in the outsourcing process is the possibility that the products or services provided by the vendor sacrifice quality for the sake of profit (McIvor, 2010). It should be noted that, in many cases, the two parties may have conflicting interests, as the external vendor aims to maximise its benefits and increase its profitability. The determinants of a successful outsourcing process should also consider the impact of other variables both at the individual level such as work motivation (Trivellas, 2011) and at the organizational level, such as culture, strategy, R & D operations and leadership style (Trivellas & Reklitis, 2014). In all cases, making the right decision remains a key challenge and it should be an important field of research in the coming years (Sakas & Kutsikos, 2014).

2.2 DEFINING LOCAL MANUFACTURING SUPPLIER DEVELOPMENT

2.2.1 Overview

Before one can assimilate the necessary requirements to develop local manufacturing suppliers, it is necessary to first understand the various life cycles of these entities. A local manufacturing supplier in this context has the same characteristics as a Small to Medium Enterprise (SME).

2.2.2 Development life cycles of local manufacturing suppliers

In his research to provide the theory of a business's development as evolution and revolution Greiner (1972) concluded that developing organisations move through five distinguishable types of growths namely; (1) Growth through creativity, (2) growth through direction, (3) Growth through delegation, (4) growth through Coordination and (5) growth through collaboration. Another significant contributor to this field is Adizes (1979) who identified 10 life cycles of an organisation which have been identified in Table 2-1.

Following on from the work of Greiner (1972), Scott and Bruce (1987) classified the growth stages of small businesses as inception, survival, growth, expansion and maturity. They stressed that a crisis of some kind comes before each advance to the next stage. These crisis were defined as either “weak general management; poor financial controls; product competition; diversification and acquisition; changing market demand; high overhead structure; manufacturing and operating problems; cancellation or delay of major contracts; poor marketing; and price competition”. The growth stages and the corresponding challenges to address in each is summarised in Table 2-2 as classified by (Scott & Bruce, 1987).

Dodge and Rabbins (1992) and Hanks et al (1993) established that the life cycle of SMEs pass through 3-4 generic phases which follow a basic S-shaped curve through the various development stages. These Phases are identified as (1) start up or formation, (2) Early growth or Expansion, (3) Later growth or Maturity and (4) Sustainability or Diversification. It is argued in their research that the final stage (Diversification/Sustainability) represents the continual strive to ensure the survival of the SME through new product development and market capture. Figure 2-4 illustrates the life cycle of SMEs. It is mentioned in the research by Hanks et al (1993) that once an SME reaches the fourth stage and peruses new products or market channels that the growth experienced by the company,

upon the success of the new venture, would experience similar growth patterns as mentioned in phases 1-3.

Table 2-1: Ten life stages of an organization (Adizes, 1979)

Life cycle	Description
1. Courtship	The initial development or creation of the proposition/ model/ business/ formation/etc
2. Infancy	After launch - start of active trading
3. Go-Go	Frantic energetic early growth and sometimes chaos
4. Adolescence	Still developing but more established and defined
5. Prime	The business or organization at its fittest, healthiest and most competitive, popular and profitable
6. Stability	Still effective, popular, can still be very profitable, but beginning to lose leading edge - vulnerability creeping in maybe
7. Aristocracy	Strong by virtue of market presence and consolidated accumulated successes, but slow and unexciting, definitely losing market share to competitors and new technologies, trends, etc)
8. Recrimination	Doubts, problems, threats and internal issues overshadow the original purposes
9. Bureaucracy	Inward-focused administration, cumbersome, seeking exit or divestment, many operating and marketing challenges
10. Death	Closure, sell-off, bankruptcy, bought for asset value or customer-base only

Van Montfort (2006) conducted a study on the successful life cycle characteristics of SME's and found that four prominent life cycles exist. In each life cycle there are certain factors that need to be addressed before progressing to the next stage. These phases and their corresponding factors before progression are summarised in Table 2-3.

Table 2-2: Growth stages and challenges in each for Small businesses (Scott & Bruce, 1987)

Growth Stages of small businesses	Challenges in each stage
1. Inception	Poor financial controls, manufacturing and operating problems.
2. Survival	General management, cancellation or delay of major contracts.
3. Growth	Changing market demand, product competition and poor marketing
4. Expansion	Diversification and acquisitions
5. Maturity	High overhead structure and price competition

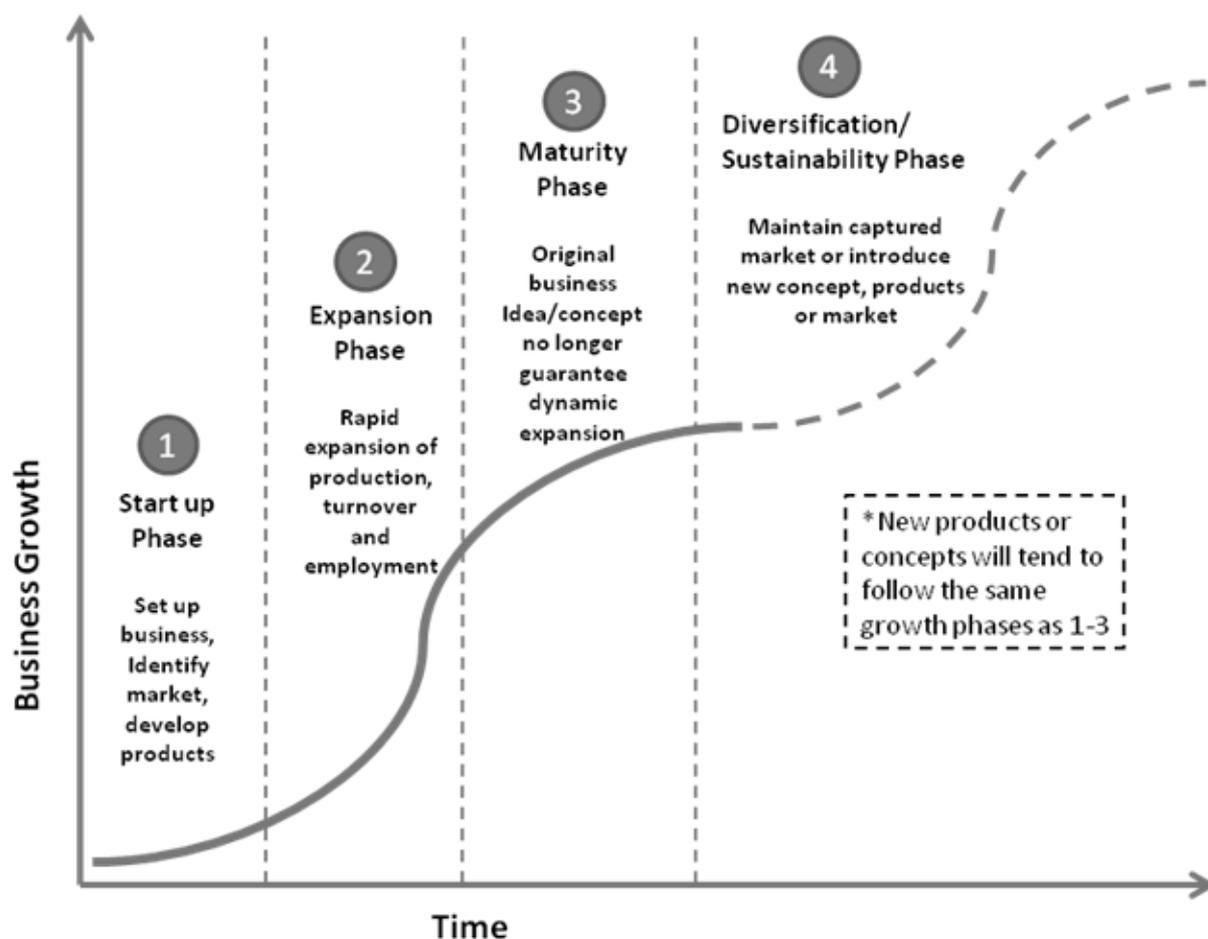


Figure 2-4: Life Cycle of SME (Dodge & Rabbins, 1992) and (Hanks, Watson, Jansen, & Chandler, 1993)

It is evident from the research conducted that the successful life cycle of an SME follows a distinctive growth pattern. It is shown that the life cycle starts from an initial idea/concept through to a growth/expansion phase and ending as a sustainable business with various challenges through each stage.

Table 2-3: Requirements in progressing through SME life cycle (Van Montfort, 2006)

Life cycle Phase	Factors to address before advancing to next Phase
1. Start up	Roles and responsibility of all stakeholders, Administrative systems, financial systems, Human Resources systems and Quality systems
2. Growth	Segregation of duties among staff/departments, Managerial systems and measurement and control systems.
3. Maturity	Ensure Sustainability, Focused/differentiated product range and offering, Identification of alternative markets and products, Continuous improvement and R&D systems/departments
4. Sustainable	-

The authors Hanks et al (1993) conducted a research study of the characteristics and key metrics in each life cycle phase of manufacturing SMEs in the United States. The research was based on exploratory cluster analysis utilising cross-sectional data of 133 manufacturing SMEs through questionnaires completed by each. Their research established six characteristics to determine the life cycle phase of manufacturing SMEs. These characteristics are as follows:

1. **Levels of organisational Structure-** Amount of hierarchical positions within the SME
2. **Specialised functions-** Various clearly defined functions of the business with various responsibilities for each function of personnel.
3. **Sales Revenue growth-** the year on year growth rate of annual sales.
4. **Mean Employment Growth-** the average year on year growth rate of the number of employees employed by the business
5. **Average age of business-** amount of years the business has been running since initial start up
6. **Product life cycle-** the main focus on the products of the business i.e. Development, Commercialisation, continuous improvement etc.

Each of these characteristics was assessed with the responses from the survey. Through statistical inferences the classification of the magnitude of each characteristic could be categorised in each life cycle phase of a manufacturing SME. Figure 2-5 represents the classification of each of these characteristics within each life cycle phase.

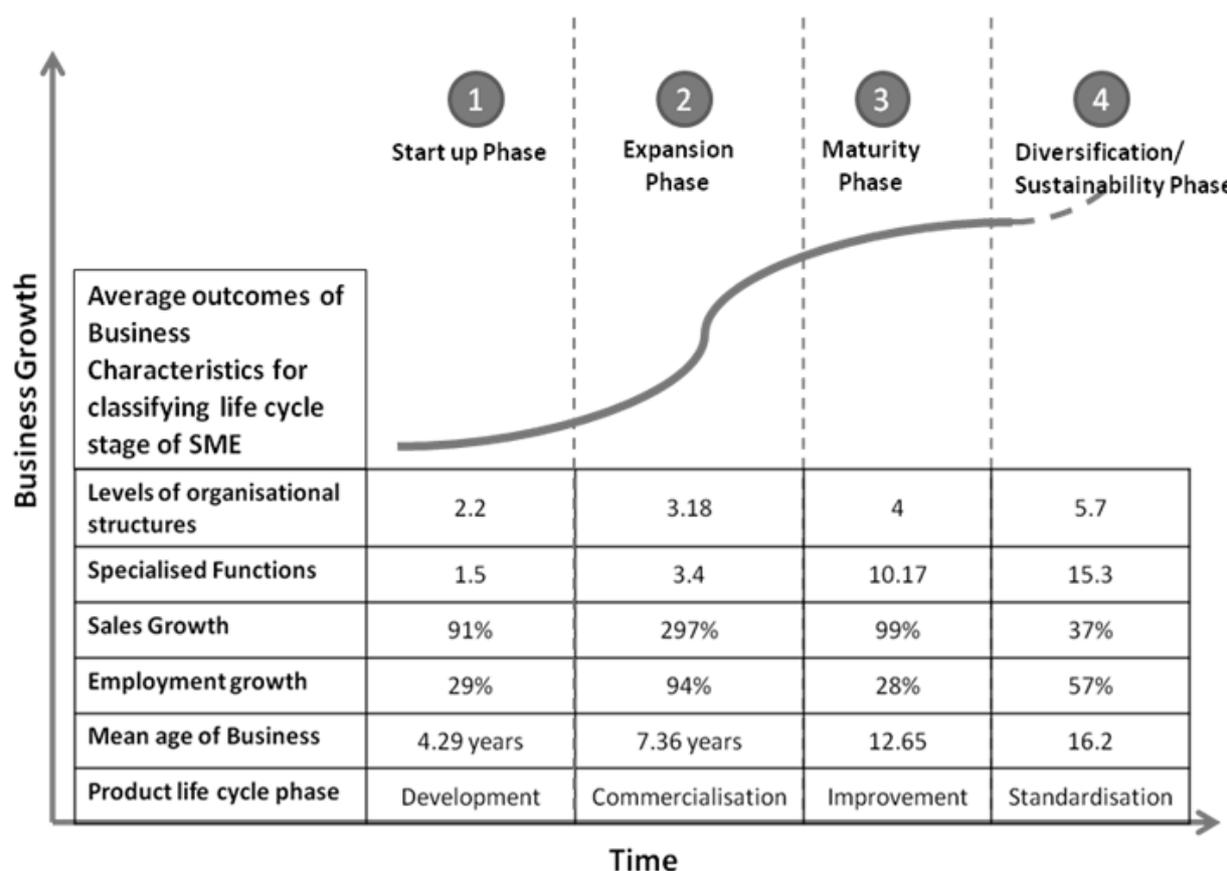


Figure 2-5: Life cycle characteristics of manufacturing SME (Hanks, Watson, Jansen, & Chandler, 1993)

2.2.3 Defining “LOCAL” suppliers

From a South African context “local” is often misconstrued with Historically Disadvantaged South Africans (HDSA). Another misperception is the assumption that geographic position constitutes “local” suppliers. Kaizer (2013) conducted a study, for the World Bank, in the mining industry across Western and Southern Africa (Kaiser Economic Development partners, 2013). Their study found that there are three elements constituting local suppliers namely; (1) the level of participation of the supplier in its local vicinity or country (whether the goods or services are supplied or manufactured locally), (2) The level of participation of local citizens in the company (3) and the

geographical location of the company. Kaizer (2013) created a matrix representing where a supplier falls within these definitions. This is illustrated in Figure 2-6 below.

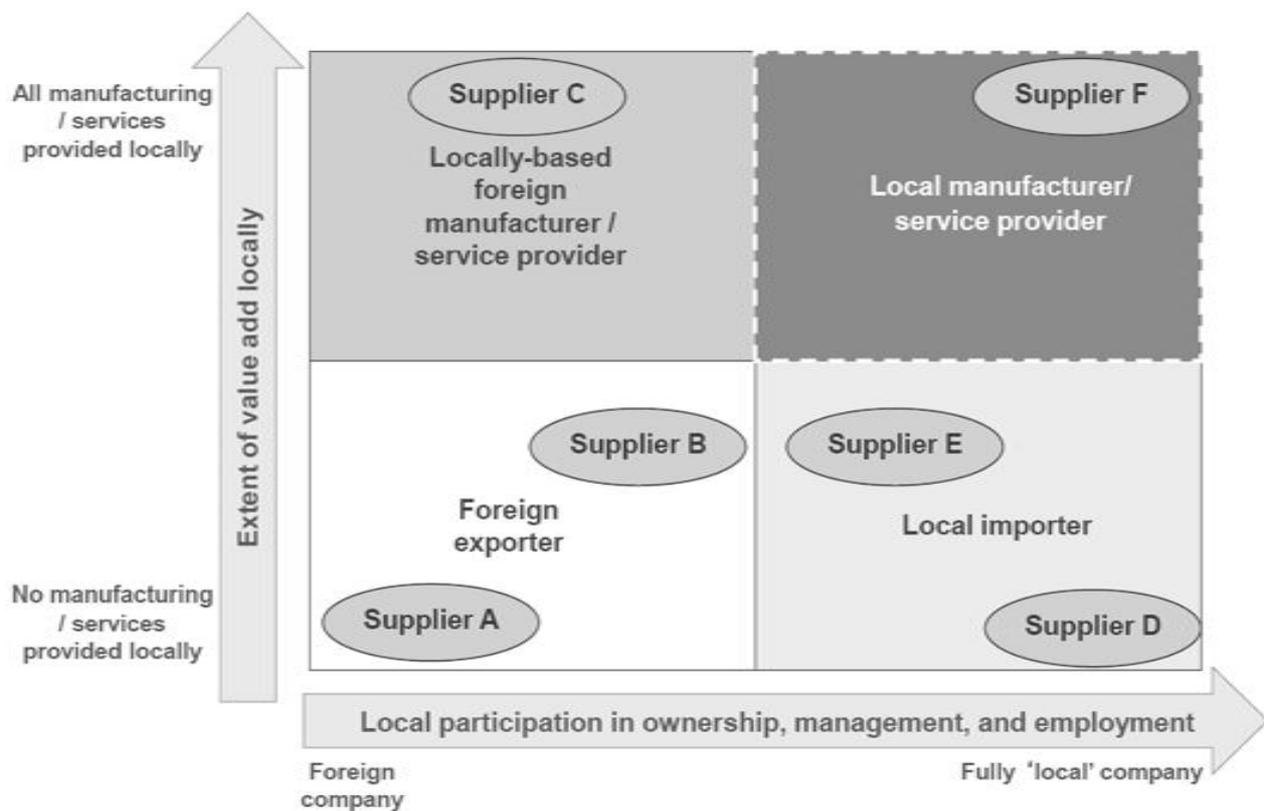


Figure 2-6: Categorisation of local suppliers (Kaiser Economic Development partners, 2013)

From this definition it can be seen that a “Local” supplier constitutes a company that is majority owned by local participants, manufactures goods locally, procures goods locally and supplies goods locally. Locally therefore remains a geographical spaced distance although the constituents of the company determine whether it is local or not.

A supplier can thus be segregated into 4 Quadrants namely:

1. **Foreign Exporter**- limited local sourcing of workforce and management, limited goods manufactured locally and majority of goods exported
2. **Locally based foreign manufacturer**- limited local sourcing of workforce and management, majority of goods manufactured and sold locally
3. **Local Importer**- Majority of workforce and management sourced locally, limited goods produced locally (majority of service offering imported).
4. **Local manufacturer**- Majority of workforce and management sourced locally, majority of product offering produced and sold locally..

2.3 RELEVANCE OF LOCAL MANUFACTURING SUPPLIER DEVELOPMENT

2.3.1 Overview

Leaders of sustainable competitive companies' primary social responsibility are to assure the financial success of the company. Only such companies have the resources and the capability to do the right thing (Welsch, 2001). In this context, business leaders need to stand up for the market economy. They need to participate vigorously and confidently, in the battle of ideas for business and the greater good of society.

Poverty remains an issue of the modern world. Despite that South Africa (SA) is one of the most developed countries in Africa, there are still regions suffering from severe poverty. More than half of the working population belongs to the so called base of the pyramid (BoP). In order to comply with tighter local supplier development legislation, Broad-Based Black Economic Empowerment (BBBEE) policies and to receive tax benefits, several stakeholders attempt to address these issues with development programs.

2.3.2 The need for local supplier development

Poverty can not only be addressed by programs that adhere to and support sustainable business conduct, growth plans and the millennium development goals. Therefore, it is critical to find a synergy amongst various stakeholders and to ensure actions are orchestrated to support the development goals. The call for systems and strategies to mobilise the target population and to ensure distributed value creation even in isolated regions, remains unanswered.

Porter and Kramer (2006) argue that organisations are doing a lot to improve the societal and environmental consequences of their activities, but there is still so much to do. The reasons why the organisations do not optimise their efforts are mainly that they see business and society as two independent entities; and secondly organisations look at corporate social responsibility (CSR) in generic ways instead of in the context of their strategies. "CSR can be much more than a cost, a constraint or a charitable deed – it can be a source of opportunity, innovation and competitive advantage" (Porter & Kramer, 2006). Welch (2001) believed social responsibility begins with a strong, competitive company. A sustainable competitive company does not only pay taxes that provide for important governmental services, it also creates excellent infrastructure and reinvests in the social development of its people.

The informal base of the pyramid (BoP) represents the largest (5 billion), but poorest (live on less than US\$ 2.50 per day) socio-economic group (London, 2008). These people should receive basic needs and basic services to survive. The BoP was first introduced in the work by Prahalad and Hart (2002) attempting to raise awareness of the world economic pyramid and the vastly untapped market. Since then, there have been considerable attempts toward developing economically viable initiatives to serve the BoP.

In theory, organizations targeting this segment operate under the proposition of mutual value creation, which suggests that creating more value for the BoP creates more value for the venture (London, 2008). In other words, in order to grow the formal economy, stakeholders need to help create value inside the informal economy by investing in education, infrastructure, skills, suppliers and enterprise development programs.

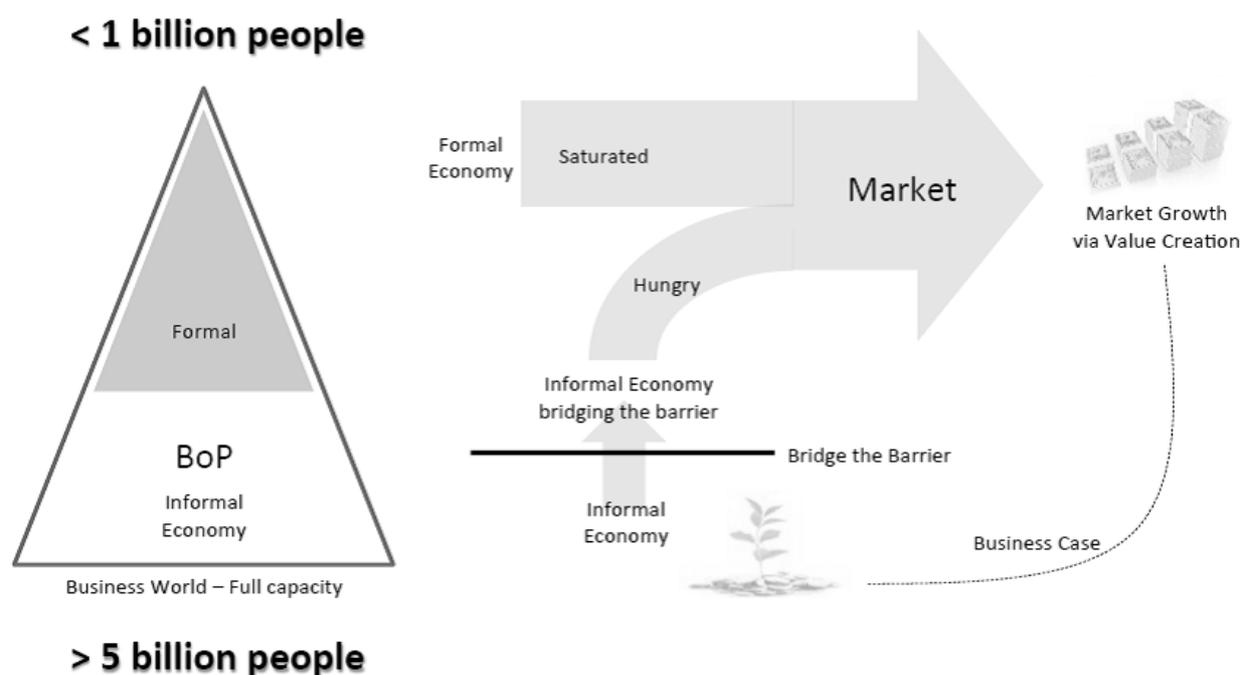


Figure 2-7 Illustration of the BoP and integration into the formal economy

According to London et al. (2010) BoP producers, which are operating in the informal sector, generate goods for sale (e.g. agricultural products and handcrafts). The challenge is that it is sold almost exclusively in local, informal markets. In addition, due to the lack of an industrial culture, one must be aware that there is not always adequate knowledge, skills, and resources for developing suppliers in the informal economy.

Still, there is evidence of undergoing activities related to BoP supplier development. Some case studies (Antúnez-de-Mayolo, 2012) show what types of innovation are best to reinforce the value propositions to address low-income consumers' problems. Other work (Diouf & Pode, 2013) proposes community desired products to meet the needs of the BoP. Khan (2012) and Hart and Simanis (2008) propose a new learning methods for BoP people. These methods have evolved from the original proposal of the BoP (BoP 1.0) where the main focus was extracting value from the BoP by selling affordable products to them from a top down approach. BoP 2.0 was introduced by the work of Hart & Simanis (2008) which strives towards an embedded process of co-invention and business co-creation. The process involves bringing corporations into close, personal business partnerships with BoP communities resulting in a commitment of mutual sharing and mutual learning in order to create mutual benefit.

Over the past decade BoP 2.0 has made head way to overcome the problem of simply selling to the poor. The BoP 2.0 approach stresses the importance of co-creating products and compelling value propositions with communities, innovating from the bottom-up and creating a dedicated set of metrics and timelines suited to the unique features of the underserved space (Hart, 2015). Organisations are still finding it difficult however to successfully implement co-creative business ventures, within underprivileged communities, due to the inherent vast amount of time and resources it requires.

The BoP 3.0 was introduced by Caneque and Hart (2015) which calls on more complex partnerships that need to be created through networks of NGOs, governments, corporations and academic partners. The aim is to integrate the wisdom of the "crowd" to ensure an environmentally sustainable solution, which would affect the triple bottom line of both the local communities and organisations involved, is created to ensure sustainable development. It strives to create an innovative ecosystem within the BoP. Table 2-4 Evolution of BoP strategies represents the progression and differences between the BoP 1.0, 2.0 and 3.0.

It can be seen from the table that the differences between the various BoP strategies relate to how the BoP is perceived by an organisation. Each variation strives to assist the local community in a positive manner by trying to include the BoP into the formal economy. In summary BoP 1.0 strives to aid the BoP by selling affordable products to increase market availability. BoP 2.0 aims to create business co-ventures to create further jobs within the community and address underlying inhibiting factors of including the BoP into the formal economy. BoP 3.0 undertakes to create an innovative ecosystem through cross sector partnerships and collaboration to ensure sustainable development and utilises the BoP to create completely new and innovative business ventures.

Table 2-4 Evolution of BoP strategies

BoP 1.0	BoP 2.0	BoP 3.0
BoP as consumer/producer	BoP as Business Partner	BoP as Innovative eco system
Deep listening	Deep dialogue	Deep inclusion
Reduce price points	Expand imagination	Open innovation
Redesign packaging, extend distribution	Marry capabilities, build shared commitment	Collaborative and creative approach, sharing channels with complimentary partners
Arms length relationships mediated by NGOs	Direct personal relationships facilitated by NGOs	Cross sector partnerships
“Selling to the poor”	“Business co-venturing”	“Innovative ecosystem”

Although the objective of the research is to create a strategic local manufacturing supplier development roadmap as a decision support tool, the BoP needs to be acknowledged as it illustrates the necessity for local development as well as the impact that communities have on business development. During the research the delineation between enterprise development and supplier development will still be made. This forms a critical further aspect of the research.

2.3.3 Benefits of outsourcing

In order to develop local suppliers some goods or services may need to be outsourced to local suppliers. Outsourcing is considered as a strategy that allows the enterprises to not only focus on competitive-advantage activities in their business, but also perform activities, which are out of their specialised fields, in accordance with necessary quality standards through professional enterprises specialised in this field (Tanyeri & Firat, 2005)

In other words, outsourcing is that an enterprise offers a service through another company specialised in the service related matter instead of producing such service within its own body (Ecerkale & Kovancı, 2005). In addition to its advantages such as reducing the operating costs, making the enterprise adapt technological advances and focus on self-competences, and providing an increase in operating efficiency, the outsourcing practice has a good number of benefits that affect the enterprise indirectly (ITGR, 2003). It can also be beneficial financially for the enterprise by decreasing investment costs to be made during the foundation stage (Özdoğan, 2006). In the functions such as product development, design, production, marketing, distribution and promotion,

the enterprises have the possibility to catch up with the new technologies in such fields through outsourcing. By this way, it becomes possible for them to benefit from research and development departments of the subcontractor companies as well as avoiding the cost to follow technologies. The enterprise should decide what its competency is that provides the competitive advantage and presents value to the customer before it transfers any one or more activities, which it sustains internally, to an external company. At this stage, which constitutes the first phase of the outsourcing decision process, it is of vital importance to take correct decision with a long term strategic approach (Şahin & Berberoğlu, 2001).

When it opts for outsourcing specific services or products, an organisation expects to obtain certain advantages, one of which is cost-efficiency (Vaxevanou & Konstantopoulos, 2015). The reason for the existence of enterprises that undertake to perform operations on behalf of an organisation is that they have the necessary know-how and that they are able to handle large volumes of operations; therefore, achieving better economic conditions for the outsourcing company.

By means of outsourcing, companies manage to liberate their administration from certain operations, limiting its responsibilities only to the control of external vendors and allowing it, therefore, to focus on more fundamental operations, which can bring a competitive advantage to the organisation. The advantages of the outsourcing process relate to the fact that the executives of these companies are able to move behind the production line. One of the most important features of the outsourcing agreement is securing an employment relationship with the human resources of the contracted enterprises (Banerjee & Williams, 2009). In like manner, selecting a successful and tested partner for an outsourcing process is a very positive element in order to increase performance within the enterprise. All the difficulties and procedural malfunctions may be addressed on the basis of security and mutual trust between the parties, leading to profits for both enterprises. The literature on the subject focuses on a specific advantage related to the implementation of the outsourcing process, i.e. risk dispersion. Any unexpected decline or change in the market where the organisation operates is borne by both parties. Table 2-5 highlights the types of benefits for outsourcing and the goal the enterprise strives to achieve for each.

Table 2-5: The goal and Categorised benefits from outsourcing

Type of benefit	Goal
External benefits from partnerships	Gain further business opportunities through outsourced company
Direct benefits	Adopt technological advances Focus on own core competencies Increase client base
Internal spin-off benefits	Increased operating efficiencies
Organisational benefits	Reduced risks Reduced operating costs
Value added benefits	Achieve competitive advantages

2.4 CURRENT LOCAL SUPPLIER DEVELOPMENT METHODOLOGIES

2.4.1 Overview

This section looks at identifying current local supplier development frameworks and identifying the key stakeholders, support programmes and roles each play in the development of suppliers. The key elements to consider during local supplier development will also be explored.

2.4.2 Governmental support programmes and funding mechanisms

The new Broad-Based Black Economic Empowerment (BBBEE) Act set by the Department of Trade and Industry in 2013 has been enforced from 11 April 2015 (South African Government, 2013). The act has changed the calculation of firms' BBBEE ratings. Table 2-6 and Table 2-7 summarises the changes from the 2007 codes to the new 2013 codes and includes the changes to BBBEE statuses based on the new total scores respectively.

The major changes to the codes highlighted above are the enterprise and supplier development weighted ratings which have moved from 15 to 40 from 2007 to 2013 respectively and the new rankings for BBBEE status based on the total scoring of a firm.

Table 2-6: Changes to BBBEE scorecards from the 2007 to 2013 codes

Criteria	2007 BBBEE Codes		2013 BBBEE Codes	
	Weighting	Bonus	Weighting	Bonus
1. Ownership	20	3	25	0
2. Management Control	10	1	15	-
<i>Employment Equity</i>	15	3	-	-
3. Skills Development	15	0	20	5
<i>Preferential Procurement</i>	20	0	-	-
4. Enterprise and Supplier Development	15	0	40	3
5. Socio-economic Development	5	0	5	0
TOTAL	100	7	105	8

Table 2-7: Changes to BBBEE status from the 2007 to 2013 codes

BBBEE Status (Level)	2007 BBBEE Codes	Procurement Recognition	2013 BBBEE Codes
1	100+	135%	100+
2	85-100	125%	95-100
3	75-85	110%	90-95
4	65-75	100%	80-90
5	55-65	80%	75-80
6	45-55	60%	70-75
7	40-45	50%	55-70
8	30-40	10%	40-55

Many companies in South Africa are grappling with the question about what the difference between Enterprise and Supplier Development is (Ganzevoort, 2015)

From the Department of Trade and Industry's web site, the differentiation between Supplier development and enterprise development is quite clear. Supplier development entails the development of a Local Supplier (level 4 BBBEE rating or better) through enhancing the suppliers business by creating business opportunities through partnerships or contractual supply agreements. Enterprise development is regarded as funding either equipment, training, housing for local communities, finance, tools etc. to aid the establishment of a potential local supplier or uplifting the local community in which a supplier can be created.

In 2013, Ghana passed a local content law with the purpose of promoting internal and external linkages between its oil and gas sector and the broader economy. An Enterprise Development Centre (EDC) was established to enhance the capacity of indigenous Ghanaian firms and promote their participation in the oil and gas industry (Ablo, 2015). The study examined the distinction between social, cultural, economic and symbolic capital and ways of enhancing local entrepreneurial capacity. It found that the EDC facilitates interaction between local entrepreneurs, officials of state institutions and foreign oil companies, which enhances local entrepreneurs' knowledge of the oil and gas sector and provides enterprises with an entry point. Ablo (2015) however concluded that only a few well-established medium to large-scale Ghanaian enterprises are able to take advantage of the opportunities provided by the EDC project to expand their operations. The majority of relatively new and small businesses are still unable to gain entry.

The Department of Trade and Industry (DTI) have numerous funding mechanisms to support local development opportunities in various sectors of the South African economy.

Table 2-8: Funding mechanisms granted by the DTI (Khan A. , 2014)

Fund name	Brief description	Funding mechanism
The Black Business Supplier Development Programme (BBSDP)	Grant encouraging black businesses to grow	Max R1 million investments. 80:20 loan (80% funded by DTI 20% invested by entity)
Co-operative Incentive Scheme (CIS)	5 or more people coming together for mutual benefit either in a social, economic or cultural way	Max R350 thousand. (90:10 principle)
Incubation support programme (ISP)	Aimed at encouraging partnerships between private sector, government and SMEs to develop incubators and create employment within communities	Max R10 Million a year for 3 years. (50:50 basis, 50% sponsored by DTI 50% by private sector. SME must contribute 40% of the fund granted from DTI.)
Manufacturing Competitive enhancement Programme (MCEP)	To improve manufacturing competitiveness in South Africa	Max 7.5 million (50:50 basis with additional tax rebate benefits)
Enterprise investment	Tailored for manufacturing	Max R200 million. Between

programme (EIP)	sector.	15% and 30% of capital required for machinery, equipment, plant and customised vehicles will be donated by DTI.
SEDA Technology programme	Grant for technology and manufacturing sectors	Max R1 million. 80% of grant must be for machinery, tools and equipment of which DTI will contribute 35%, the remaining 20% must go towards business development programme.

A few of the available funding mechanisms, relevant to the manufacturing industry, have been incorporated into Table 2-8. The table gives a brief overview of the specific fund and the structure of the funding mechanism.

There are currently approximately 40 privately- and publicly-funded incubation areas in South Africa. The Department of Trade and Industry (DTI) currently supports publicly funded incubators via the Small Enterprise Development Agency's Technology Programme, and has very ambitious plans to establish additional incubators under its recently launched Incubator Support Programme (ISP). These incubators are currently covering industries like chemicals, furniture manufacturing, stainless steel processing, mining and agricultural tooling, construction, jewellery, agro-processing and renewable energy.

The Department of Public Enterprises (DPE) established a Competitive Supplier Development Program (CSDP), which involves procuring in such a way as to increase the competitiveness, capacity and capability of the local supply base. This program also helps to develop enterprises and sustainable suppliers using these incubators in the clusters.

Through the CSDP, state owned enterprises (SOEs) are encouraged to consider the long-term benefits of forming partnerships with local competitive suppliers. The aim is to further increase spending on national industry as opposed to international import, and improving supplier development programs so as to ensure fruitful, sustainable relationships and transactions between suppliers and SOEs. To ensure this, targets are set by the CSDP for local supply procurement, and an

“SOE procurement capacity, capability and professionalism programme” has been put in place to ensure development of local supply networks.

Through the CSDP it is envisaged that more competitive suppliers will result in bigger savings for SOE’s, and thus improved competitiveness amongst service providers too. An increase in market competition amongst suppliers also offers security of supply to SOE. Another advantage is that local supply will improve, and imports will be needed less; this eliminates challenges such as currency differences, long delivery times, communication barriers, etc and offers local partnership, job creation and industry growth. This initiative aims to better the local economy as well as local service delivery from SOEs through improving local competition and supply.

Shanduko Black Umbrellas (SBU) is a non-profit incubator that supports emerging black businesses through enterprise development. These businesses are provided with a working environment and support services of SBU collaborates with partners in the private sector as well as public sector to promote SMEs and enterprise development. The main objective of these collaborations is to provide the necessary support to ensure that SMEs are sustainable beyond the first three years of operations (Shanduka Black Umbrellas NPC, 2010).

The mission of SBU is to develop South Africa’s black businesses and this is achieved through the following methods;

- Promotion of entrepreneurship as a career choice for black south Africans
- Nurturing merging black owned businesses through the first three years and providing mentorship
- Creating employment opportunities through SMEs
- Facilitating and assisting with funding applications and processes
- Monitoring and growing the knowledge of SMEs and the quality of services provided

Incubators, or more specifically business incubators, are typical institutional programs which support entrepreneurial or start-up companies via various business support resources and services. Young entrepreneurs enrol at these incubators to develop skills. As the lack of knowledge, skills, resources and infrastructure are universally recognised; technology transfer becomes a key mechanism for introducing institutional systems to the informal economy. In the last decade, we have witnessed some new emerging approaches to technology creation and transfer. Collective organisational forums emerged such as industrial clusters and networks. Nowadays, the innovation process is even totally opened to global communities in which everybody can participate.



The Technology Localisation Implementation Unit (TLIU) is an initiative of the Department of Science and Technology (DST) which seeks to implement its Technology Localisation Plan (TLP). The TLIU is hosted and incubated at the CSIR (TLIU, 2014). The TLIU assists with technological enhancements of the manufacturing, transport and energy sectors. The main focus area of the incubator is to provide a Gap analysis of a SMEs current technological or manufacturing capability and capacity and intervene with the necessary training and up skilling required. The DST incorporates assistance from the private sector and experts, including the CSIR to assist in the development needs of the SMEs. Figure 2-8 illustrates the process involved during supplier development from the TLIU.

Within clusters the suitable forms for diffusion of technologies are business alliances and partnerships, such as joint ventures and public-private-partnerships. These forms are especially suitable for big technological and infrastructure investments. The geographic proximity of cluster partners are used to integrate into global value streams. Industrial clusters support collaboration and cooperation among partners (Wiendahl & Luts, 2002). They provide a sound basis for competitiveness, innovativeness, agility and adaptiveness by enabling the interconnected partners to (1) form long-term business coalitions, (2) share information, knowledge, resources, competencies and risks, (3) develop mutual understanding and trust, (4) jointly react to business opportunities, and (5) gain synergetic effects by collaboration and cooperation. Thus, they combine good characteristics of large companies with the advantages of SME's and introduce new possibilities and potentials for innovation. Successful clusters consist of entities from the industry, public bodies, finance, media, universities and formal and informal networks.

Incubation clusters are geographic concentrations of interconnected companies and institutions in a particular field that compete and collaborate at the same time. These clusters also reflect the specializations of regions in activities, within which companies can gain higher productivity through accessing external economies of scale or other comparative advantages (Dudley, Oosthuizen, & Pretorius, 2015). This support model gains competitive strength because of its better access to trained and experienced employees, suppliers, specialized information and public goods, as well as from the motivating forces of local competition and customer demand. The ability to identify opportunities co-creatively and bring innovative products to market effectively in an efficient way also enhances the incubation cluster's competitiveness (Al-Shaikh, 1998).

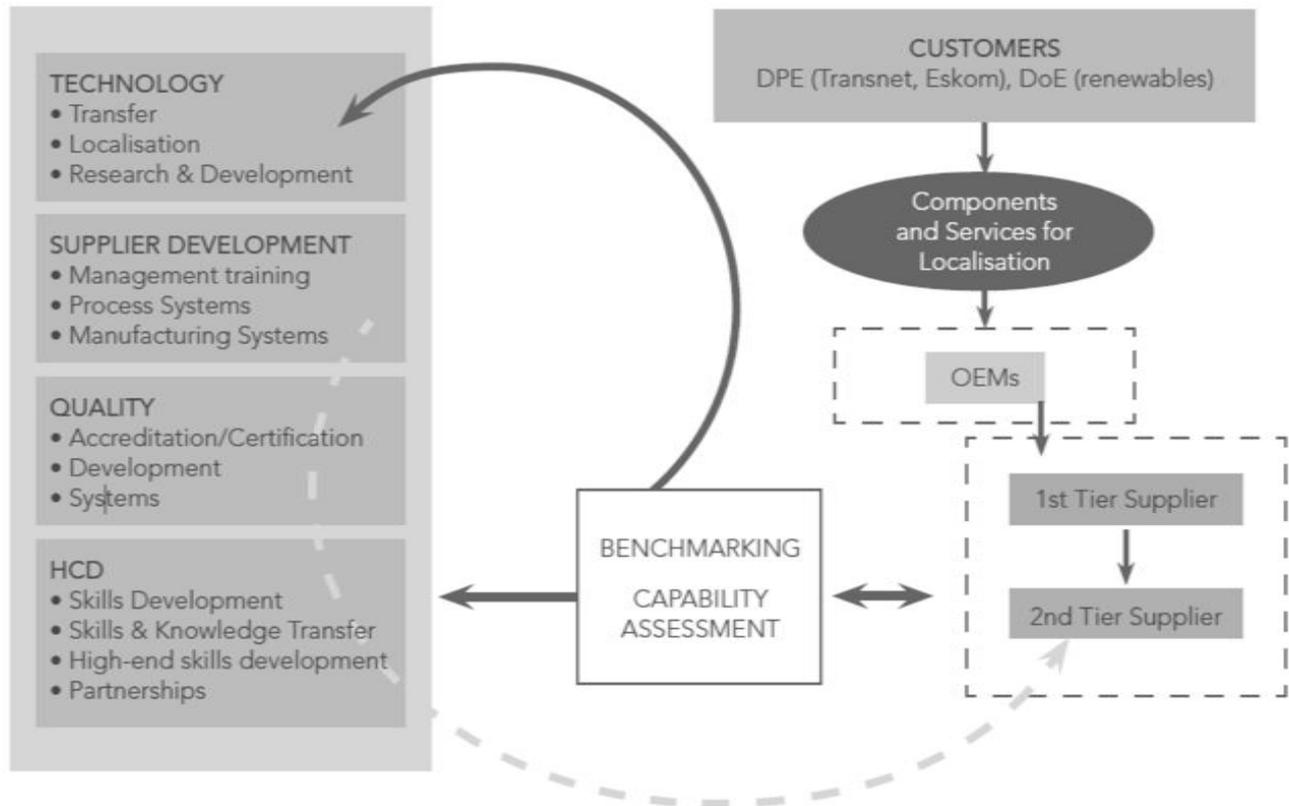


Figure 2-8: Supplier development process from the TLIU (TLIU, 2014)

South Africa has adopted this concept since 2004 with the support from the Small Enterprise Development Agency (SEDA). SEDA is mandated to implement government's small business strategy; design and implement a standard and common national delivery network for small enterprise development; and integrate government-funded small enterprise support agencies across all tiers of government (SEDA, 2006). The country has now established more than 40 incubators across the country. This has reduced the failure rate of SMMEs in the first two years of their operation from 90% to about the current 70% (Industry, 2013). The failure rate of these SMME's in the first two years was reported to be over 60% in Africa and other developing countries. Still, these SMME's incubated from these clusters struggle to grow from a start-up into established value streams, due to the absence of strategic partnerships with well established customers.

According to Miemiec (2013), an enterprise development report launched by Impact Amplifier and New York University's centre for global affairs, conducted a study on 60 of the top 100 JSE listed companies' funding towards enterprise development (ED). The study found that the funds invested by these companies into ED have not realised on its potential to impact on socioeconomic transformation, nor has the commitment accomplished the intentions of the BEE codes. Miemiec (2013) also states that with the changes to the ED element proposed by the amendments to the Codes, companies would have to re-align their supply chain strategies in order to comply. Since

Enterprise and Supplier Development will count for 40 points on the new scorecard, it is no longer going to be as easy to score full points for ED. This will drive companies to invest more in their beneficiaries by linking ED to Procurement. It is envisioned that companies would no longer just invest in ED and similarly in Corporate Social Investment (CSI) but actually incorporate Local suppliers into their value chain.

2.4.3 Current local supplier development literature and frameworks

Ganzenvoort (2015) states that supplier development is an integrated function of a company's supply chain which should be governed by strategic procurement policies and supported by enterprise development. Figure 2-9 illustrates the relationship and driving factors behind the sustainable co-existence between an organisation, its supply chain, enterprise development and supplier development.

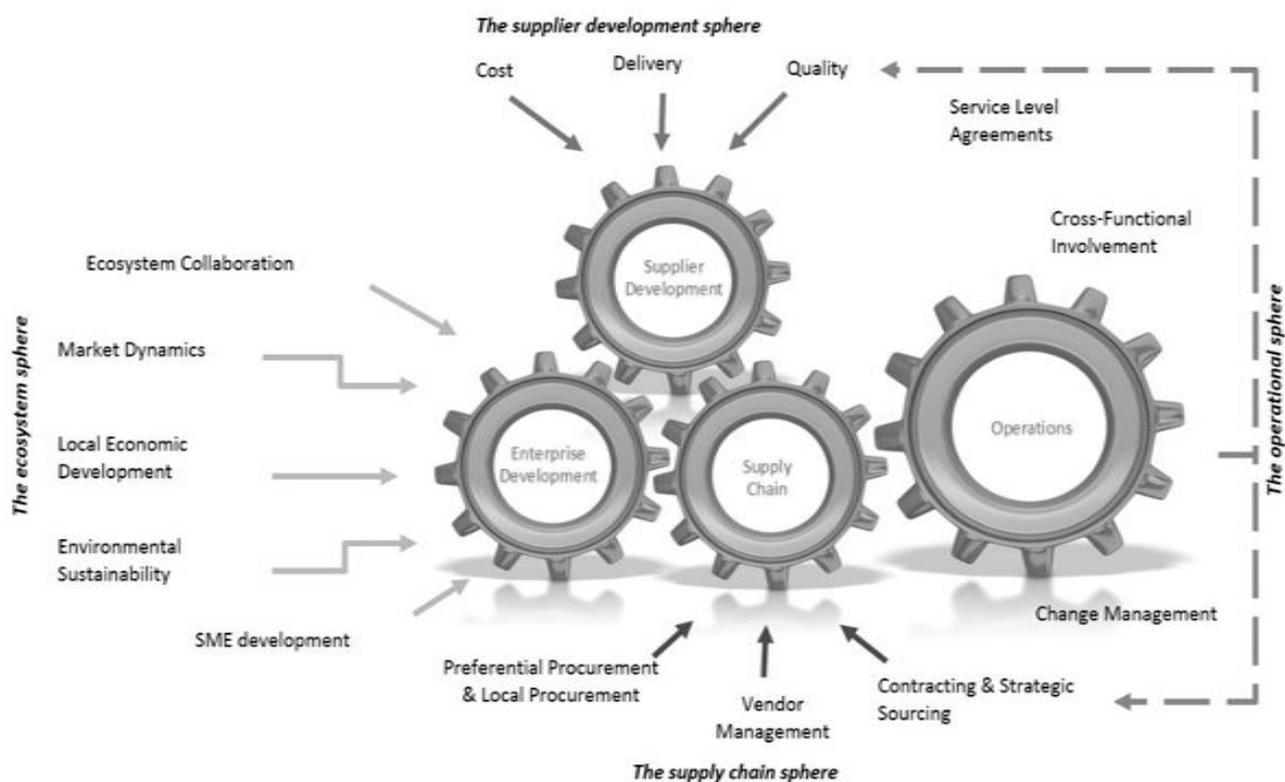


Figure 2-9 Integration of supply chain and Local supplier development. (Ganzenvoort, 2015)

The main element an organisation needs to consider within its supply chain function, during local supplier development, is the structuring of its policies regarding (1) Contracting and strategic sourcing, (2) vendor management, (3) preferential procurement and local procurement. Key drivers within enterprise development involve SME development, environmental sustainability, local

economic development, market dynamics and ecosystem collaboration. The key performance criteria during local supplier development are cost, delivery and quality. All of these factors need to be incorporated into an organisations strategy to ensure the sustainability of the locally developed suppliers (Ganzenvoort, 2015).

The supplier development Plan (SDP) is a framework established by the Department of public enterprise in South Africa and managed under the CSDP as previously mentioned. The essence of the Plan is to assist both SOEs and the private sector in establishing metrics to use in order to identify the opportunities for LSD and the selection of a local supplier (Department of public enterprises, 2008). The metrics to use for analysing LSD opportunities are summarised in Table 2-9 below.

Table 2-9: Framework for identifying Local supplier development opportunities (Department of public enterprises, 2008)

Metric	Breif description
Pareto Analysis- Items or products that can be outsourced	Repetitive high value, high risk or high volume items that make up a considerable contribution to an organisations product or service offering
Sole vender supplied items	Items that are sourced from a single vendor with no compition in the market
Imported poruducts	Items that could be sourced locally with the benefit of reduced lead times, exchange rates, ease of communication, local costs etc.
Spend Analysis	Segregate spend according to categories; Potential for export, lack of competitiveness, ever increasing priced products, imported products, high spend products, and repetitive spend/High volume.
Supply industry and supply market analysis	Identify possible suppliers through, Porters 5 forces, SWOT analysis, Value chain analysis, PEST, resourced based view (RBV), Structure conduct performance (SCP).
Sustainability of Local supplier	Establish a clear understanding of the market demand, competitive pricing and cost structures, causes for market failure and the holistic value chain of the local

	supplier.
Benefit	Establish the value of LSD (financial, contribution to broader economy, reputational etc.)

Similar to the framework of the CSDP, Simunye have established a high-level framework for the holistic collaboration between Enterprise development and Supplier development focussing on the key metrics to consider during selecting local suppliers as portrayed in Figure 2-10. These factors are demand analysis, supply analysis, enterprise selection, barriers to growth and required interventions to overcome barriers (Simanye, 2014).

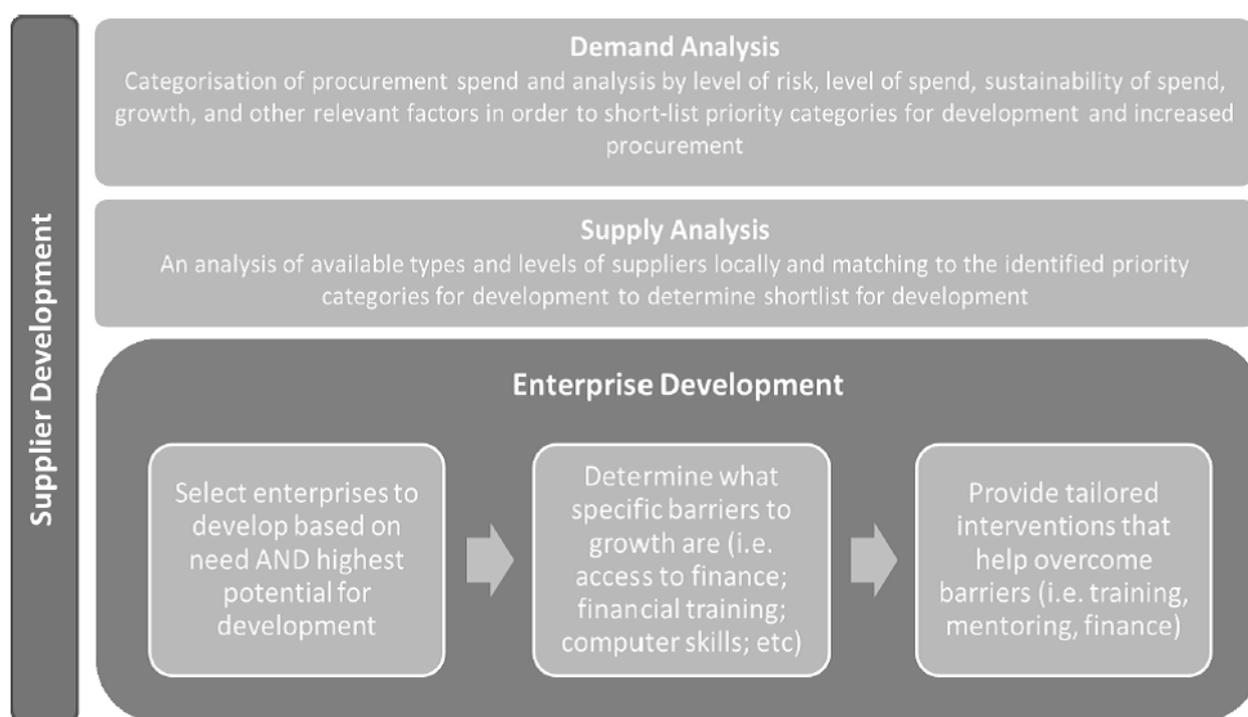


Figure 2-10 Link between Enterprise development and local supplier development in identifying local suppliers (Simanye, 2014).

The City of London's Economic Development Office has developed a five stepped approach for companies to implement a local procurement strategy which is illustrated in Table 2-10. The approach ensures that the benefits for local supplier development have been analysed, opportunities for competent suppliers have been identified, contracts are put in place for local suppliers, adequate capacity of local suppliers is assured and correct procedures are put in place to monitor and review the strategy (Economic development office, 2008).

Table 2-10: five stepped approach to implementing a local procurement strategy (Economic development office, 2008)

Critical step	Internal steps to consider
1. Benefit of Local Procurement	<ol style="list-style-type: none"> 1. Identify strategic objective of company and clarify whether local supplier can support it 2. Identify costs of implementing local procurement strategy 3. Conduct cost vs. Benefit analyses of local procurement strategy.
2. Identify Opportunities for Local suppliers	<ol style="list-style-type: none"> 1. Establish timeframes for potential opportunities 2. Assess spend categories 3. Categorise contracts and spend categories in terms of difficulties or strategic importance 4. Assign minimum requirements to each level 5. Identify priority contracts 6. Inform all stakeholders
3. Establish contracts for local suppliers	<ol style="list-style-type: none"> 1. Create action plan to address barriers of local suppliers accessing contracts 2. Start process of benefits realisation 3. Identify method of tracking spend
4. Ensure capacity and capability of local supplier	<ol style="list-style-type: none"> 1. Create a profile of business support agencies that exists nearby 2. Create effective partnership
5. Monitor and review strategy	<ol style="list-style-type: none"> 1. Agree on targets for local supplier 2. Agree review period 3. Update actual scores and agree review periods

Following on from the above stepped approach a template for identifying the benefit of a local procurement strategy has also been developed and can be viewed in Table 2-11. The template is used to effectively link a company's strategic objective to plausible benefits from local procurement and the timeline in which these benefits will be realised. The contribution that local procurement provides to a company can be measured with set criteria, proposed in the template, for various strategies that a company may seek to gain a competitive advantage. This is important to note as each benefit that can be attained through local procurement will need to be measured/quantified to ensure its feasibility to implement as well as the timeline in which the benefit will be realised.

Table 2-11: Template for Identifying and Prioritizing benefit for LMS (Economic development office, 2008)

Strategic Objective	Can local purchasing support this objective (yes or no)	What are the benefits associated with local purchasing?	How will these be measured	Priority (1,2,3)	When will benefits materialise? (Short, medium or long term?)
Increase market share/revenue		<ul style="list-style-type: none"> • Securing of new customers • Winning bids • Value creating SME acquisition • New product or process development 	<ul style="list-style-type: none"> • % increase in market share/revenue • Specific bids won a successful acquisition or business venture. 		
Reduce risk/regulatory compliance		<ul style="list-style-type: none"> • Less supply chain disruptions • Compliance with labour or environmental standards 	<ul style="list-style-type: none"> • Reduced costs as a % of total revenue • Increase of % in market capitalisation 		
Reduce cost		<ul style="list-style-type: none"> • Reduction in total cost of ownership linked to reduced energy/transportation costs • Reduced compliance costs 	<ul style="list-style-type: none"> • % reduction of costs per project 		
Corporate responsibility		<ul style="list-style-type: none"> • Increased social impact • Increased environmental impact • Increased sustainability 	<ul style="list-style-type: none"> • Application of the local Multiplier 		

2.4.4 Supplier identification strategies and analytical tools

The sustainability of an entire supply chain and the final product is affected by the sustainability performance of each partner in the chain (Kumar & Rahmanb, 2015). A sustainable supply chain can be achieved by developing relationships with supply chain partners, although literature (Cai et al., 2008; Cheung & Rowlinson, 2011; Walton, Handfield, & Melnyk, 1998) on buyer-supplier relationships also focuses on determining the magnitude of this relationship with respect to specific key suppliers, and the trade-off between the cost of the relationship and relationship performance. Further research (Ageron, Gunasekaran, & Spalanzani, 2011; Hall, 2000; Salloum, Al Sayah, & Azouri, 2015; Vachon & Klassen, 2008) indicates that this relationship depends upon the capacity, capability and intention of the supplier to incorporate sustainability strategies into its business's vision.

Cheung and Rowlinson (2011) state that companies need to use relationship strategies to motivate their supply chain partners to adopt sustainability practices and develop trust and commitment in a long-term relationship. This concept is also supported by Ageron, Gunasekaran and Spalanzani (2011) who stated that companies need to support and assist suppliers to instil sustainability within their operations. Hence, relationship management with customers and suppliers is required for implementing sustainability practices across the supply chain (Klassen & Vachon, 2003), creating a marketing advantage and increasing profits (Ytterhus, 1999; Zhu, Sarkis, & Lai, 2008).

Buyer-supplier relationships are critical to the adoption and diffusion of new manufacturing processes (Florida, 1996). Relationship management has been given importance by many researchers after seeing its contribution to sustainability in the supply chain (Cheung & Rowlinson, 2011). Collaboration and compliance have been identified as two options to develop and maintain supply chain relationships (Simpson, Power, & Samson, 2007). Gold et al. (2010) advocated collaboration with supply chain partners to achieve economic, social and environmental objectives are pertinent to ensure sustainability. Therefore, companies need to focus on the type of relationship they wish to instil with their supply chain partners, based on the type of product or part of the value chain to be outsourced, in order to gain a competitive advantage (Senge & Prokesch, 2010).

Leek, Turnbull and Naude (2002) found that companies use two of the following relationship management methods namely; (1) a formal documented system and (2) personal judgement and meetings. It could be said from this that there exists either a formal method of managing a relationship through legal contractual agreements, or an informal approach linked to mutual understanding and trust. Golicic et al. (2003) established that there are two main categories of buyer-

supplier relationships existing of either a “Collaborative” relationship or a “compliance” relationship. Hansen (2009) Goes further to say that these categories can be further sub-divided into (1) Transaction, (2) Collaborative, (3) Co-production and (4) co-creation relationships.

Table 2-12: Supplier-Buyer relationship types, general application and supplier type (Cannon & Perreault, 1999); (Rinehart et al, 2004).

Relationship Type	General application in Business	Type of supplier
Basic buying	Used where little to no risk is involved regarding a threat to loss of I.P, customers, quality, profits. Used for basic off the shelve type of items.	General, Reputable and well established supplier.
Non-strategic	Little to no risk is involved regarding a threat to loss of I.P, customers, quality or profits. Used for day to day items that can be manufactured from certain suppliers.	Reputable and well established supplier with many competitors.
Contractual	Where risk is involved in loss of I.P, customers, Quality and profits. Certain performance criteria need to be achieved by supplier to meet specifications and repercussions enforced for non-compliance.	Supplier with few competitors
Administrated	Where risk is involved in loss of I.P, customers, Quality and profits. Certain performance criteria need to be achieved by supplier to meet specifications and repercussions enforced for non-compliance.	Supplier with many competitors
Specialized contract	Where High risk is involved in loss of I.P, customers, Quality and profits. Certain performance criteria need to be achieved by supplier to meet tailored specifications and detailed repercussions enforced for non-compliance.	New to the market suppliers with very few competitors
Partnership	The core product offering of a company is	Supplier offering partial

	partially produced by another supplier. Loss of I.P, customers, quality and profits are crucial to the success of the relationship	development of final product or potential competition for the business.
Joint venture	Partnering up with a supplier to embark on enhancing current service offering or developing a new product	Supplier with certain competencies that are more established than own business and in the similar industry.
Customer supply	Where a supplier will be subcontracted out to directly deliver a product to a company's customer. Used when a customer might not have access to this supplier based on certain criteria. This relationship is commonly known as the "middle man" scenario. Where the company acts as the middle man between the supplier and customer.	Trusted well established supplier with very little competition. (best in class) Only supplies to customers that meet certain thresholds i.e. Spend, Volume bought, qualified to buy, legal requirements etc.
Mutually adaptive	A relationship involving the bi-directional sharing of certain processes, knowledge, technology, infrastructure, funds etc. Where both parties achieve mutually equal benefits from the agreement. This could be similar to a joint venture but it does not necessarily have to do with jointly developing a product offering.	A supplier that is willing to offer certain elements of its business in exchange for other elements from the company.
Strategic alliance	Creating a business ally to work together to achieve improved business performance. This is different to a joint venture as the two companies can still function independently from each other and strive rather to "help each other out". The companies would also tend to share the same strategic views and practices.	Supplier is similar to the company or Supplier offers same products as the Company.

From further research (Cannon & Perreault, 1999; Rinehart, Eckert, Handfield, Page, & Atkin, 2004) the following types of buyer-supplier relationships, listed in Table 2-12, were identified and the general application of each, within a business context, is given for different types of suppliers.

The different types of Buyer-supplier relationships are categorized into the relationship management types required for each in Figure 2-11, which also represents where these relationships lie on the risk continuum. Risk in this case refers to the risk business will face if the relationship is not maintained or the supply of products or services aren't met.

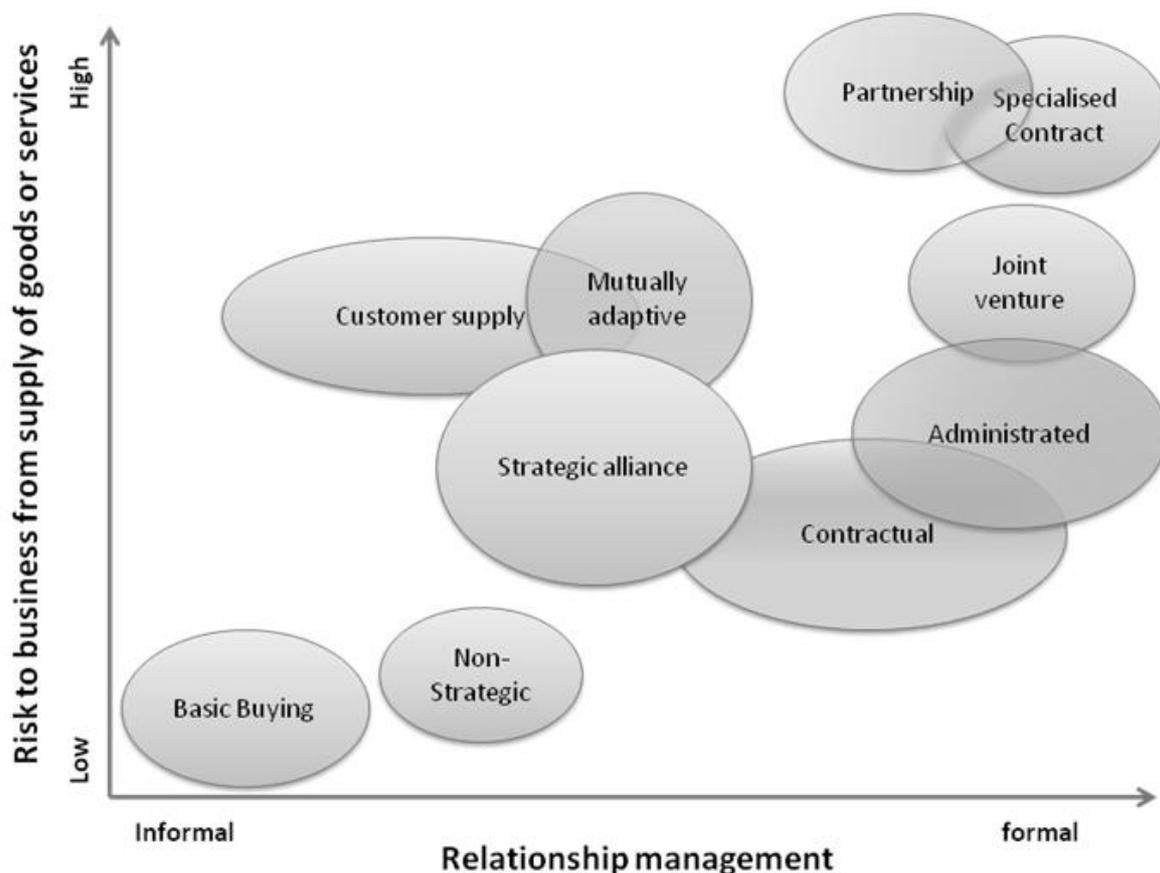


Figure 2-11: Segmentation of Relationship types into Level of Risk and relationship management required (Rinehart, Eckert, Handfield, Page, & Atkin, 2004) & (Leek, Turnbull, & Naudé, 2002)

The supplier selection process is pivotal to the effectiveness, efficiency and sustainability of a company's supply chain which ultimately has a great impact on the bottom line. From a manufacture's perspective, Chan (2003) reports that customers are becoming increasingly influential in terms of their purchasing and buying power. Ultimately this leads to manufactures needing to cooperate or interact with suppliers to ensure maximum productivity is reached at minimal costs while ensuring that customer requirements are still satisfied. The selection of suitable suppliers in an

organisation should involve all critical decision makers of the business that would influence or be affected by the performance of the supplier. Strategic management decisions influence the relative importance of the various criteria involved in the supplier selection process (Weber, Current, & Desai, 2000). This collaborative approach would ensure the required “buy in” from all parties.

Chou and Chang (2008) established four steps to the decision making process namely; defining the problem, formulation of criteria, qualification, and final selection. Defining the problem in the decision-making processes is the first step in the method that supports the decision makers in carefully questioning the need for a decision and identifying available alternatives.

Table 2-13: Supply chain issues for supporting the company's strategy (Heizer & Render, 2004)

Elements of Strategy	Low Cost strategy	Response strategy	Differentiation strategy
1. Supplier's goal	Supply demand at lowest possible cost	Respond quickly to changing requirements and demand to minimize stock outs	Share market research; jointly develop products and options
2. Primary selection criteria	Select primarily for cost	Select primarily for capacity, speed, and flexibility	Select primarily for product development skills
3. Process characteristics	Maintain high average utilization	Invest in excess capacity and flexible processes	Modular processes that lend themselves to mass customization
4. Inventory characteristics	Minimize inventory throughout the chain to hold down costs	Develop responsive system, with buffer stocks positioned to ensure supply	Minimize inventory in the chain to avoid obsolescence
5. Lead time characteristics	Shorten lead time as long as it does not increase costs	Invest aggressively to reduce production lead time	Invest aggressively to reduce development lead time
6. Product design characteristics	Maximize performance and minimize cost.	Use product designs that lead to low setup time and rapid production ramp-up	Use modular design to postpone product differentiation for as long as possible

During the formulation of criteria, the main task for buying firms is assessing the key competitive factors in their industry and translating these dimensions into supplier selection criteria. The qualification stage involves prioritising or assessing the performance of each supplier against the selection criteria and assigning a scoring metric to represent conformance to the criteria. The final selection process involves adjudicating the overall scores of the suppliers and deciding which supplier to choose.

Aligning a company's strategy to the selection criteria for suppliers will involve aligning a company's supply chain strategy to ensure it satisfies the ever changing market demand (Heizer & Render, 2004). In order to do this it is necessary to consider the supply chain issues listed in Table 2-13.

De Boer, Labro, & Morlacchi (2001) established that most of the decision making methods are applied to the qualification and final selection stages in the buying process. A thorough supplier selection method is essential for establishing effective supplier development and partnerships. Various criteria for the supplier selection process have been established in research throughout the years.

Table 2-14: Selection criteria for supplier and measurable criteria

Selection Criteria	Measurement criteria (KPI)
Price	Discount from alternative (Saving)
Quality	value for money (Defects, life span of products)
Capability	Conformance to specification (NCRs- non conformances reported)
Service (customer satisfaction)	Perceived service from supplier (ability of supplier to be flexible or go the extra mile)
Reliability/consistency	Deliveries reported on time in full (OTIF)
Capacity	Output rate of supplier and lead times (lead times)
Growth Potential	Potential of supplier to grow

In a survey conducted by Dickson (1966) the following criteria for supplier selection were established; Quality, delivery, performance history, warrant and claim policy, net price and technical capabilities. Weber, Current, and Benton (1991) identified price, delivery, quality, facilities and capacity, geographic location, and technical capability as selection criteria. In a survey conducted by Choi and Hartley (1996) in the US automotive industry supply chain managers identified finance, consistency, relationship, flexibility, technological capability, service, reliability, and price. Van

Weele (2000) identified R&D and engineering capabilities, financial stability, production capacity, potential capability, and quality of their logistics and quality systems as assessment criteria for selecting suppliers. Hong, Park, Jang and Rho (2005) identified two main categories for supplier selection criteria namely supply risk and supply profit. Supply risk refers to whether or not a supplier can deliver the desired product, in the desired quality at the desired time. Supplier profit referred to price, quantity and quality of service.

Table 2-14 summarises the selection criteria of suppliers based on the research presented. It includes the factors that could be used to measure suppliers against each of their selection criteria. These measurements consist both of a quantitative and/or qualitative nature in certain cases.

Once the criteria for supplier selection have been established, qualification/evaluation techniques need to be used to assign performance scoring of suppliers against the criteria so that objective adjudication can take place to select the most suitable supplier. According to Chou and Chang (2008) in mostly all cases of supplier selection, certain criteria will involve the rating /prioritisation of supplier performance against qualitative (subjective or linguistic) or quantitative (measurable) characteristics. Examples of qualitative characteristics include; scoring a supplier against its alignment to the company's strategy, capabilities or potential to grow, reliability of supply, customer satisfaction, quality etc. Quantitative characteristics include price, lead time, capacity etc. where an exact unit of measure can be allocated. The dilemma of weighting the importance of certain criteria against each other in order to align with the company's strategy would also pose the problem of qualitative or quantitative scoring. Supplier selection has been deemed to be a multiple criteria decision making (MCDM) problem in that it considers the input from various participants in addition to the criteria and weighting factors mentioned (Choi & Hartley, 1996; Chou & Chang, 2008; Hong, Park, Jang, & Rho, 2005).

Various analytical tools exist to deal with MCDM problems within a supplier selection context and have been summarised in Table 2-15 with referenced made to relevant research where the tools have been applied during the supplier selection process.

Table 2-15: Analytical tools used in supplier selection problems and reference to application in research

Analytical tool	Description	Reference to literature
Analytical hierarchy process (AHP)	AHP provides a framework to cope with multiple criteria situations involving intuitive, rational, qualitative and quantitative aspects to prioritise alternatives.	(Bhutta & Huq, 2002); (Nydick & Hill, 1992); (Chan, Chan, Ip, & Lau, 2007)
Data envelopment analysis (DEA)	DEA is an optimization method of mathematical programming used to generalize single -input/ single-output technical efficiency measure to the multiple-input/ multiple - output case by constructing a relative efficiency score as the ratio of a single virtual output to a single virtual input	(Clarke & Gourdin, 1999); (Weber, Current, & Desai, An Optimization Approach to Determining the Number of Vendors to Employ, 2000)
Analytical network process (ANP)	ANP is used to handle dependencies and feedback among criteria and Alternatives	(Gencer & Gurpinar, 2007) & (Liao, Chang, & Tseng, 2010)
Artificial neural networks (ANN)	method to describe the non-linear relationship between inputs and outputs in dealing with multiple variants and sub criteria	(Aksoy & Ozturk, 2011)
Linear programming (LP)	Solving a problem through creating an single objective function to optimise a solution where certain decision	(Talluri & Narasimhan, 2003); (Hong, Park, Jang, & Rho, An effective supplier selection method for

	variables and constraints exist.	constructing a competitive supply-relationship, 2005)
Multi-objective programming (MOP)	Solving a problem with multiple Objective functions	(Ozkok & Tiryaki, 2011)
Simple multi-attribute rating technique (SMART)	A technique used where multiple decision criteria are given weighted ratings and alternatives are scored against each criteria resulting in a alternative with a highest average weighted score.	(Chou & Chang, 2008);
Case-based reasoning (CBR)	Process of solving new problems based on the solution of similar past problems	(Kwon, Im, & Lee, 2007)
Technique for order preference by similarity to ideal solutions (TOPSIS)	“It is a method of compensatory aggregation that compares a set of alternatives by identifying weights for each criterion, normalising scores for each criterion and calculating the geometric distance between each alternative and the ideal alternative”. (Assari, Mahesh, & Assari, 2012)	(Safa, Shahi, Haas, & Hipel, 2014)

In a recent research study, Yildiz and Yayla (2015) conducted an extensive literature review on the different types of analytical tools used for MCDM supplier selection problems. In their research they analysed 91 studies conducted between 2001 and 2014 in this field. They established the number of times a study dealt with analytical tools in each type of sector and the type of tool used for supplier selection. Figure 2-12 illustrates the frequency of analytical tools used in each type of industry.

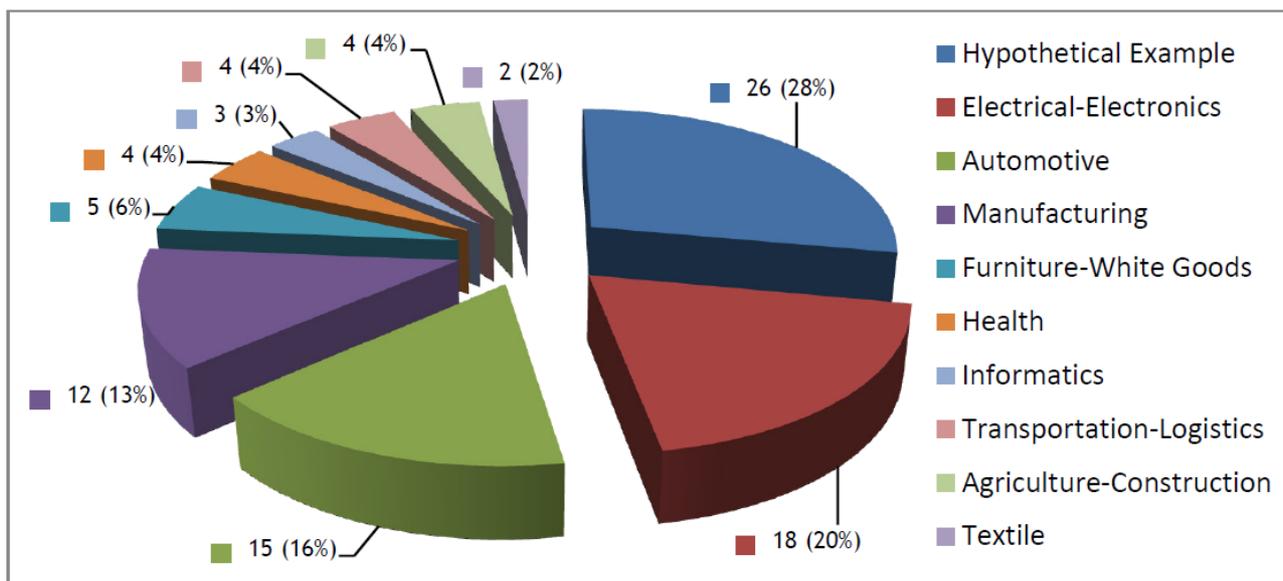


Figure 2-12 Sector based distribution of reviewed papers Source: (Yildiz & Yayla, 2015)

Although the use of hypothetical examples were used most often (28%), the Electrical-Electronic (20%), Automotive (16%) and Manufacturing (13%) sectors represented 49% of the remaining categories.

Following on from these results the study further evaluated the type of Analytical tools used in the studies conducted in these 3 main sectors (Manufacturing, Electrical-Electronic and automotive). The tools identified and the frequency of occurrence for each are represented in Figure 2-13. It was established that the 5 most common analytical tools used for supplier selection in order of frequency used are; (1) Analytical Hierarchy Process (AHP), (2) Analytical Network Process (ANP), (3) Linear Programming (LP), (4) Artificial Neural Networks (ANN) and (5) Data Envelopment analysis (DEA).

The findings of Yildiz and Yayla (2015) bear great relevance to this study in the sense that the research of this thesis pertains to the manufacturing sector and the development of local suppliers. Selecting a local supplier to develop will inherently involve MCDM processes therefore the AHP method will be used/included within the framework.

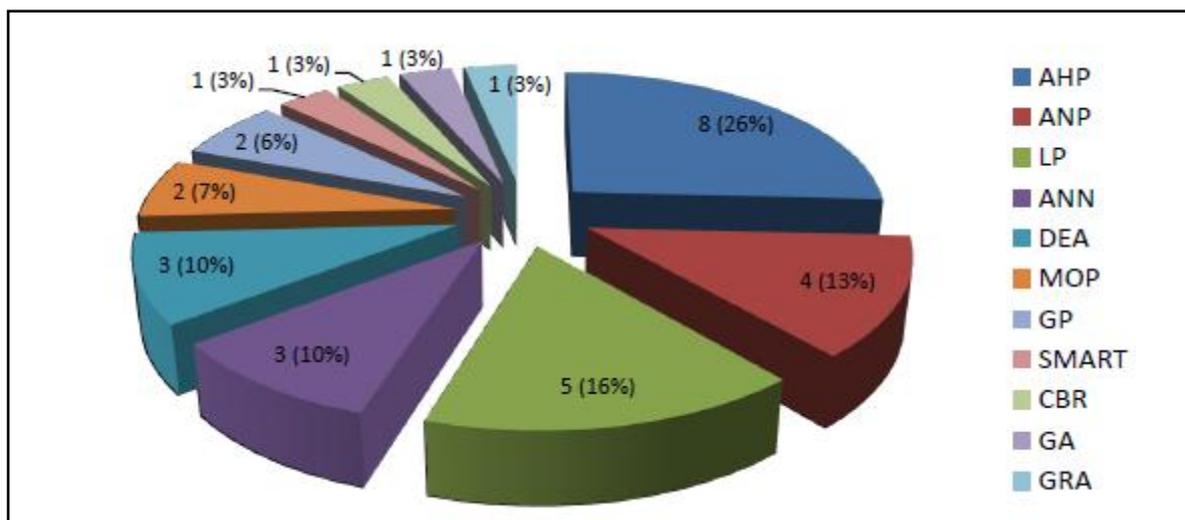


Figure 2-13 Individual analytical methods used for supplier selection Source: (Yildiz & Yayla, 2015).

The Analytical Hierarchy Process (AHP) involves formulating an overall goal to work towards and establishing primary criteria influencing the overall decision and linking secondary/sub criteria to each primary criterion. A weighted scoring method is used for each primary level criterion and for each sub criteria under the primary to establish the importance of each criterion. Each alternative option is then scored against each criterion according to the level of conformance to each. The overall score for each alternative is established by multiplying the score and weighted score of each sub criteria along the path, summing all the scores for the sub criterion at the primary level and multiplying the score with the weighted score of the primary criterion. This is carried out for each primary criterion and the overall score for the alternative is the summation of the calculated primary criterion scores (Akarte, Surendra, Ravi, & Rangaraj, 2001).

2.4.5 Key to successful supplier development projects

Morrison, Breen, and Ali (2003) state that the key success factors of SMEs are a balanced alignment of the owner's intention, the business's abilities and the opportunity environment. SMEs generally exist due to the knowledge and capability of the craftsmanship they poses and manage their businesses on tacit knowledge (Nooteboom, 1994). Small firms are more likely to engage in informal management practices and principles than to adopt sophisticated planning and control techniques (Everett & Watson, 1998).

Table 2-16: Success factors and key elements for a project to develop local suppliers (Forsman, 2008)

Success factor	Element of success	Focus of assessment
Project preparation	<ul style="list-style-type: none"> • Clarity of business impact • Balance between project goal and resources 	<ul style="list-style-type: none"> • Identifying business opportunity and impact • Realistic project goal and resource allocation
Entrepreneurial success	<ul style="list-style-type: none"> • Richness of opportunity • SME business ability 	<ul style="list-style-type: none"> • Status of industry evolution and promising niche markets • Managerial skills of SME owner, Know-how and expertise in area, ability and capability to capitalise on opportunity
Change management	<ul style="list-style-type: none"> • Need for change • Communication 	<ul style="list-style-type: none"> • Identify reasons for change • Effectiveness of information distribution about the change and feedback gathering
Project management	<ul style="list-style-type: none"> • Planning and documentation • Identifying key stakeholders • Control and feedback on progress • Risk management and problem solving • Training 	<ul style="list-style-type: none"> • Sophisticated planning and documentation • Level of defined responsibilities and authorities between responsible parties • Monitoring progress • Identify risks, manage risks sophisticated practices for problem solving • Sufficiency, practicality, level and timing of training for local suppliers
Project success	<ul style="list-style-type: none"> • Efficiency • Impact on local supplier 	<ul style="list-style-type: none"> • Meeting budget and schedule goal • Solving suppliers problems and providing continued growth opportunities

In a journal paper conducted by Forsman (2008), four case studies of local supplier development projects were analysed to determine what the key success factors are in ensuring the sustainability of the SME created. The study found that there are 5 pivotal factors during the supplier development

project of a company to ensuring success namely; (1) Project preparation success, (2) Entrepreneurial Success, (3) Change management success, (4) Project management success and (5) Project success. It is understood that the project success (creating a successful and sustainable supplier) is as a result of the other 4 factors. Table 2-16 represents the elements for each of the factors identified and the relevant focus of assessment for each.

This Project management approach to LMSD will be incorporated in the development of the LMSD framework to ensure a sophisticated approach to implementing the strategy is followed.

2.5 CURRENT SHORTFALLS FOR LOCAL SUPPLIER DEVELOPMENT

2.5.1 *Integrating local suppliers into value streams*

One of the challenges that organisations face is to integrate business and society. Organisations must optimise the interdependencies between the organisations and society. At the same time, small and medium sized enterprises suffer from the shortage in skills (know-how), appropriate technology and the lack of a collective support system. This leads to inefficient value creation, a high degree of energy (resources) wasted in production processes and frightening pollution.

When the Harvard Business Review organised a team of leading academics in the discipline of supply chain management, it was not technology that was foremost in the discussion, but people and relationships that were identified as the major themes. For example, the opportunities and challenges of globalisation and the continual pressure for speed and cost containment are requiring businesses to establish relationships with new types of suppliers (Beth, et al., 2006).

The challenge in supply chain integration is to coordinate activities across the supply chain so that the enterprise can improve performance by reducing costs, increasing service levels, better utilising resources, and effectively responding to changes in the market place (Kwon & Suh, 2005). A survey (Naude & J.A, 2011) conducted in the automobile industry in South Africa recorded the current short falls of local suppliers as experienced by customers. In a review conducted by the FEM research group in South Africa in 2011 it was identified that various factors affect the development and functioning of SMME's. As outlined in the international literature (Everett & Watson, 1998) there are both endogenous and exogenous factors that affect SME's.

Internationally, the management of cash flow, debt and access to markets have been identified as key challenges; while at a South African level the necessary skills and the ability to implement (fear of

failure) have been identified as critical shortcomings (industry, 2008). According to Porter and Kramer (2006) this interdependence takes two forms, namely inside-out linkages where an organisation impinges upon society through its operations in the normal course of business and secondly outside-in linkages where external social conditions influence the organisation for better and for worse.

Consider supply chain integration to be a strategic tool that aims to reduce costs and thus increase customer and shareholder value. Effective supply chain planning, built on shared information and trust among partners, is a vital part of successful supply chain functioning. Researchers (Monczka, Handfield, Giunipero, & Patterson, 2010) define integration as *the process of incorporating or bringing together different groups, functions, or organisations, either formally or informally, physically or by information technology, to work jointly and often concurrently on a common business-related assignment or purpose*. Supply chain integration is also described as:

- Supply chain members using techniques enabling them to work together to optimise their collective performance in creation, distribution and support of the end product (Sundaram, 2002)
- Coordination mechanisms imply that business processes should be streamlined and interconnected, both within and outside the organisation's boundaries (Cagliano & Caniato, 2006).

Business sectors in South Africa currently also face the mandate to comply with the new Broad-Based Black Economic Empowerment (BBBEE) Act set by the Department of Trade and Industry in 2013 (South African Government, 2013) which has been enforced since 11 April 2015. The act has changed the calculation of firms' BBBEE ratings, which summarises the changes from the 2007 codes to the new 2013 codes. The ratings a firm receives in accordance with the codes, determines a firm's BBBEE compliance, which in turn determines the ability to receive governmental tenders, licences and investments.

The new imposed BBBEE ratings thus pose a great challenge for international/local non-compliant BBBEE companies (from here on referred to as Non-compliant companies) who would be faced with restructuring their business strategies, in the South African market, to ensure their sustainability. This ultimately creates the opportunity for local businesses (Local Suppliers in South Africa who conform to the BBBEE requirements) to capitalise on the market share in South Africa.

The contesting debate, however, is whether the local suppliers would be able to supply products/services at the same (or better) quality, reliability and cost than their non-compliant global counterparts. Thus certain elements of a product/services' value chain, supplied conventionally by

non-compliant companies, needs to be analysed to determine the possibility of certain elements being produced or procured by local suppliers- either back to the original company or to the market itself. This would require, in essence, that the non-compliant company either relinquishes a certain element of its value chain to the new local supplier or creates an opportunity for local suppliers to enhance its current product/service offering.

2.5.2 Sustainability challenges facing local suppliers

The lack of sustainability efforts in SMEs is attributed due to the inherent characteristics of SMEs (Lee, 2009). SMEs often lack the awareness, expertise, skills, finance, and human resources to build the required changes for sustainability within the organization (Fatimah, Biswas, Mazhar, & Islam, 2013). Hillary (2004) identified barriers and drivers for the environmental management system for SMEs. These barriers are lack of knowledge, training, implementation cost, transient cost, local community, employee skills and government. The drivers for sustainability in SMEs, as identified by Hillary (2004) are customers, insurers, banks and larger companies.

The Simunye project was established in 2007, in Roodepoort South Africa, and focuses on the sustainable development of local communities in South Africa by providing underprivileged people with entrepreneurial skills and education through volunteers and donations from Businesses, universities and individuals (Simanye, 2014). In an interview with Alana Bond (2016), from Simunye the following barriers and challenges to local supplier development were listed:

- Lack of capacity of local SMEs
- Developing the “right “ SMEs
- Stringent on site requirements from customers’ Policies in terms of Health and safety, quality policies (ISO 9001), Risk assessments etc.
- Information gaps
- Tendering process complexity from customers
- Global set procurement and global sourcing contracts from customers
- Avoidance of change and risk aversion of customers
- “Compliance blindness” and failure to see the business potential
- Lack of buy-in to a process which typically requires significant involvement and co-operation from the customer.

Further to the interview, the lack of capability/competence in local SME suppliers is subject to a lack of:

- Funding access as well as lack of cash reducing ability to wait for long invoice payment terms.
- Business expertise
- Technical expertise
- Necessary skilled labour
- Diversified customers

From the above research the differentiation can be made between the inhibiting factors, or as Hillary (2004) stated, “barriers”, in starting up a local SME and factors relating to sustaining a local SME. This delineation can be split up into the local “ecosystem” (the surrounding community, infrastructure, funding, technology, skills etc) requirements for an SME to be created and the inhibiting factors of the local SME’s business development/architecture in sustaining itself. Figure 2-14 illustrates the relationship between these two factors in terms of increasing competence and capability (representing the “Ecosystem” requirements) and increasing sustainability (representing business opportunities/constructs to ensure sustainable business growth).

Competence and Capability refer to the following requirements of a local manufacturing supplier:

- **Funding**- The necessary capital and operating cash flow to maintain the business
- **Skills**- The required “know-how “ to conduct the required activities for the business offering (technical skills, administrative skills, managerial skills etc)
- **Capacity**- The physical required space, correct and sufficient amount of tools/machinery, sufficient amount of resources and adequate processes and systems to ensure the required throughput of the business.
- **Technology**- relevant technology to ensure a competitive advantage (modern machinery/tools to ensure quality, cost and time constraints are met).
- **Information**- market intelligence and customer feedback/improvement systems to ensure business metrics are properly measured and utilised.

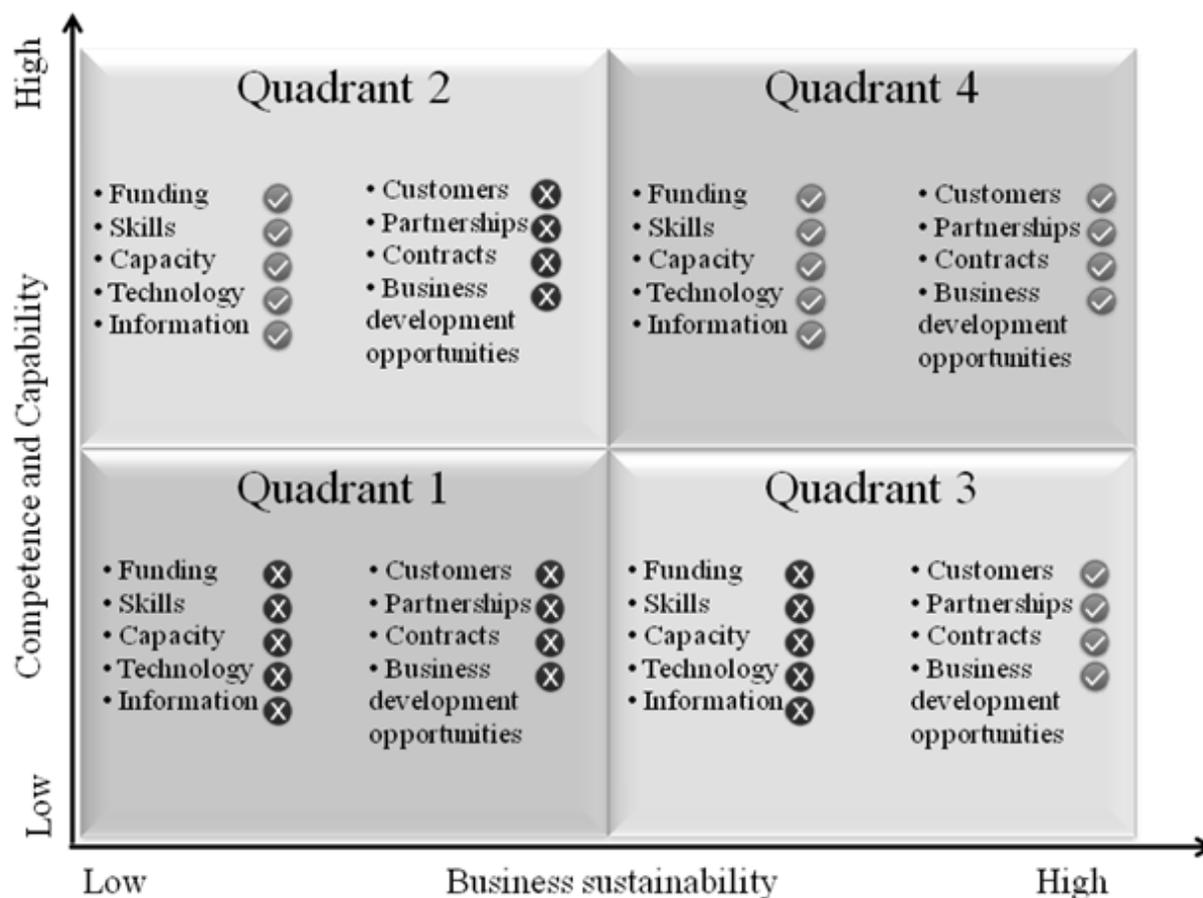


Figure 2-14: Relationship matrix between Sustainability and Competence & Capability factors

The business sustainability metric of the matrix refers to the ability of the business to ensure its growth or continuity in the market. Factors affecting business sustainability include:

- **Customers-** Ensuring a client base or market to provide goods for
- **Partnerships-** Creating alliances with similar businesses to jointly produce goods or share workloads.
- **Contracts-** Establish off take agreements, supply contracts, fixed terms contracts etc. with customers, ensuring demand and business.
- **Business development opportunities-** Expand business offering through new product development and capturing new market opportunities.

The effect of overcoming each of these factors incrementally, places a local supplier in a certain quadrant. If one had to only focus on increasing a Local SME's Capability and Competence the SME would have all the right tools/skills to do the job, but no one to do it for. If only the sustainability factors for a Local SME were to be enhanced, it would have all the customers and work coming in to

survive but no “tools/skills” to do the job. It is thus apparent from the research that these two factors need to be closely considered to ensure the prosperity of local manufacturing suppliers.

2.6 CONCLUSION OF LITERATURE REVIEW

From the literature review it is evident that local manufacturing supplier development is more than just providing a potential supplier with aid or an opportunity. There are various constructs to consider before attempting developing a supplier. These involve firstly the reason an organization is deciding to develop a supplier, secondly deciding which supplier to develop, thirdly to determine what the supplier needs in order to be successful/sustainable and lastly finding a constructive way to develop the supplier to ensure the desired benefit is achieved.

There are many concepts to consider during the development of the supplier. The research has shown that various funding and support mechanisms exist that organizations could draw from to assist in the development of suppliers. It is thus evident that various stakeholders have a role to play during the development of a supplier and along different life cycles of the supplier's development. The main aspects of the research that contribute significantly towards the development of local suppliers are:

- Identifying key challenges local suppliers face
- The role the government plays in supplier development
- The role the private sectors play in supplier development
- The role of incubators and training centres
- Supporting structures and funding mechanisms
- Identifying opportunities for local suppliers
- Various life cycles of local suppliers
- Supplier development strategies and frameworks

These main aspects will be evaluated in detail in section 4 of the thesis in order to construct a conceptual framework for local manufacturing supplier development.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 OVERVIEW

This thesis represented a strategic local manufacturing supplier development roadmap as a decision support tool which will be utilised within the South African manufacturing industry. The development of the tool/framework entailed a thorough literature review of current local manufacturing suppliers' challenges, development requirements and current support structures to assist their development.

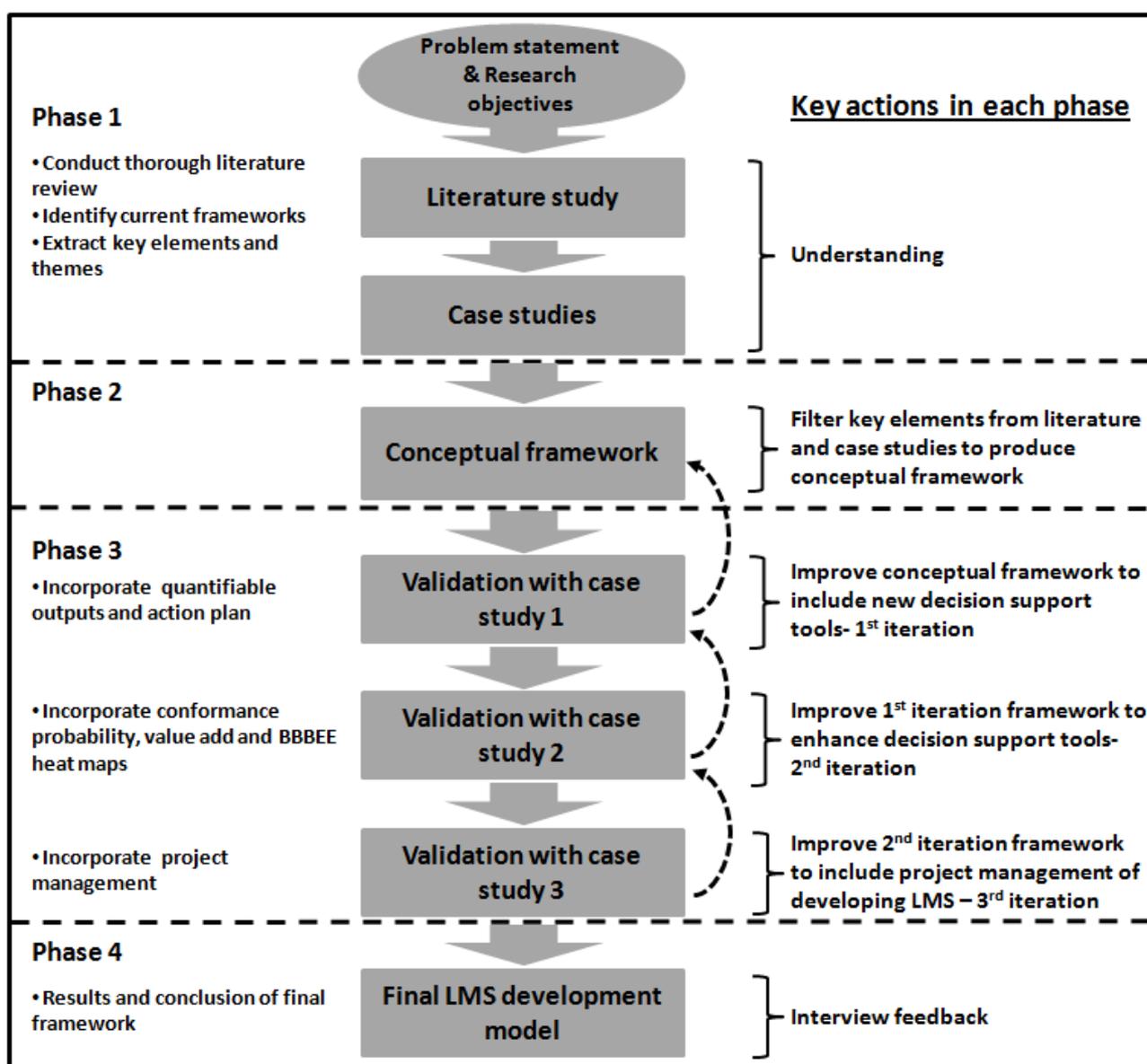


Figure 3-1: Research Methodology for Developing LMS Framework

The necessary requirements and strategies from a company's perspective to develop LMS was investigated in conjunction with the policies/strategies of the Government to promote local supplier development.

During the literature review, research from the various fields of the topic were combined with current governmental policies, current supporting structures, case studies, interviews and the author's own industry experience to establish a theoretical framework. The theoretical framework was then applied to 9 case studies of local supplier development to test the shortfalls and gaps in the framework in order to establish a conceptual framework for local supplier development. From the literature review and case studies, constructs of the LMS development roadmap were established to create the conceptual framework.

The conceptual LMS development framework was then validated through the use of case studies in industry to determine if all constructs created correlate to the practical application thereof. After each case study the conceptual framework was re-evaluated to incorporate further enhancements to ensure the final framework included all necessary decision support tools. Once the final LMS development roadmap with decision support tools was established, it was then verified through presenting the framework to subject matter experts to gain feedback on the relevance and validity. Feedback from industry related personnel regarding the effectiveness of the tool is represented in Appendix D. Figure 3-1 illustrates the research methodology for the development of the strategic LMS development roadmap as a decision support tool.

3.2 RESEARCH APPROACH AND DESIGN

The initial stage of the research entailed a detailed literature review to combine all current mentioned methodologies, policies, practices, development tools and theories on local supplier and SME development within a South African context, into a conceptual framework. Nine case studies, relating to supplier development, were then further analysed to gather additional data pertaining to the constructs of the framework. The framework was further enhanced and validated by comparing its outcomes to three industry related case studies (within the manufacturing industry) where iterative improvements were made in order to develop a strategic local manufacturing supplier development road map as a decision support tool.

This type of research methodology is known as Grounded Theory. Grounded Theory is a systematic methodology in the social sciences involving the construction of theory through the analysis of data (Bryant & Charmaz, 2007). Grounded theory is a research methodology which operates inductively,

in contrast to the hypothetico-deductive approach. Thus, grounded theory is quite different from the traditional model of research, it involves choosing an existing theoretical framework, and only then collects data to show how the theory does or does not apply to the phenomenon under study (Allan, 2003). Grounded theory further seeks to create opportunities for the development of new conceptualized theories (Charmaz, 2006).

In this thesis the Grounded Theory methodology was the most appropriate as it provided an empirical enquiry (proposal of a new strategic LMS development road map as a decision support tool) that investigates a current phenomenon within a real life context utilizing data of past projects, current projects, academic literature, semi structured interviews and participant observations (Simons, 2009). The research conducted in this manner uncovered new information after evaluating each case study. This included the need to create a model to quantify the conformance of a LMS to each key element during each stage of the LMS development phase. An action plan stating the various areas to develop a LMS with suggested solutions, funding mechanisms and support programs to utilise during the various phase of an LMS's development was also incorporated into the model. Further iterations revealed that comparative analysis between selecting various suppliers is required. This resulted in the creation of the probability of an LMS conforming to requirements to be incorporated into the model. Heat maps comparing the investment required for each LMS to conform to specifications were also included into the model to enhance the decision support capabilities. The final validation uncovered the need to incorporate a LMS development project management program. The final LMS development road map was successfully tested through feedback from industry participants, interrogating the final validation of the model.

The results from the research are representative rather than indicative. The Framework represents a generic validated method of selecting and developing a LMS and it cannot be proven that all steps, tools and development phases will be utilised in each development project as certain cases would only utilise a relevant portion of the framework.

3.3 DATA COLLECTION AND ANALYSIS

The research presented utilised various methods of data capture. These included audio recordings, own experience, interviews and observations. The use of voice recordings proved to be particularly useful as the interviews conducted could be referred back to in verbatim at later stages. The type of data sampled was mainly in line with information required for the case studies, inputs into the model and data from previous local supplier development projects in the manufacturing industry.

Data was analysed through a process of categorising findings which resulted in the creation of themes and key elements. The data from the output of the model was further evaluated in order to transform it into meaningful information to support the decision making process of selecting the most appropriate LMS for development.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 OVERVIEW

The objective of this section is to create a final strategic LMS development roadmap to be used as a decision support tool for identifying an appropriate LMS and establishing the procedure for its development. All necessary developmental stages, key elements in each, existing support and funding structures as well as the necessary decision support tools will be incorporated through the development of the tool. This will be done through summarising the relevant literature, case studies and validation process to incorporate all necessary constructs. The final represented tool will be validated through interviews with industry experts and the results discussed.

4.2 LITERATURE SUMMARY AND KEY ELEMENTS

This section aims at extracting the main elements to consider in a LMS development framework from the literature review conducted. It will focus on the key challenges LMS face, the existing support structures and frameworks and the proposed methods of developing a LMS.

4.2.1 *Key challenges of LMS*

It is important to first identify and categorise a local supplier. This relates to the identification of the “localness” of a supplier as described by Kaiser (2013). Ultimately a company should be engaging with suppliers who are defined as “fully local” in terms of their local participation in ownership, management, employment and extent of value add locally. The grading tool developed by Kaiser (2013) would thus be used during this differentiation in the LMS development framework as represented in Figure 2-6. This is important as certain companies need to comply with the BBBEE policies stipulated by the DTI.

From the literature review it was established that local suppliers face both internal and external challenges (Everett & Watson, 1998). Hillary (2004) established that there are both barriers and drivers that affect the sustainability of local suppliers’ success. Figure 2-14 categorised the challenges identified from the literature review under the underlying themes of the external (linked to sustainability) and internal (linked to competence and capacity) challenges of local suppliers. It was established that the challenges under these themes need to be addressed congruently as they are

mutually dependent on each other. Quadrant four highlights the ideal quadrant a local supplier should operate in.

4.2.2 Key stakeholders and supporting mechanisms

A balanced sustainable development framework will ensure that a geographic area is utilised effectively, its people are healthy, skilled and educated; the infrastructure is sufficient and that there are abundant employment opportunities within respected governance systems. Similar to Maslow's hierarchy of needs, one must satisfy lower level basic needs (e.g. Social and Institutional) before further development can occur to meet higher-level growth needs (e.g. Infrastructure and Economic). Once these needs have been reasonably satisfied, one may be able to reach the highest-level of self-actualisation by being a local supplier.

In order to achieve this, inputs from various entities are required and a clear understanding of their responsibilities and contributing roles need to be identified. From the research presented in this thesis the following stakeholders have been identified as contributors towards LMSD:

- Government
- Private sector (Companies/corporates) or State owned entities (SOEs)
- Non-Profit organisations (incubators, Expert bodies, consultants)
- LMS
- Local community

Figure 4-1 highlights the responsibilities of each of the identified stakeholders and their contributing roles. The following sections will highlight the responsibilities of each of the identified stakeholders and their contributing roles, which will be incorporated into the framework.

4.2.3 The role of the government

The overall objective of the Government is to ensure the contributing participation of as many citizens as possible, in the economy of South Africa, to ensure GDP growth and the prosperity of the country. The government has therefore instituted the amended BBBEE codes (referenced made in the literature review in chapter 2.4) to bolster local development. Not only did it include this policy in legislation, it provided incentives and business opportunities for adhering entities. Through its departments of Trade and Industry and Science and Technology it created enablers and funding mechanisms to support the implementation of its strategy.

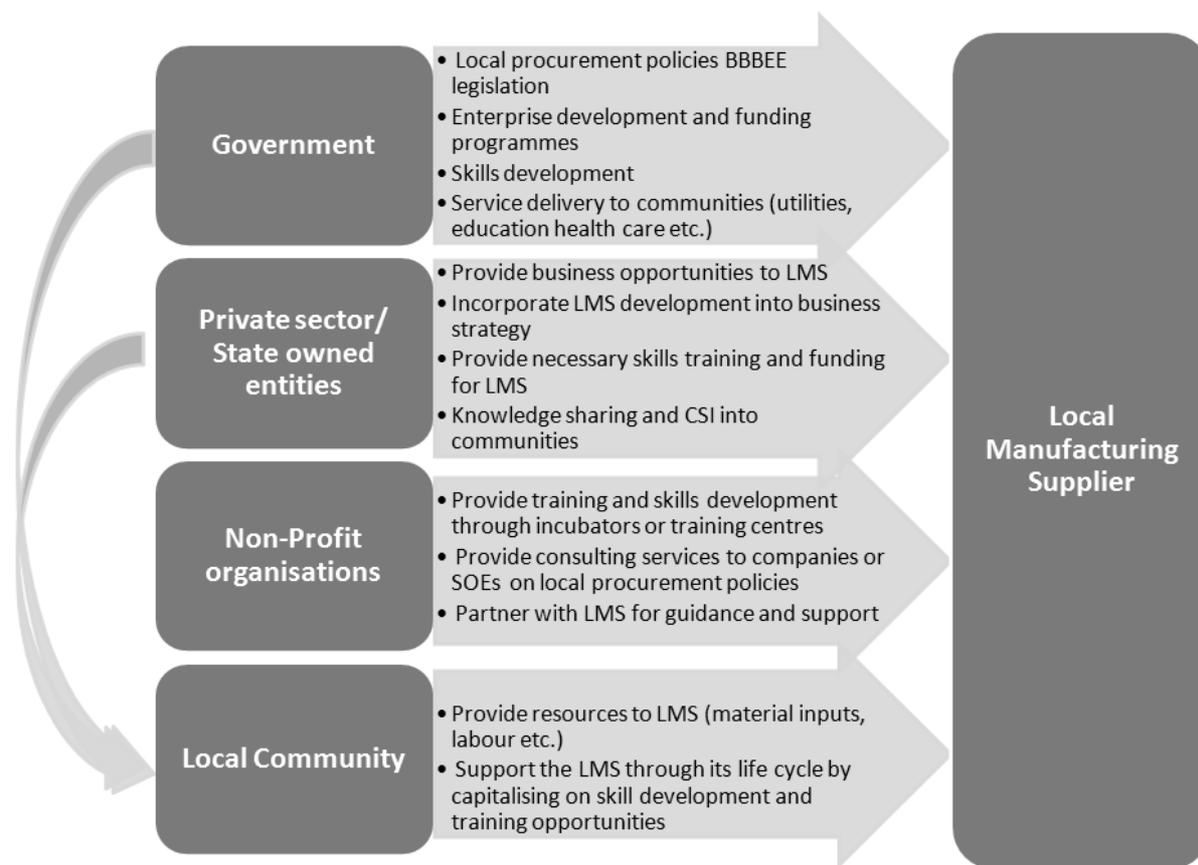


Figure 4-1 Responsibilities of key stakeholders

The mechanisms created by government to support local development were detailed in chapter 2.4.2. These mechanisms included incubators, funding, training and policies. From the perspective of the manufacturing industry various incubators with ties to external expert bodies (eg. CSIR, Universities, training colleges etc.) have been created to support local manufacturing suppliers with business skills development, technology training, training and certification on artisanship, business improvement and general skills upliftment. Various funding mechanisms have been created to either kick start or support further development of local manufacturing suppliers as illustrated in Table 4-1.

In supporting its strategy for local development the government also instituted programs such as the CSDP to guide its SOEs in local procurement strategies and ensuring sustainable growth of local suppliers. It is clear that the role of the government is to motivate and support the development of local suppliers and to encourage the private sector to incorporate local supplier development strategies into its own supply chain and business strategies.

4.2.4 *The role of Private Sector*

The primary objective of the private sector, with regards to local supplier development, is to incorporate local supplier development into its business strategy. This will ensure that business opportunities for local suppliers are identified, support functions of the strategy are implemented and communications channels are in place to drive the necessary paradigm shift within the organisation (change management).

It is deduced from Vaxevanou & Konstantopoulos (2014) that the most sustainable way to introduce a new supply chain strategy is for it to be enforced by executive management and included in company policy. Clear targets in terms of timelines, budget and resource allocation need to be set during the implementation of a LMSD strategy. Clear communication of the plan needs to be managed and the correct channels need to be established to ensure continuous feedback and progress reporting.

The role of the private sector is to create sustainable opportunities for LMS by creating partnerships/supply contracts to ensure them a continuous supply of income. It was identified that where a supplier lacks certain competencies or capacity the company could further assist in its development. These development opportunities involve; (1) training on certain skills and ensuring certification on required service offerings, (2) Capacity enhancement by donating or lending equipment, tools, resources etc. (3) knowledge sharing or mentorship, (4) Technology training or enhancements to improve business processes, (5) Capital funding, (6) CSI in local community to ensure sufficient basic services and needs are met (houses, schools, hospitals etc).

Companies have the option of partnering with incubators to provide onsite training or establishing a network with incubators to provide business opportunities for the candidates/entrepreneurs graduating,

4.2.5 *The role of Incubators and training centres*

Incubators provide the skills required for LMS to capitalise on business opportunities provided by Companies. Incubators partner with government to align with its strategy and industries invested in and rely on the funds provided by government for up skilling candidates. Partnerships are also established with the private sector where funding is also provided and opportunities for graduated candidates are established.

Incubators also establish partnerships with external experts or consultants to enhance their business training and practical training. From the literature examples were given of such partnerships as was the case with TLIU partnering with the CSIR.

4.2.6 *The role the LMS and community play*

It is the sole responsibility of the LMS to capitalise on the opportunities afforded to it by the private sector or government. The LMS needs to ensure an open channel of communication to the business it is supplying and proactively make the business aware of any challenges it might face before they occur.

Sustainability should be the LMS's top priority. This will include not accepting work if it knows it won't be able to deliver as this could damage its reputation and prevent future work from being awarded to it. The LMS should continuously seek new opportunities and strategies of improving its service offering and diversity of its client base. It is up to the LMS to reinvest its capital back into the business and local community to ensure the upliftment of its environment.

4.2.7 *Supporting structures to address LMS shortcomings*

Various supporting frameworks and mechanisms were identified in the literature review. These funding mechanisms can be brought into the framework to identify possible support structures to utilise during the development of a LMS. Table 4-1 illustrates the proposed funding mechanisms to incorporate into the framework. Figure 4-2 represents the various support mechanisms' position along the life cycle development of the LMS from inception to self sustainability. The illustration is not exactly to scale although it demonstrates where the mechanisms are intended to be of assistance to the LMS.

The key challenges faced by local suppliers to overcome have been categorised in Table 4-2 as discussed previously. In order to establish a framework for LMSD the solutions to the challenges will need to be identified. These solutions thus need to be built into the framework. The proposed solutions to each of the challenges are incorporated into **Error! Reference source not found.**² as identified by the supporting mechanisms available.

Table 4-1: Funding and support mechanisms (Khan A. , 2014)

Fund name	Brief description	Funding mechanism
The Black Business Supplier Development Programme (BBSDP)	Grant encouraging black businesses to grow	Max R1 million investments. 80:20 loan (80% funded by DTI 20% invested by entity)
Co-operative Incentive Scheme (CIS)	5 or more people coming together for mutual benefit either in a social, economic or cultural way	Max R350 thousand. (90:10 principle)
Incubation support programme (ISP)	Aimed at encouraging partnerships between private sector, government and SMEs to develop incubators and create employment within communities	Max R10 Million a year for 3 years. (50:50 basis, 50% sponsored by DTI 50% by private sector. SME must contribute 40% of the fund granted from DTI.)
Manufacturing Competitive enhancement Programme (MCEP)	To improve manufacturing competitiveness in South Africa	Max 7.5 million (50:50 basis with additional tax rebate benefits)
Enterprise investment programme (EIP)	Tailored for manufacturing sector.	Max R200 million. Between 15% and 30% of capital required for machinery, equipment, plant and customised vehicles will be donated by DTI.
SEDA Technology programme	Grant for technology and manufacturing sectors	Max R1 million. 80% of grant must be for machinery, tools and equipment of which DTI will contribute 35%, the remaining 20% must go towards business development programme.

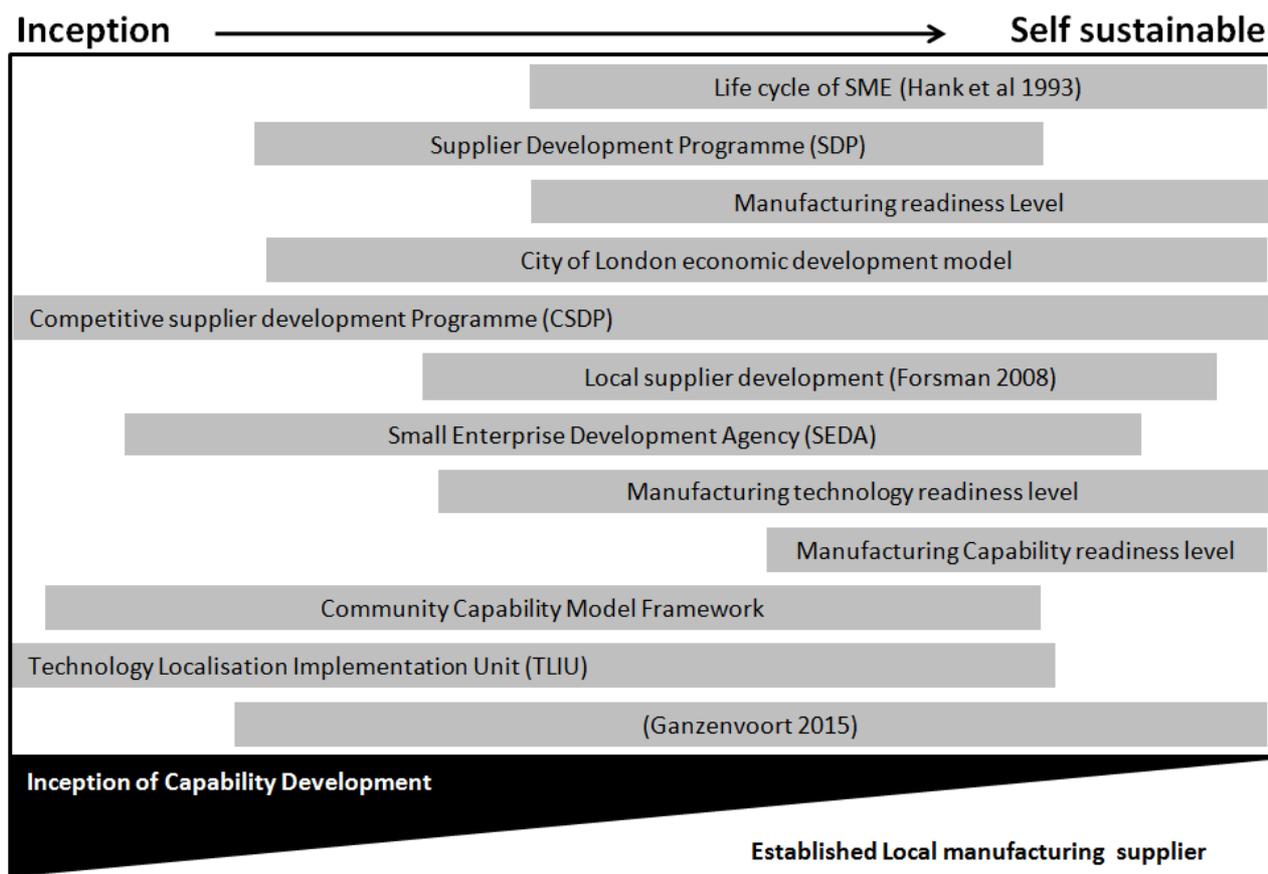


Figure 4-2: Support mechanisms and their position along LMS development stages

It can be seen that a general correlation between the challenges faced and their solutions for LMS exist. This is evident by the similarity of the solutions that exist. These correlations are; (1) funding, capacity and technology, (2) Skills and Information, (3) customers and contracts, (4) partnerships and business opportunities. The solutions that correspond to (1) entail funding or gifting from an external institution to overcome the financial burden of the LMS to address its shortcomings. The solutions in (2) involve social upliftment in the local communities and adequate training on business/technical skills for the LMS. The solutions to (3) and (4) involve business opportunities generated by external organisations through supporting LMS through local procurement and establishing Joint ventures or partnerships to aid the development of the LMS respectively.

4.2.8 Identifying opportunities for LMS

Before a supplier can be developed a characteristic/area for development needs to be identified or an opportunity needs to be created for it to develop towards in order to achieve the desired conformance levels.

Table 4-2: LMS challenges and proposed solutions

Category	Challenges	Solutions
Competence & Capability	Funding - loans, capital, cash on hand, access to funding.	Seed/Angel capital, Donations, Joint ventures or partnerships with other companies (clusters) or large corporate, Government funding.
	Skills - inadequate training, lack of required skills in local community, lack of entrepreneurial skills, managerial skills, Financial controls etc.	Community based training programs and qualifications. Business incubators and training centres. Government or Corporate funded training and bursaries.
	Capacity - Shortage of staff, relevant equipment, floor space, infrastructure, accesses to basic services etc.	Seed/Angel capital, Donations, Joint ventures or partnerships with other companies (clusters) or large corporate, Government funding.
	Technology - legacy equipment, processes, access to internet etc.	Donations, government funding, incubators, gifting, lending.
	Information - lack of knowledge of customer tendering processes, User specification requirements, Quality standards, Customer health & safety Policies etc.	Community based training programs and qualifications. Business incubators and training centres. Government/corporate funded training and bursaries.
Business sustainability	Customers - lack of diversity, single reliant customer or no customers	Buying support or Supply contract from Corporate/companies, established customer base, niche product market.
	Partnerships - business development and growth	Joint venture or partnership with corporate company
	Contracts - Lack of steady supply of business	Fixed term contracts with customers
	Business opportunities - keeping abreast with market movements	Joint venture or mentorship programs.

From the literature the CSDP has established six means of identifying an opportunity for a LMS that companies can utilise. These metrics will be incorporated into the framework as illustrated in Table 2-8.

Similar to the framework of the CSDP, Simunye have established a high-level framework focussing on the key metrics to consider during selecting local suppliers for development as portrayed in Figure 2-10. These factors are Demand analysis, Supply analysis, Enterprise selection, Barriers to growth and required interventions to overcome barriers.

4.2.9 *Supplier development project plan*

The key element of LMS development is ensuring the role out of the development project is structured and that the key focal areas of each phase are addressed accordingly to ensure a successful role out of the project. Forsman (2008) developed the key success factors of a local supplier development plan as illustrated in Table 2-15. This methodology will be incorporated into the framework to ensure successful project management of the LMS development process.

4.2.10 *Summary of inclusions into proposed LMS framework*

From the literature the key elements to consider have been identified and proposed to incorporate into the LMS development framework. Figure 4-3 represents the high level overview of the aspects considered from the literature to be included into the framework.

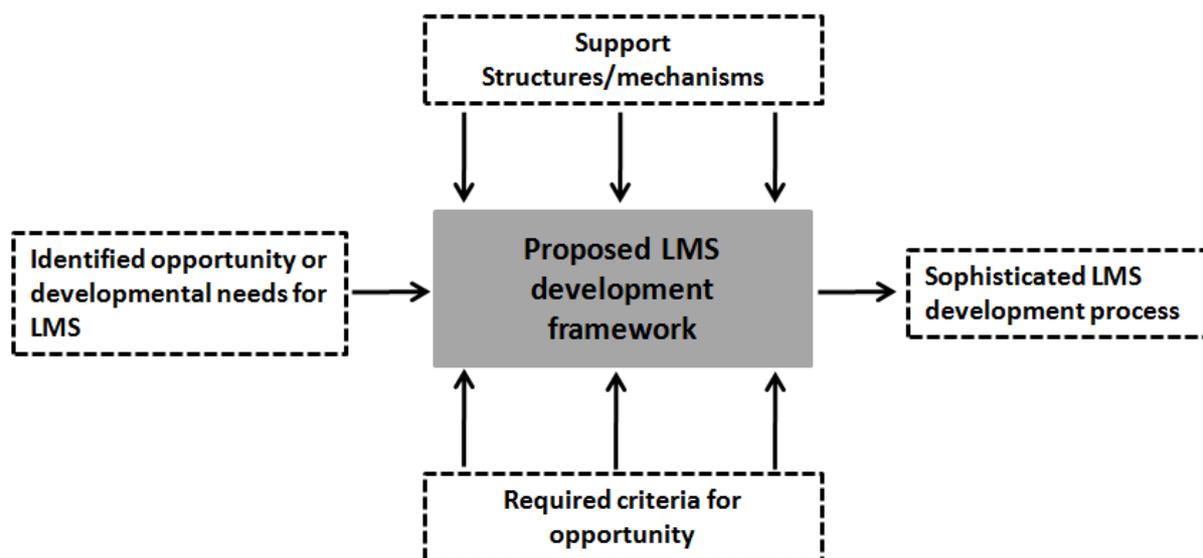


Figure 4-3: *Proposed inclusions of key elements into LMS development framework*

4.3 DEVELOPMENT OF CONCEPTUAL FRAMEWORK

The following section will evaluate different case studies on LMS development and provide a summary of the key elements, sequence of events, relevant stakeholders and supporting mechanisms utilised in each case study. These key elements in conjunction with the summary of the constructs for LMS development from the literature review will be used to develop the conceptual roadmap for developing a LMS.

4.3.1 *Zig-Enterprises case study*

In 2010 Schnellecke (a leading logistics service provider) was selected as the technical skills provider for the Automobile Industry Development Centre's (AIDC) Ford T6 BBBEE incubation program. The program's objective was to develop a local JIT supply company on the premises of Ford SA, in Rosslyn, to supply all parts manufactured by the incubator, for the Ford T 6 model (Ford Ranger) as well as manage the storage and supply of the parts from Faurecia. The program was funded through the Gauteng Provincial Government, Department of Economic Development in Partnership with Ford SA, to establish the facilities on Ford's premises. Schnellecke provided all technical skills training, knowledge transfer, mentorship and logistical support during the set-up of the incubator. The AIDC managed the development of the incubator until 2011 when Zig-enterprise was established as the logistics service provider for Ford SA.

“Today Zig-Enterprise plays a significant role in the South African automotive industry where their expertise includes, receiving of commodities, warehousing according to international quality standards, sequencing and various other line feeding processes and quality management. Zig-Enterprise supplies different commodities with a workforce of 18 employees and approximately 1,500 m² warehouse space” (AIDC, 2012).

This case study illustrates the different roles expert institutions/companies, government and the underlying company can play in local supplier development. The summary of the case study in terms of key elements, sequence of events, stakeholders, and supporting mechanisms are represented in Figure 4-4.

4.3.2 *Mass mart supplier development fund*

Massmart created a supplier development fund of R240 million in 2012 to develop local SMEs in the manufacturing and farming sector. The aim of the program is to enhance its current and prospective

local suppliers to improve their quality and service delivery which ultimately improves the procurement and supply chain metrics of Massmart. According to Massmart's annual report the objectives of the fund are to:

- Improve quality of products;
- Assist local suppliers to expand production capacity (existing and potential);
- Assist suppliers to reduce input costs;
- Enable Massmart to increase and diversify its local sourcing capacity;
- Provide a route to market to deserving products (locally and internationally); and
- Establish and build long-term, effective supplier partnerships

Title: Zig Enterprises

Date: 2010 - 2012

Budget: unknown

Place (Location): Roslyn Pretoria

Why: Develop Local Supplier for Cost effective Products and Branding compliance to Governmental Policies (BBBEE ratings)

Elements already in place: Well Established Local Community



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Funding Mechanisms	Identify Opportunity for LMS	Schnellecke (Technical Skills Provider)	Guateng Provincial Government (Funding)	Incubation Programme
Create Incubation Facility (Skills Training, Knowledge transfer, mentorship)	Establish Incubator	Ford SA (Developing Company) AIDC (Industry partner)	Department of Economic Development (Funding)	Create Competence and Capability
Skills Training, Knowledge transfer, mentorship	Source Human Resources	Provincial Government	Ford SA (Funding, Skills Training, Gifting of Land/premises)	Establish Business Infrastructure
Establishing Quality Management for LMS	Train and up-skill Personnel Mentorship	Department of Economic Development	AIDC (funding, managing of development programme)	Establish Local Supply Company
Opportunity Identified for Local Supplier	Create Business Infrastructure (Equipment, facilities, resources, administration etc)	Zig Enterprises (Local Supplier)	BBBEE Regulations (Government policy)	
Integrate Local Supplier into Value Chain	Launch local business			

Lessons Learned:

Source: AIDC 2012

Benefits: Local Supplier provides On time Delivery, reduced lead times, Cost effective products,

Challenges (Risks) and Drawbacks: Dependency of Local Supplier on Ford SA

Figure 4-4: Summary of Zig Enterprises Case study

Grant Pattison (CEO of Massmart Holdings) reported that “Ultimately we want local supplier development to be an embedded feature of how Massmart does business”.

The fund makes provision for the development of local manufactures with a specific focus on suppliers who can supply goods back to Massmart. In the 2013 Annual report the following was stated, “Support to manufacturing SME suppliers can include grants for production materials and equipment, facility improvements, working capital, etc. Identified key categories for funding include bricks, clothing, paint and milling manufacturers. The programme intends to develop sector clusters around these four priority categories (eg rolled out in two to three provinces and supplying at least a regional market, and at best full distribution to the Massmart national market)” (Massmart, 2013). The program has also prioritized categories for local manufacturers that it would be partnering with in areas of processed food, home and garden products, building materials and household detergents.

The local supplier development program has a well documented procedure and has been established through a 7 step stage gate process for execution. It can be seen that the success of the program hinges on the successful management and governance of the function by strategic role players in the organization to ensure its sustainability and prosperity.

In the 2013 annual report Massmart highlighted the success of one of their local suppliers, Jamela Mogodi. Mogodi is a 71 year old retired nurse with access to 28 hectares of farming land. In 2003 she started farming on less than half an acre of land with very little crop management knowledge. Irrigation development costs, funding and infrastructure cost to develop here land further were one of her biggest challenges to expand her business. In time she received government funding to help irrigate 7 more acres of land. She started producing green beans, butternut, tomatoes and green peppers to the local community markets but still lacked infrastructure costs, especially fencing (to keep animals at bay) and road development as the state of the roads could not support trucks coming in to collect her produce.

Massmart assisted Mogodi with an interest free loan to buy farming inputs such as seedlings, pesticides, fertilizers and other chemicals as well as to upgrade the road infrastructure at her farmstead. Massmart also provided crop management training and technical support to improve Mogodi’s business. This has helped Mogodi to increase her turn over by 50% and has recently employed 5 additional staff providing further jobs in her community in Julesburg Limpopo.

Title: Mass Mart supplier development**Date:** 2012 – on going**Budget:** R240 million**Place (Location):** Across South Africa**Why:** Develop Local Supplier to improve on Supply Chain Metrics (Assist suppliers to reduce input costs, Provide route to market for Local Businesses, Build Long term Supply Partnerships, Diversify and increase local sourcing capability.**Elements already in place:** Governance Structure for Fund Management**MASSMART**

Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Funding Mechanism	Establish Funds for LMSD	Mass Mart (Developing company)	Mass Mart Supplier development Fund	Financially Assisting Local Suppliers
Develop local suppliers to ensure quality products are produced.	Establish Key Categories for Fund (Identify key opportunities)	Government funding Programme	Training and Mentorship programmes from Mass Mart	Creating Local Supplier Base
Funding, Skills Training, Knowledge transfer, mentorship for LMS	Identifying Opportunities for LMS	Local Supplier		Develop Sector Clusters for local suppliers' product off take (new Market)
Identifying Local Supplier And Proximity to Market and Community	Identify short comings of local supplier (Quality, resources, infrastructure)	Local Community and Infrastructure		Ensuring the Quality of Products produced by local suppliers
Ensuring Business Environment (external Support structures) of LMS are sufficient.	Assist Supplier with both external and internal business requirements and develop accordingly	Sector Clusters (markets for local supplier off take)		
Identify current Requirements (Gaps) of LMS to produce Quality goods.	Establish off take opportunity for local supplier.			

Lessons Learned:**Benefits:** On time Delivery, reduced lead times, Cost effective and Quality products, Local Supply base to source from, Creating new Clusters for local businesses**Challenges (Risks) and Drawbacks:** Management of funds and Suppliers' Drive to sustain its self*Figure 4-5: Summary of MassMart case study***4.3.3 CRH Africa Case study**

CRH Africa was founded as a family Business in 1946. It currently operates as a manufacturing supplier for the automotive industry supplying flanges for exhaust manifolds, seat structures and metal pressings. CRH Africa have the capability to design and manufacture each individual element of the product offerings. In 2013 they faced severe challenges regarding their high scrap rates, machine down times and inability of achieving their required production levels. This was as a result of their lack of understanding of lean manufacturing principles and inefficient performance management systems. The automotive Industry Development Center (AIDC) approached them to assist in their inefficiencies.

The AIDC was established in 2002 as a key program for Supplier development within the automobile industry. Their main focus is to improve supplier competitiveness through lean manufacturing tools targeting safety, quality, cost, delivery, energy efficiency and to transfer skills of continuous improvement methodologies to its suppliers. In 2009 the DTI approved a 3 year contract with the AIDC, in partnership with the United Nations Industrial development Organization (UNIDO), to lead the supplier development program and contributed towards the development costs. The aim of the program was to develop and ensure delivery improvements of 65 suppliers within the automotive industry in South Africa. The program has been such a success that the DTI extend the services of the AIDC to date.

The AIDC sent a team of Business improvement specialists to CRH Africa to assist with their current challenges. The first step was to identify the current problems faced at CRH Africa by walking through the plant and interviewing various process owners. Once an understanding of the problem was established, training of lean manufacturing principles could be rolled out to the relevant personnel. This ensured that everyone involved during the improvement projects had a basic understanding of the process involved and could contribute to the improvement initiatives (ensuring their buy in to the process.)

Various key areas for improvement were identified and improvement projects were established for each one. This was achieved through the utilization and proposed application of the operational improvement tools housed within the lean manufacturing methodology. These Optimisation tools included the 5S work place optimization, line balancing and value stream mapping. Cross functional teams were created and assigned to a relevant improvement project and a supervisor from the AIDC over saw each project implementation and ensured the correct KPIs were put in place to track the progress and improvement impact of the project.



Figure 4-6 Storage of Tool Die Plates Before (AIDC, 2012)



Figure 4-7: Storage of tool Die plates after (AIDC, 2012)

Figure 4-6 and Figure 4-7 illustrate the improvement made in the storage of the Tool Die plates by reducing the cycle times of the production process. At the completion of the four improvement projects the end result concluded an annual saving of R4.1 million. The improvement projects lead to 30% improvement in On-time and in Full (OTIF) deliveries, 23% increase in production output, a 28% decrease in downtimes and 27% decrease in scrap rate (AIDC, 2014). Upon completion of the project the AIDC contracted an intern to remain at CRH Africa to train and assist in further improvement projects.

Figure 4-8 represents the summary of the case study presented. Further to the conclusions of the improvement projects it was realized that to ensure a continuous competitive advantage a culture of business improvement would need to be instilled into the company. This could be done by motivating or encouraging staff to identify improvement projects or creating key performance metrics and controls to ensure continuous improvement.

Title: CRH Africa Development case study

Date: September 2011- August 2012

Budget:

Place (Location): Port Elizabeth

Why: Improve production throughput, Implement Performance management system, no improvement management systems

Elements already in place: Established Local Supplier



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Identify Production problems	Understand/Identify challenges faced	AIDC (developing institution)	Training Consultants (AIDC)	Production improvement to conform to Customer requirements
Lean manufacturing principles	Identify Key areas for Improvement	CRH (developing Company)	Lean manufacturing Methodologies	Improvement of Processes
Training on Lean manufacturing methodologies	Training on Lean manufacturing methodologies		Intern From AIDC	Entrenching continuous improvement within culture of company
Ineffective production processes	Establish cross functional project team			
Not conforming to customer requirements (Demand levels, cost etc.)	Implement operational excellence methodologies and improvement projects			
Sustainable Business improvement Culture	Track improvement progress establish continuous improvement culture (visual management boards, etc.)			

Lessons Learned:

Benefits: Cost effective products, Enhanced capabilities of Local Suppliers (Diversify service offering and Skills), Reduced lead times on Products to customers and Local Supplier Cluster

Challenges (Risks) and Drawbacks: Maintaining competitiveness

Figure 4-8: Summary of the CRH Africa case study

4.3.4 Transnet's Electric automotive case study

In 2012 Transnet concluded a deal with China South Rail (CSR) to purchase 95 electric locomotives as part of Transnet's long term fleet renewal program. The deal was structured in such a way that CSR would provide all necessary training and technical knowhow to assemble, construct and maintain the locomotives so that Transnet could produce them locally while CSR only supplied the critical control components. On the 19th of March 2015 the 95th locomotive was completed. This deal saw Transnet producing 85 of the locomotives at its local Koedoespoort facility and only 10 being manufactured by CSR.

In line with Transnet's commitment to the Competitive Supplier Development Program, localization, sustainability and skills development were a major factor during this project. At the start of the project several tender processes were opened for local manufactures to take part in for components

that could be manufactured locally. Three of the local suppliers that were selected for production of various components were Hermes Appollos engineering, Thaleka engineering and Mizana engineering. Transnet sent 120 delegates to the CSR facility in china for training and technical up skilling in order to gain the required skills necessary for the completion of the project. These delegates also included members of the local suppliers selected to ensure they gain the required training. The summary of the case study is represented in Figure 4-9.

Title: Transnet electric Motor Case study

Date: 2012- 2015

Budget:

Place (Location): Koedoespoort

Why: Ensure local competitiveness and conformance of local suppliers to Quality and technical requirements

Things already in place: Established Local Suppliers



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Identify Opportunity for LMS	Identify Opportunity for LMS	Transnet (Developing Company)	CSDP	Training and Mentorship of Local suppliers to ensure Conformance to Quality and technical Specifications
Selecting LMS	Selecting LMS	China South Rail (Providing Business Opportunity and Mentorship)	Funding from Transnet for Training and Development	Developing Local Supplier
Ensuring Quality and technical Conformance of LMS	Establish Training mechanism/Partnership	Hermes Appollos (LMS)		
Partnerships for Training Programme	Train LMS to ensure Compliance to requirements	Thaleka engineering (LMS)		
Sponsorship for Training and skills development	Roll out opportunity to LMS	Mizana engineering (LMS).		
		CSDP		

Lessons Learned:

Benefits: Cost effective products, Enhanced capabilities of Local Suppliers (Diversify service offering and Skills)

Challenges (Risks) and Drawbacks: Dependency of Local Supplier on Ford SA

Figure 4-9 Summary of Transnet Case study

4.3.5 Federal Mogal Case study

The Federal Mogal operation in Pine Town is a major supplier of valves and bearings to the automotive industry including Original Equipment Manufacturers. Due to a lack of an efficient performance management system Federal Mogal were facing major challenges in their On-Time in Full deliveries (OTIF), high inventory costs, high input costs, inefficient production processes and product competitiveness in the market place (due to inefficiencies and high costs).

Title: Federal Mogal

Date: September 2011- October 2012

Budget:

Place (Location): Pine Town

Why: Improve Inventory levels, OTIF delivery, input costs, performance measurer system and overall performance (move towards Global Competitiveness)

Elements already in place: Established Local Supplier



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Asses current processes and customer requirements	Train Staff on Improvement Processes, create cross functional improvement teams	AIDC (developing institution)	Training Consultants (AIDC)	Improve Productivity
Training on Lean manufacturing principles	Identify Current problem areas	Federal Mogal (developing Company)	Lean manufacturing Methodologies	Reduce cost of Production
Understand current problems and translate into areas for improvement	Identify and prioritise Improvement projects based on reward vs. effort/investment			Establish accurate and effective performance management systems and controls
Train supervisors on Business Improvement principles	Implement Improvement processes			
Identify Areas for Improvement, establish teams, create improvement projects	Establish KPI to track and Monitor. Implement Improvement projects			
Track and maintain improvement projects (KPIs, Performance management systems, Controls etc.)	Instil improvement processes into company Culture, Track and Maintain improvement projects			

Lessons Learned:

Benefits: Cost effective products (savings realised R1million), Reduced lead times on Products to customers and effective and efficient manufacturing processes, Performance management principles integrated into business

Challenges (Risks) and Drawbacks: Sustaining Business improvement culture, maintain and track competitive advantage

Figure 4-10 Summary of the Federal Mogal case study

In 2011 the AIDC initiated an improvement initiative at Federal Mogul to assist in improving their productivity and reducing their input costs. Training of all relevant staff members commenced in September 2011 on all relevant lean manufacturing methodologies and principles to create an understanding of the improvement process. A SWOT analysis and value stream mapping exercise was conducted to fully understand the current inefficiencies and problem areas to address. Improvement initiatives for each were then Identified and prioritized according to the effort vs. benefit matrix to ensure timely and effective improvement initiatives were conducted first. Project improvement teams were then assigned to each initiative and KPIs were created to track and monitor progress of the improvement projects. These projects included improving the logistics system through JIT principles, FIFO system to relieve congestion in the production system and introduction of the 5S Principles to reduce waste in the production lines.

The benefits realized from the improvement projects are a 45% improvement of the throughput rate of the plant, a 30% improvement of their OTIF deliveries and 47% reduction in input costs (AIDC,2014). Figure 4-10 illustrates the summary of the case study.

4.3.6 Local cluster sourcing project- STC-LAM case study

The Stellenbosch technology center-laboratory for advanced manufacturing (STC-LAM) was contracted by Ideco to manufacture a new product as part of their new biometric scanner product offering. Due to confidentiality concerns the specifications and exact description of the product technology cannot be disclosed but elements and sub components of the product will be discussed in general terms.

Due to the capacity requirements and expected delivery times of the final product to the customer the STC-LAM had to outsource various components of the product development. It decided to outsource portions of the required work to local manufactures in close proximity to its facility rather than international suppliers due to:

1. The large risk that global sourcing brings in terms of lead time, transportation costs, as well as the new communication channel that would have to be established which is vital in the design process of the product.
2. The project manager at STC-LAM having close ties with the Institute for Advanced Tooling, which is in the early stages of a local cluster sourcing project which focuses on local supplier development as well as spreading the workload in projects to achieve client goals more effectively.

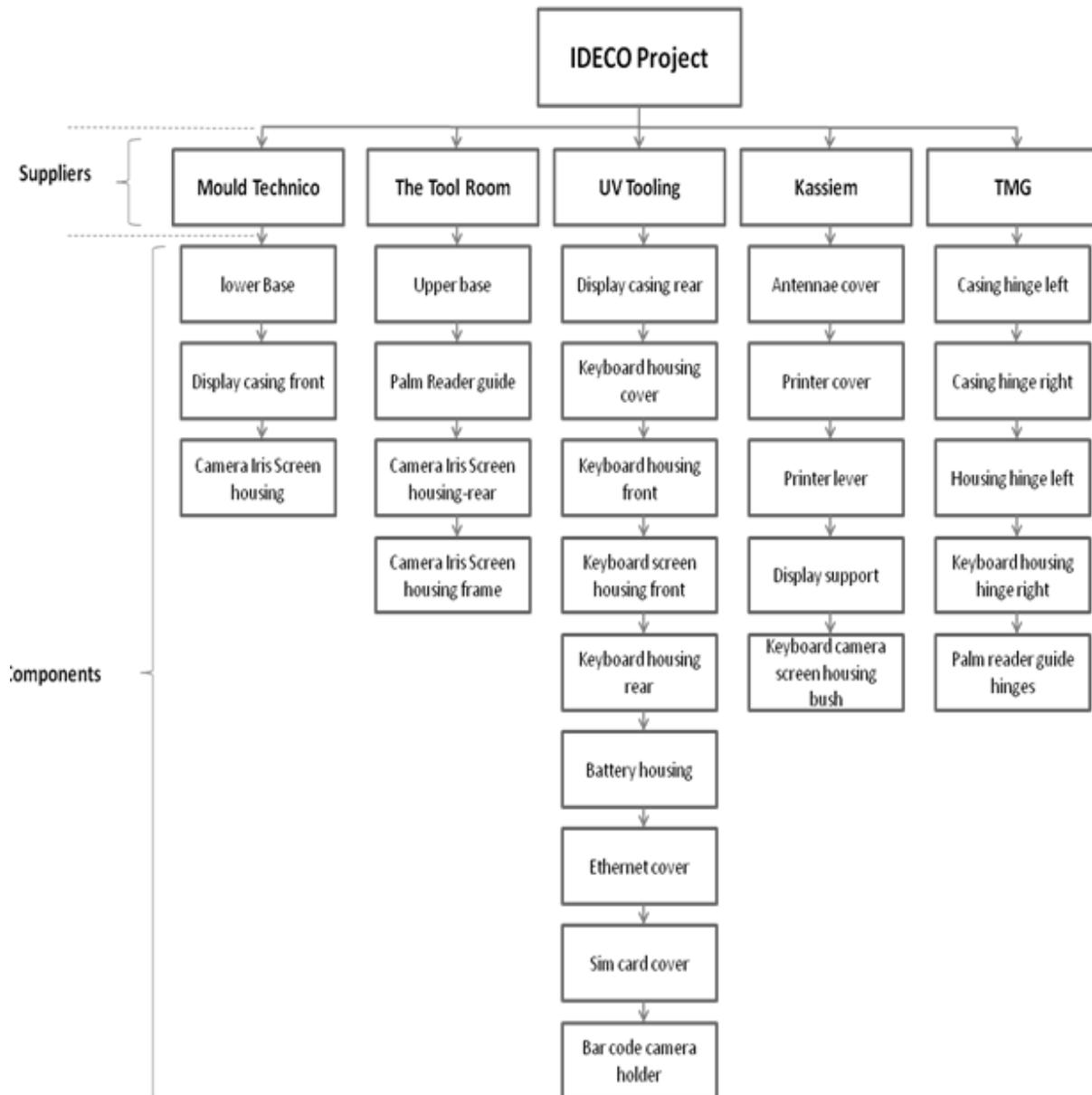


Figure 4-11: Assigning components of product to suppliers in IDECO project

From this various suppliers were identified that could carry out certain elements of the product design and fabrication. This was established by analyzing the final product and segmenting the required work into specific categories and elements requiring specific tasks, skills, technology or competence. Selection of the final suppliers was based on their; current competencies and capacity to carry out the required work, quality, price, lead times and experience. Figure 4-11 gives a high level overview of the process followed.

This case study highlights the ability of outsourcing various components of a final product by segmenting the required work into smaller work packages that can be executed by local suppliers.

This process will also ensure that a company remains fixated on its core competencies and poses opportunities to further develop or improve on its service offering by outsourcing non-core activities.

Figure 4-12 represents the summary of the case study evaluated.

Title: Local Sourcing Cluster- STCLAM

Date: 2014- 2016

Budget:

Place (Location): Stellenbosch

Why: Supply Chain effectiveness (lead times, costs, Communication channels etc.) Establishing local competitiveness through Supplier Cluster

Elements already in place: Established Local Suppliers



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Identify opportunities for Local Suppliers	Identify opportunities for Local Suppliers	Ideco (Business Opportunity)	Stellenbosch University (Skills and training provider, Governance and funding support)	Develop Local Suppliers within close Proximity to enhance lead times and Quality inspection.
Identifying required Criteria for each Opportunity	Identifying required Criteria for each Opportunity for evaluating LMS	STC-LAM (Developing entity)	STC-LAM (developing institution)	Create Local Supplier Cluster to enhance Supply Chain Effectiveness
Proximity of LMS	Select LMS based on compliance to requirements	Local manufacturing Suppliers (Cluster)		
Identify relevant suppliers	Roll out project to LMS			
Identify core components or IP that need to be protected				
Cluster Project				

Lessons Learned:

Benefits: Cost effective products, Enhanced capabilities of Local Suppliers (Diversify service offering and Skills), Reduced lead times on Products to customers and Local Supplier Cluster

Challenges (Risks) and Drawbacks: No Structured approach for developing suppliers, informal decision process on supplier selection.

Figure 4-12: Summary of Local Sourcing Cluster- STCLAM

4.3.7 Auto Cast Case study

Auto Cast is an iron cast facility situated in Neave Township in Port Elizabeth. They produce various engine components ranging from catalytic converter cones, exhaust manifolds, cranks shafts and bearing caps. Auto Cast is a tier 1 supplier to Ford, VW and Toyota. Their average annual energy consumption ranges between 45MWh-46MWh making them the largest single energy consumer in the Eastern Cape.

Due to the recent hikes in energy prices from ESKOM, Auto Cast has been losing their competitive advantage in relation to their global competitors and has encountered the following challenges since 2010:

- Inefficient machinery
- Not achieving demand
- High energy consumption in kWh
- Gas wastage

The need to improve on their competitive advantage through increasing their current process efficiencies was their greatest concern. Due to budgetary constraints no capital was available for newer more effective/efficient equipment and technologies. The AIDC was therefore approached in October 2011 to offer assistance in this regard.

All relevant staff was firstly trained on business improvement principles and methodologies before evaluating any improvement initiatives. The full extent of the challenges faced were analysed by creating value stream maps for all processes and understanding where the inefficiencies lie through GAP analysis. From the understanding of each problem an improvement initiative could be created. Each improvement initiative was then analysed and a cost/effort vs. benefit analysis was done to prioritise the improvement projects.

Through this analysis 5 improvement projects were identified and assigned to a cross functional team to implement the improvement processes. The project teams ensured that effective KPIs were created to ensure they track and monitor the improvement of the processes. The KPI's are also necessary for future performance management to ensure pro-active improvement projects are rolled out within the organization and instil a continuous improvement culture. By the end of September 2012 the improvement projects lead to a 10% improvement in energy consumption and a 42% improvement in gas consumption which totalled an R3million annual saving (AIDC, 2014).

Although the improvement led to substantial savings, the recommendation from the AIDC was for Auto Cast to employ an energy saving manager. This would be to ensure the culture of energy saving and business improvement is integrated into the business strategy contributing to the competitiveness of the business.

Title: Auto Cast

Date: October 2011- September 2012

Budget:

Place (Location): Port Elizabeth

Why: Improve production throughput, Meet demand, inefficient Machinery, lack of performance measurement system, High levels of Waste, Improve Profitability

Elements already in place: Established Local Supplier

AUTOCAST



Automotive Industry Development Centre Eastern Cape SOC Ltd
Your partner in becoming globally competitive

Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Limited Capital for Improvement initiatives	Train Staff on Improvement Processes, create cross functional improvement teams	AIDC (developing institution)	Training Consultants (AIDC)	Enhance production capabilities
Identify low hanging fruit for business improvement	Identify Current problem areas	Auto Cast (developing Company)	Lean manufacturing Methodologies	Throughput improvement, Reduce inefficiencies and waste
Cost vs. benefit of Improvement	Identify and prioritise Improvement projects based on reward vs. effort/investment			Enhance Profitability through effective and efficient processes
Train supervisors on Business Improvement principles	Create Business improvement teams for each project			Cost Saving
Identify Areas for Improvement, establish teams, create improvement projects	Establish KPI to track and Monitor. Implement Improvement projects			
Track and maintain improvement projects (KPIs, Performance management systems, Controls etc.)	Instil improvement processes into company Culture, Track and Maintain improvement projects			

Lessons Learned:

Benefits: Cost effective products (savings realised R3million), Reduced lead times on Products to customers and effective and efficient manufacturing processes, Performance management principles integrated into business

Challenges (Risks) and Drawbacks: Sustaining Business improvement culture, maintain and track competitive advantage

Figure 4-13: Summary of Auto cast Case study

4.3.8 Lonmin-IFC program for local supplier development

Lonmin is the world's 3rd largest platinum mining producer and operates mines in the northwest Province and Limpopo provinces of South Africa. In July 2007 Lonmin partnered with the International Finance Corporation (IFC) which is a division of the World Bank that focuses on private sector development in emerging markets.

The Lonmin-IFC local supplier development program is an ambitious program that aims to bring economic development and wealth to the local community (Lonmin, 2014). It focuses on local businesses situated within a 15km radius of its main operation in the Marikina region. This region is



plagued with a 60% un-employment rate and 50% of the 250000 inhabitants live in informal settlements and shacks. Prior to the launch of the program Lonmin focused its local community development plan on a procurement strategy that sourced services and products from Historically Disadvantaged South Africans (HDSA). Although Lonmin far exceeded its targets set for this strategy, the policy did not result in uplifting the local community as HDSA suppliers in the metropolitan regions of Pretoria and Johannesburg mainly benefited from this policy.

The strategy of the Lonmin-IFC program has thus set a target to develop 60 locally owned supply companies during the next ten years. Lonmin has set aside US\$60 million for developing local suppliers through awarding contracts to supply services and products to its mining operations. The intent of the program is to promote sustainability through contributing significantly to skills development, enhanced knowledge, and entrepreneurial development within the community. The objective is for the locally developed suppliers to not only extend their services to the mining industry but for them to also stand on their own and break into other industries in the market.

The benefits of this program to Lonmin includes; reduced turnaround time on their products sourced locally, reduction in input costs through sourcing locally and not internationally (rand exchange fluctuations) and increasing their BBBEE score through developing local suppliers.

Lonmin established a local training center in the community where training programs are given on basic principles of business, management and entrepreneurial skills. It also sponsors apprentice training and artisan certification courses for local individuals to enhance knowledge of construction, manufacturing and business development. By 2014, Lonmin had awarded 215 contracts to 34 local suppliers to the value of US\$31.5 million. These contracts are in the discipline of construction, ore transport, training and catering (Lonmin, 2014).

It is important to note that the health of the “environment” in which the LMS operates in is just as important as the opportunities it is given to prosper. Without the necessary infrastructure and resources to draw from the local community, the LMS will struggle to maintain the business support required to ensure a consistent supply of goods to its customers.

In summary to the case study presented, it is important to note the key role-players in this program. The IFC represents the funding mechanism to the program whereas Lonmin represents the vehicle to drive local development through the sustainable business opportunities it presents to the local

community. By awarding local suppliers fixed and long term contracts, Lonmin assures the suppliers a continuous supply of business. The local community plays the role of the potential asset that can be unlocked to provide local business support to the mine to ensure quicker delivery times, increased responsiveness to supply demands, local supply pricing (not linked to foreign rate of exchange) and increasing the infrastructure in the surrounding environment. The other key learning of this case study was the initial HDSA procurement policy Lonmin implemented where it did not clearly define the term “Local”. From Kaiser (2013) we can see that although the HDSA suppliers might have been locally owned, sourced their goods locally and manufactured their goods locally, they were not part of the local vicinity of the mine. Figure 4-14 represents the summary of the case study presented.

Title: Lonmin Local Supplier development programme

Date: 2013- on going

Budget: \$60 million

Place (Location): Marikana

Why: Economic development of local Communities, Enhanced Supply Chain effectiveness, Increase BBBEE rating

Elements already in place: Funding Mechanism



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Identify Mutually beneficial business opportunity	Funding Mechanism Established	IFC	Training Centre (Established by IFC and Lonmin)	Ensuring economic development and sustainable business opportunities within Local Communities
Skills development, Proximity of LMS and Community to Company	Training centre established by Lonmin	Lonmin	Funding Mechanism (IFM)	Entrepreneurial Development of local Community
Funding	Business opportunities Identified for LMS	Local Community	Supply Contracts	
Education and skills training Training	Training and skills development within Community	LMS		
Sustainable Business opportunity	Local Businesses established within Community	HDSA		
Partnership with IFC	Infrastructure and services provided to LMS			
Proximity of LMS and Community to Company	Supply Contracts awarded to LMS			
Ensure sustainability of LMS				

Figure 4-14 Summary of Lonmin Case study

4.3.9 Quantum Automotive Case study

Quantum Automotive specializes in the manufacturing of engine crankshaft and water pump pulleys which it supplies to the automotive industry. Situated in the Ga-rankuwa Township near Pretoria,

they are in close proximity to the Ford and BMW manufacturing plants situated in Roslyn (approximately 40Km away). Quantum Automotive needed to reach Global competitiveness levels in order to exploit the business opportunities surrounding them. In March 2012 the AIDC investigated the current short coming of Quantum Automotive and laid out a business improvement road map to reach global Competitiveness, ensure effective Quality assurance systems are in place and improve productivity.

At the kick off of the improvement process all staff were given training on business improvement principles and methodologies. The current problems faced were then identified through the improvement tools and prioritized according to the benefit/value vs. effort/investment matrix and scheduled into the project road map to global competitiveness. KPIs were then created to measure and track the improvement of the processes during and after implementation. The KPIs would intern form part of the performance management system and Quality assurance system for monitoring conformance to requirements and pro-actively Identifying short comings. The improvement projects included line balancing on 2 out of the 3 production lines, creating standardization of work packages and installing quality process sheets for operators and optimization of work cells though 5s principles.

By The end of December 2013, these improvement projects lead to an average 52% increase in productivity, 56% improvement of quality assurance (Defects) and 22% reduction in operating costs. The recommendations from the AIDC after the project closed out was to ensure continuous improvement projects are carried out regularly to ensure products remain competitive within the market. Sustaining a culture of continuous improvement is vital to an effective performance management system and Quality assurance processes (AIDC, 2012). Figure 4-15 represents the summary of the finds from the case study.

Title: Quantum Automotive

Date: March 2012- December 2013

Budget:

Place (Location): Garankuwa township

Why: Reach Global competitiveness, Instil Quality Assurance System, Productivity Improvement

Elements already in place: Established Local Supplier



Elements	Sequences of Events	Stakeholders	Supporting Mechanisms	Typical Activity (Project)
Asses current processes and customer requirements	Train Staff on Improvement Processes, create cross functional improvement teams	AIDC (developing institution)	Training Consultants (AIDC)	Improve Productivity
Training on Business improvement Methodologies and Train the trainer initiative.	Identify Current problem areas	Quantum Automotive (developing Company)	Lean manufacturing Methodologies	Improve Quality Assurance
Understand current problems and translate into areas for improvement	Identify and prioritise Improvement projects based on reward vs. effort/investment			Create structured Work Processes
Train supervisors on Business Improvement principles	Establish KPI to track and Monitor. Implement Improvement projects			Train the Trainer initiative to ensure Business improvement culture in Organisation
Identify Areas for Improvement, establish teams, create improvement projects	Implement Improvement processes			
Track and maintain improvement projects (KPIs, Performance management systems, Controls etc.)	Instil improvement processes into company Culture, Track and Maintain improvement projects			

Lessons Learned:

Benefits: Cost effective products (savings realised R0.8million), Reduced lead times on Products to customers and effective and efficient manufacturing processes, Performance management principles integrated into business

Challenges (Risks) and Drawbacks: Sustaining Business improvement culture, maintain and track competitive advantage

Figure 4-15: Summary of the Quantum case study

4.3.10 Summary of case studies

In the case studies presented it is evident that in each case there exist certain key elements/challenges local suppliers face and there exists a common sequence of events to develop the LMS.

Certain stakeholders are present with common roles/supporting functions. There exists a need from an organisation to include LMSD into its business strategy either for the inherent benefits (Lead time reduction, reduced and consistent input costs, improvement of surrounding infrastructure and resource pool etc.) or governmental policy/enforcement (conforming to BBBEE requirements, CSDP, local procurement policies etc.).

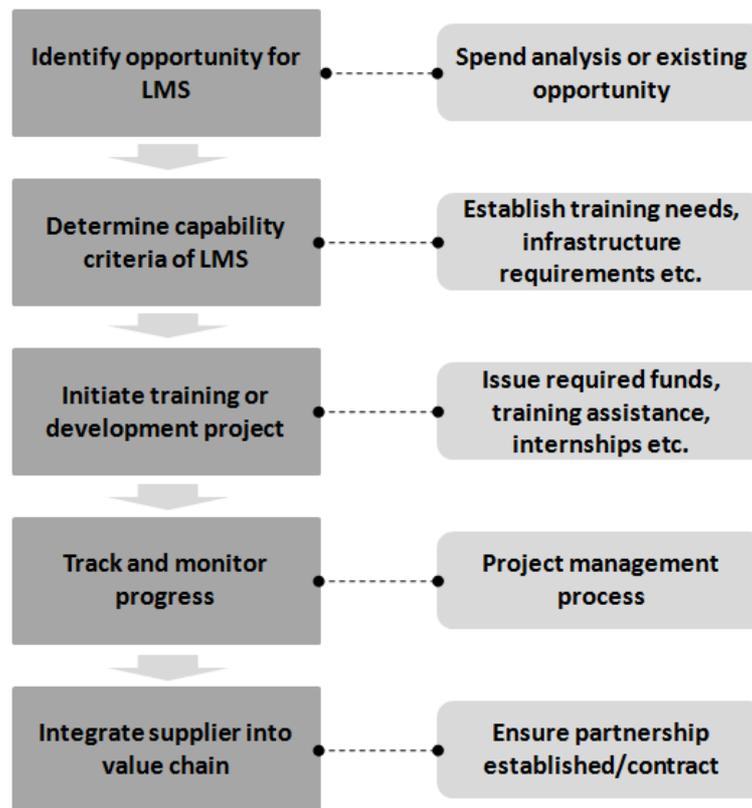


Figure 4-16: Summary of key elements, stakeholders and process of LMSD from case studies

A summary of the sequence of events during the LMS development from the case studies is presented in Figure 4-16.

4.3.11 Constructs of conceptual framework

The process in developing a LMS development framework involves analysing the current inhibiting factors for local supplier development, segmentation of these factors into categories, determining the requirements to overcome each of the inhibiting factors/categories and mapping these solutions in a sequential/chronological manner interlinking and identifying all interdependencies between stakeholders. A framework set out in this way will determine the fundamentals required in developing local suppliers through a systematic process by taking into consideration all value chain challenges throughout its life cycle.

From the literature review it was established that two main categories for the development of LMS exist namely; capability building and supply and demand (Sustainability). The key developmental elements identified, from the case studies and literature, for an LMS to fulfil is summarised as follows:

- **Infrastructure**- Necessary equipment, tools, technology etc.
- **Economic**- business opportunity, manufacturing readiness, business administrative functions etc.
- **Location** – Capacity, physical floor space or land, proximity to business etc.
- **Social**- basic needs of surrounding community (education, security, Healthcare etc.)
- **Competitiveness**- Quality of goods/services, performance measurement systems, continuous improve culture Sustainable Profit and Market Growth, integration into greater procurement value streams.
- **Competence**- Basic understanding of business, access to skill development for the LMS and community etc.

The themes identified now need to be prioritised in terms of the building blocks required to ensure all needs are met for a LMS to have the competence and capacity required to run a business. The starting point for this would be the operating environment; therefore the social and competence requirements are the foundation, as the community will fuel the human capital for the LMS. This was evident during the evaluation of the case studies as training and skills development constituted the backbone for the LMS to conform to the required competence levels.

Secondly the LMS would require a location to start its business and infrastructure to support it. From the case studies presented it is established that the location and infrastructure play a pivotal role in ensuring the LMS has the required tools, equipment and facilities to ensure the products produced are according to specifications. Thirdly the LMS would need to establish a business opportunity to help grow its business and maintain working capital. The last aspect is to ensure further growth and expansion. The LMS would need to differentiate itself by focussing on quality and competing with well established firms in the private sector and being integrated into their value streams.

From these elements discussed above it is clear that four main phases exist during the development of the LMS. These phases can be identified as (1) Social and educational, (2) Infrastructure and technology, (3) Economic and (4) Longevity and integration. The Social and educational category ensures the required skills and social well being of the LMS are present to be able to achieve the basic level of support to the LMS. The objective of the infrastructure and technology phase ensures that the supplier achieves all necessary business structure to support it in complying with the end users requirements. The business security phase involves making sure that the supplier is at the correct manufacturing readiness level and can comply with the necessary requirements. The longevity and integration phase ensures that the supplier can maintain its competitiveness by

implementing the necessary performance measurement systems and being integrated into the end users values stream. Figure 4-17 represents the sequence of the key developmental elements during the development life cycle of the LMS.

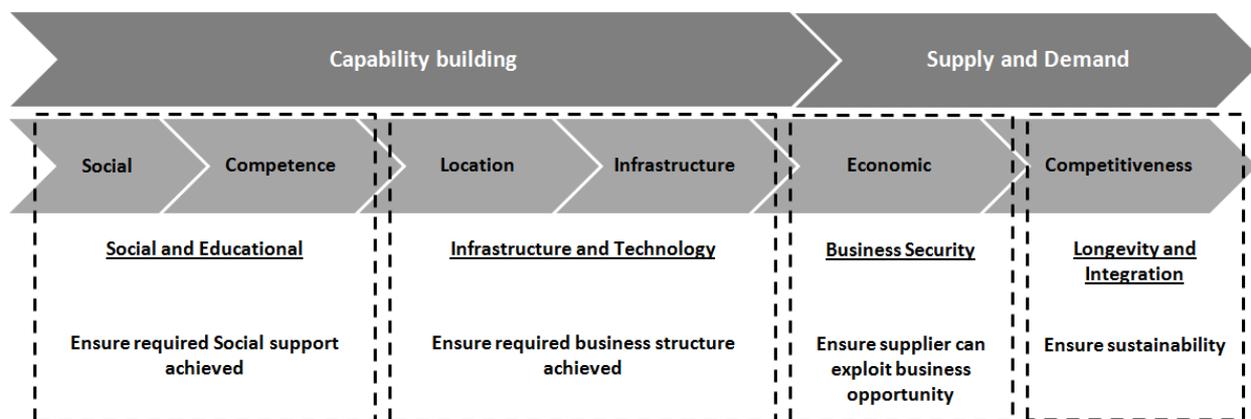


Figure 4-17: Key elements and sequences of the developmental requirements of a LMS

From the case studies presented various key elements from the development of the LMS were established and have been categorized under each of the elements and phases identified. The full spectrum of these elements has been tabled in APPENDIX A in Table A-1.

The utilisation of the various supporting fund mechanisms can now be established along the development life cycle phases of the LMS. Figure 4-18 illustrates the various funding mechanisms that are available at the different stages of the LMS development life cycle.

From the case studies presented it can be seen that different types of supplier development projects exists. In the case of the Lonmin case study it can be seen that the project involved development from the local community right through to integrating local suppliers into its value chain. This can be seen as a full local supplier development project from enterprise development to integrating the LMS into the company's value chain. The AIDC and CRH Africa case study is seen as developing a supplier to a more competitiveness level. This involved ensuring that continuous improvement and performance management is instilled in the company's business culture. Figure 4-19 represents a few examples of the different types of LMS development projects along the development life cycles.

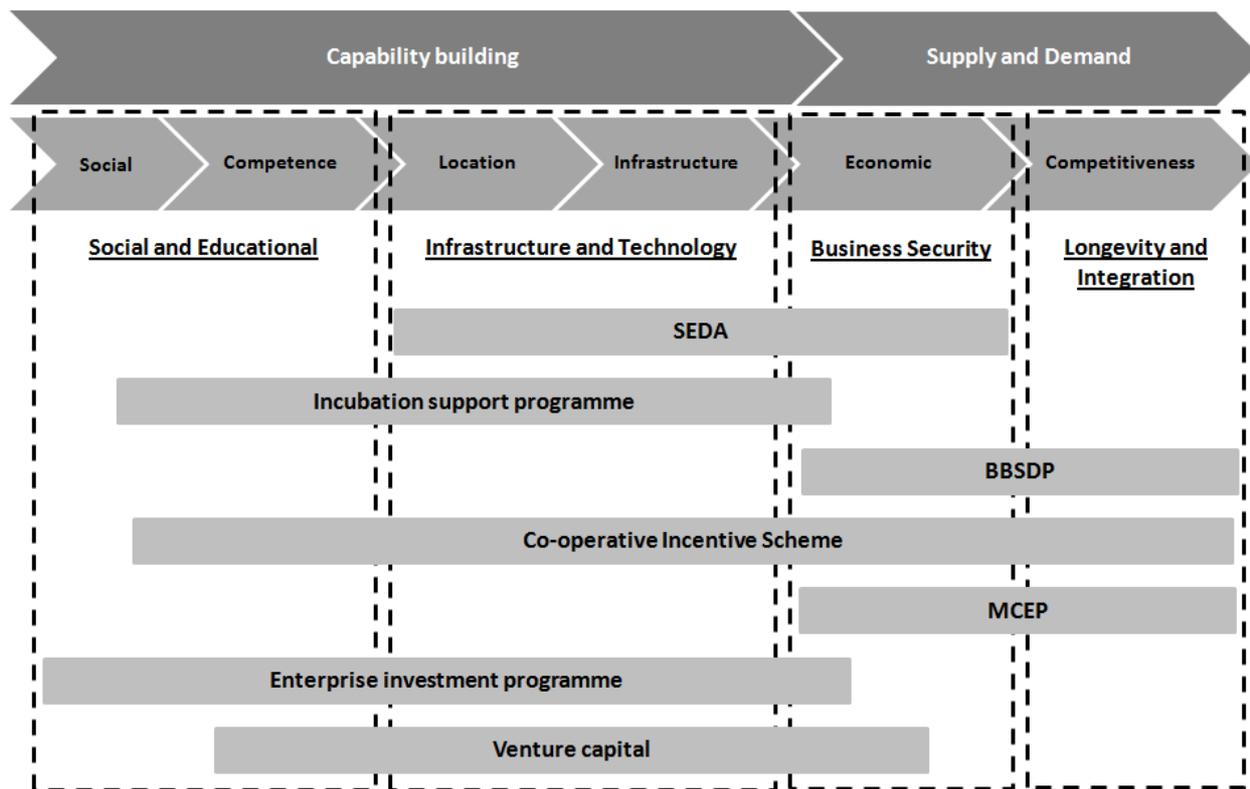


Figure 4-18: Funding mechanisms available at the various life cycle phases of LMS development

It is evident that not every type of LMS development project will necessarily involve the full life cycle phase. It however still needs to be quantified if the required key elements of the previous phase have been satisfied.

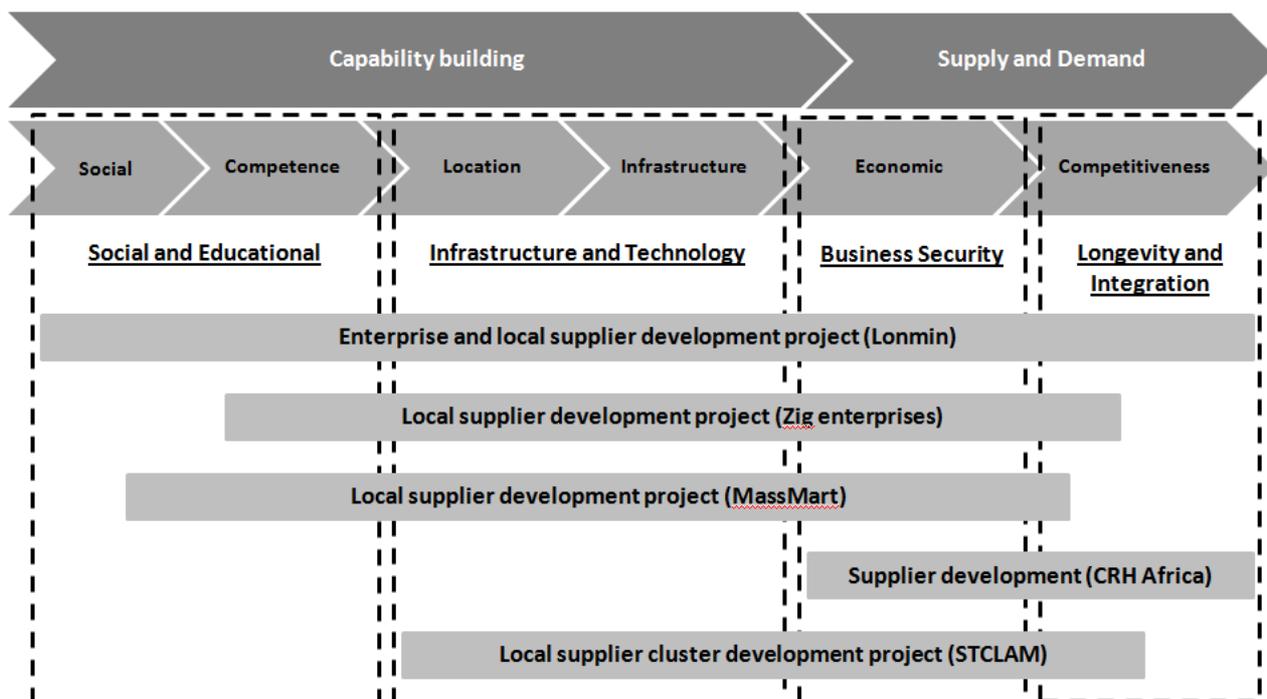


Figure 4-19: Different types of supplier development projects from the case studies

It is important to note that by ensuring each life cycle phase meets the necessary requirements it will promote the successful adoption of the LMS to the next development phase.

Incorporating all these elements into the framework the conceptual LMS development roadmap can now be constructed. The outputs from the model would now be able to illustrate the current position of the LMS on the development life cycle phases. From the requirements of the end user the required developmental elements would be identified and the project development process would be followed to conduct the development project. Figure 4-20 represents the additional inclusions into the framework as well as the newly established out puts.

4.3.12 Conceptual LMS development roadmap

The conceptual model can now be represented graphically illustrating the various key elements and sequences of each through the various life cycle phases. Figure 4-21 represents the conceptual LMS development roadmap.

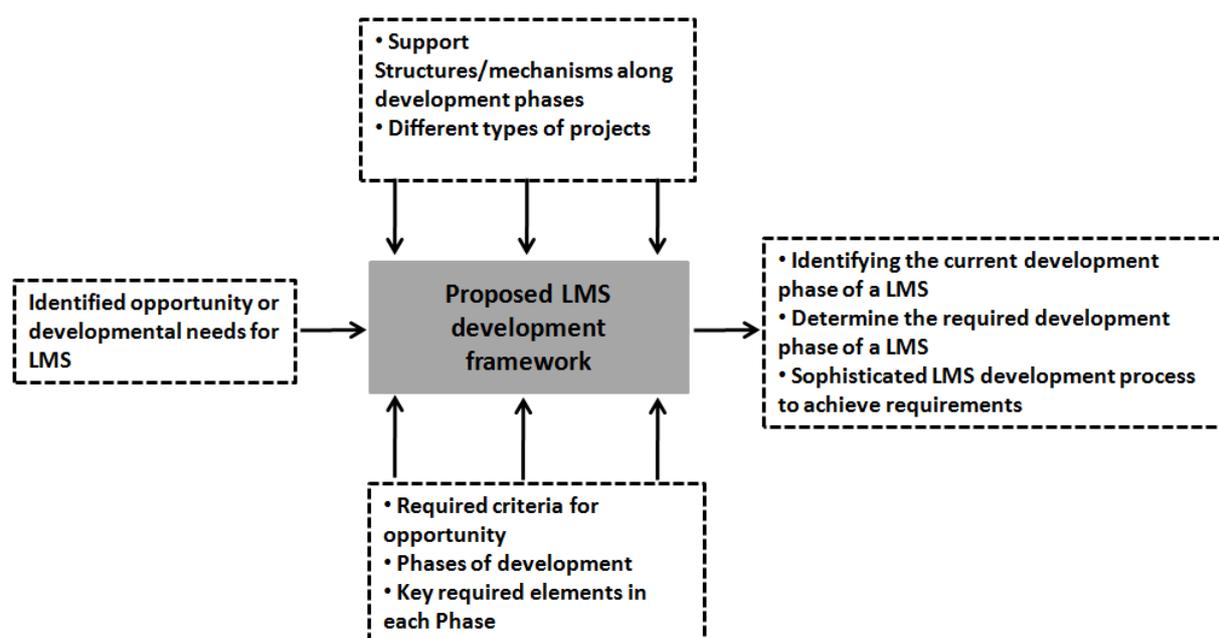


Figure 4-20: Additional inclusions to Framework from case studies

The elements of the framework include; the required opportunity for the LMS, the required developmental elements in each phase of the roadmap, the funding mechanisms available during each life cycle phases of the LMS. The outputs include the identification of the elements that still need to be developed and a project management process for the development of the LMS.

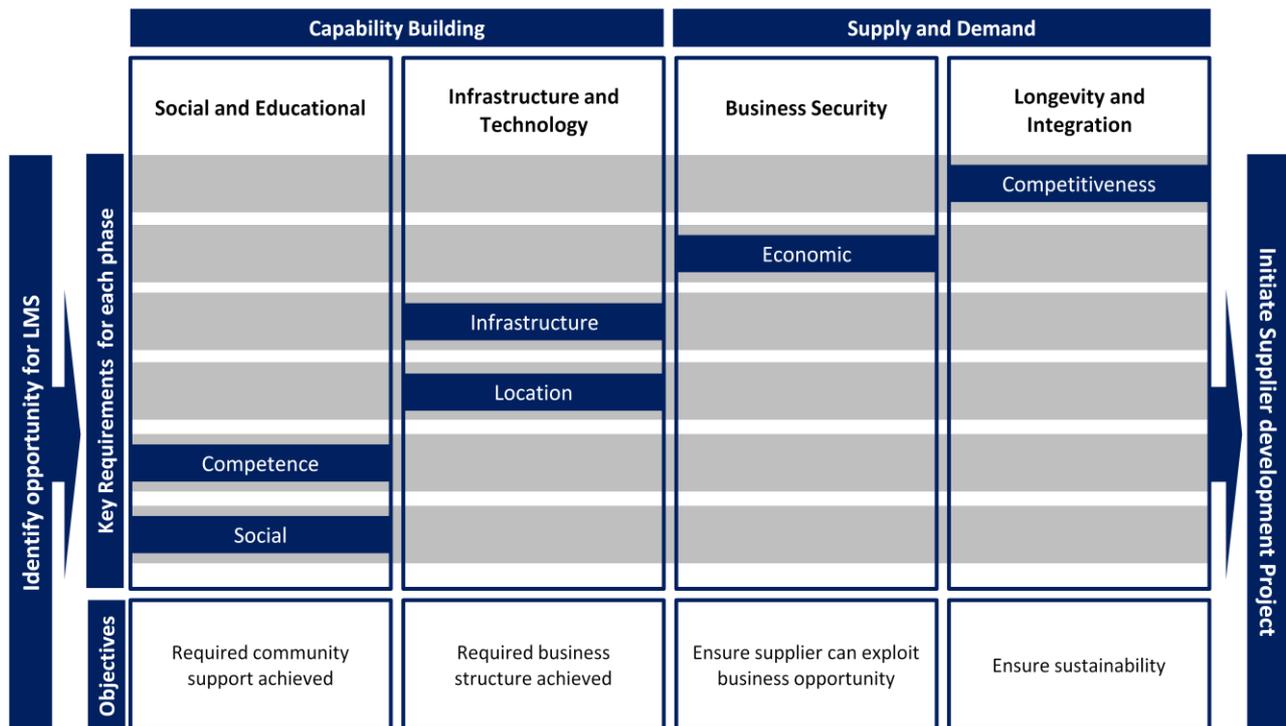


Figure 4-21: Conceptual Local Manufacturing Supplier Development Framework

4.4 VALIDATION OF THE CONCEPTUAL FRAMEWORK

4.4.1 Setup of the validation

During the validation of the Holistic LMSD Framework the following components of the framework will be assessed to correlate their significance to industry related case studies:

- **5-Step approach-** The use or compatibility of the 5 stepped approach for identifying and determining the type of LMS development project (or the life cycle phase of the LMS)
- **Identifying the current position** of the project/LMS on the LMS development roadmap relevant to the requirements of the customer.
- **Identify the critical elements required during each phase-** The identified key elements within each phase of the LMS life cycle vs. the elements identified in each case study.
- **Validate the sequence of each Phase during LMS development**
- **Objectives of each phase and function of the stakeholders along each phase.-** The categories identified in the framework and the relevance to each case study

4.4.2 Case study 1- Resource efficiency process chains for titanium parts

The South African titanium strategy framework formulated with a view to deliver titanium related competencies across the entire value chain, from production of titanium minerals to developing local titanium manufacturing suppliers. South Africa is currently the world's second largest producer of raw titanium minerals. In spite of this, it still has very limited market position further downstream in the value chain for the production of primary titanium metal, mill products or finished components. The strong demand for titanium driven by its increased use across a number of industry sectors has resulted in an increased global focus to reduce the cost of producing the metal and its products. The Department of Science and Technology (DST) in South Africa has been spearheading a research-led industrialisation initiative, driven by the following considerations:

- Stated government industrial policy in terms of the Department of Mineral Resources (DMR) mineral beneficiation strategy. (government strategy)
- The Department of Trade and Industry (dti) National Industrial Policy Framework (Government policy)
- South Africa's positioning as the 2nd largest global producer of Titanium minerals with a share of 23 % of the world deposits but no capacity for production of titanium metal, mill products, components or downstream fabrication (Opportunity identified)
- Rapidly growing demand for titanium, particularly from the commercial aerospace and biomedical sectors due to fundamental technology shifts (composite airframe structures) and ageing populations, respectively, which represent sustainable long-term market growth trends (sustainable opportunity identified).

Over the last decade, it started with the training and education, i.e. capacity building and the development of high-end skills for industry. Several publications and more than 30 MSc and PhD Dissertations represents the institutional (expert bodies created- Support structure).

These high-level skills shall ensure both further technology development and transfer beyond simple results of publications. Only then, the incubation areas, other than at the Universities, shall establish identified institutions and industrial partners to address the development of technology platforms (private sector support). The idea is to build on these platforms and to expand local industrial capacity and capabilities.

It is evident that the development efforts are concentrated on key technology building blocks that are required for the development of local titanium manufacturing suppliers. Technology and expertise

found to be the barrier between the competing formal economy and base of the pyramid informal economy (key challenges Identified). Another key focus area developed in this project is the transfer of the competencies and technologies to the industrial partners, and their implementation on production components.

The development of resource efficient manufacturing process chains demonstrated the integration of these approaches carried out on selected benchmark components (product breakdown to identify opportunities). This enabled economic value for industrial cluster partners in local value streams. In particular, the capability to design and implement more efficient and cost effective manufacturing process chains for quality titanium parts will represent a differentiating competence for local manufacturers relative to international competitors (competition identified). These developments of integrated resource-efficient process chains create integration opportunities into global value streams of the aerospace, automotive and biomedical industries (sustainable opportunity).

4.4.3 Analysis of case study 1

The first element of the LMS development road map is to identify the opportunity for the LMS. From the case study it is evident that this was executed through the selection of certain benchmarked components. This correlates to the method of deconstructing a current product to identify opportunities for a LMS to exploit (as shown in Figure 4-11). The second step of the process, before the identification on the LMS development road map can be determined, is to establish the necessary requirements of the LMS. These were identified as the capability building (training of people e.g. Masters students and PhD students to support the industry), technology building blocks, incubation areas, and benchmark optimisation.

From this case study it is evident that the focus is around providing the necessary supporting structures to aid the development of local suppliers. This entails creating a supporting environment. The local environment in this case represents the actual industry for a LMS to operate within. It is clear that before a LMS can be established or selected, the supporting environment and people need to be established first. The case study further illustrates the key requirements for a LMS, the supporting structures, elements and key stakeholders. The relevant correlation of the framework created and the elements thereof used in the case study, is represented in Figure 4-22.

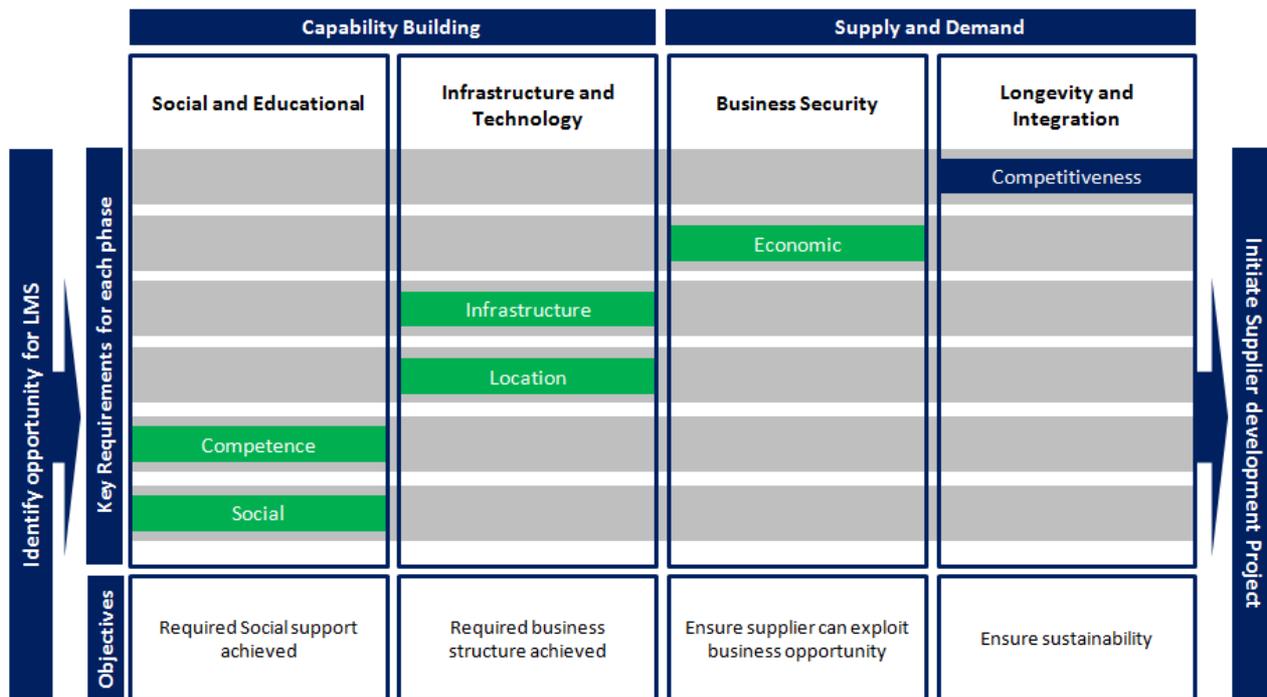


Figure 4-22 Validation: Framework correlation with developing local titanium manufacturing suppliers

In terms of the LMS phases, the case study illustrates that before a LMS can be developed the foundation of its supporting environment needs to be established before it can move on to the subsequent phases. The phases identified during the case study and the key requirements in each are summarised in Table 4-3. According to the LMS development Road map the likely local suppliers would currently fall within the Business Security Phase.

4.4.4 Shortcomings of conceptual model

Although the current position of the local suppliers can be identified along the LMS development road map, it is unclear to what quantifiable extent they will fulfil the requirements at each stage. It is evident that a scoring technique needs to be implemented into the framework to calculate the level of conformance to each requirement. This will involve a Multi Criteria Decision Analysis (MCDA) technique as various criteria in each stage might be of more importance than others. From the literature review it was established that the AHP is a recommended processes for evaluating MCDA problems.

Table 4-3: Phase Identified during Case study, key requirements and stakeholders

Phase	Key Requirements	Objectives	Stakeholders
Social and Educational	Appropriate skills for supporting the industry and Knowledge of Titanium manufacturing processes	Capability Building of the supporting environment	Universities, DST, DTI
Infrastructure and Technology	Technology Building blocks, Incubation areas, access to markets	Required business infrastructure is in place (access to technology, Transfer of competencies and technologies to industrial partners)	Technology Clusters, Universities, DTI, DST and Local suppliers
Business Security	Manufacturing Titanium components at required costs and specifications	Ensure the Manufacturing readiness of the suppliers to exploit business opportunity cost effectively	Local Suppliers, DST, DTI and DMR.
Longevity and integration.	Not yet established	Not yet established	Not yet established

The second short coming from the case study presented is that various suppliers will have different capabilities. This would mean that they would require different development needs based on their conformance to required criteria. Thus a model would need to be created detailing the level of conformance of each requirement of the LMS and highlight the current capabilities that need to be developed. This will further allow the ability to identify under which exact criteria investment or assistance is required.

The third shortcoming of the conceptual model is to create an action plan of how to address each noncompliant criterion. This will involve prioritising each one and proposing possible solutions based on the support structures and mechanisms identified.

4.4.5 Iteration of conceptual model

The previous conceptual model consisted of high level key requirements for each stage i.e. social, competence, location, infrastructure, economic and competitiveness. In order to create quantifiable conformance to each requirement during the evaluation of various suppliers, a scoring continuum is required for each criteria linked to a weighted metric. This will represent the importance for each supplier to conform to the relevant requirement.

An Excel model is therefore proposed in which each requirement will be assigned a level of compliance, based on a continuum created, to represent the required conformance. Each criteria will also be given a weighting (as a percentage) to represent its overall importance within each category. The sum total percentage for each criteria assigned under each key element (social, competence, location etc.) may not exceed 100% as the weighting is relevant to the total amount of criteria under each key element. Table 4-4 demonstrates the above mentioned scoring technique using the example of the Social criteria under the first phase of the LMS development road map (Social and Educational).

The required level for each criterion represents the point along the continuum required by the end user, for the LMS to conform to. Examples of these continuums under each element from the various phases of the LMS road map are illustrated in Appendix A from Table A-2 to Table A-7. The compliance to each criterion of the LMS is calculated as follows:

Table 4-4: Representation of Criteria scoring from model inputs

Social Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	LMS Conformance	Annual Investment required for LMS to comply				
					Year 1	Year 2	Year 3	Year 4	Year 5
Societal Needs									
Access to Health and Welfare	3	2	20%	0.13					
Housing	4	2	15%	0.08	R 150 000	R 150 000		R 150 000	
Security	3	3	15%	0.15					
Utilities									
Water	4	3	20%	0.15					
Electricity	4	4	20%	0.20					
Roads and transport	3	3	10%	0.10					
Total Compliance of LMS				81%					

Let R_{ij} = The required level for LMS in criteria i within key element j $i \in (1,2,...n), j \in (1,2,...6)$

Let C_{ij} = The current level for LMS in criteria i within key element j $i \in (1,2,...n), j \in (1,2,...6)$

Let W_{ij} = The weighting assigned to Criteria i within key element j $i \in (1,2,...n), j \in (1,2,...6)$

Let X_{ij} = The conformance score of LMS for criteria i within key element j $i \in (1,2,...n), j \in (1,2,...6)$

Let Y_j = The total compliance score for the LMS under key element j $j \in (1,2,...6)$

$$\sum_{j=1}^6 \sum_{i=1}^n Wij = 100\% \dots\dots\dots(\text{Equation 4.1})$$

$$Xij = \sum_{j=1}^6 \sum_{i=1}^n \left(\frac{Cij}{Rij} \right) * Wij \dots\dots\dots(\text{Equation 4.2})$$

$$Yj = \sum_{i=1}^n Xij \dots\dots\dots (\text{Equation 4.3})$$

By utilising the equations identified, the total Compliance of the LMS from Table 4-4 can be calculated as 81%. These equations are utilised in the model to determine the compliance level for a LMS in each of the key elements of the road map. For each criterion under the various key elements the investment required can now be identified.

Now that the compliance of the LMS to each criterion can be calculated an action plan can be established to determine the focus areas required for the development of the LMS. The action plan can include the criteria that the LMS does not meet as well as the investment required for it to reach compliance. From the literature review various support mechanisms have been identified that can assist the LMS or end user during its development. These proposed support mechanisms and stakeholders can be included in the action plan. Table 4-5 represents the action plan generated from the model.

The first priority will always be given to the key elements from the first stages and will progress upwards from there. This is due to the evidence provided that before a LMS can successfully achieve a competitive advantage, all fundamental aspects of its life cycle stage need to be in place. This means that before any criteria can be addressed in a particular phase, all critical criteria in the preceding phases need to be complied to.

These additions to the conceptual model will assist the decision making process of the end user as to which LMS should be selected.

4.4.6 Case Study 2 – Modikwa mine

In September 2010 The Department of Mineral Resources (DMR) issued an amendment to the Mining Charter (MC) with regards to the local preferential procurement policy. In conjunction with the BBBEE policy, the mining charter mandated that all mining companies need to ensure that their procurement policies make provision for spend with BBBEE level 4 companies. The mandate stated that 70% of spend on services, 40% of capital expenditure on goods and 50% spend on consumables need to be procured through level 4 BBBEE suppliers. The charter was enforced by April 2014. The risk companies could face if non-compliance persists, is that the DMR could withdraw the mining licences issued to these companies. (DMR,2015)

Table 4-5 Action plan for identifying development needs of LMS

Action Plan for Local Manufacturing Supplier Development				
Priority	Key Focus Areas	Life cycle element of LMS	Compliance %	Suggested Options to consider
1	Access to Health and Welfare	Social Element	25%	Joint funding mechanisms with Government and EIP or ISP
3	Electricity	Social Element	33%	Joint funding mechanisms with Government and EIP or ISP
4	Roads and transport	Social Element	33%	Joint funding mechanisms with Government and EIP or ISP
5	Manufacturing and operational Skills	Competence Element	20%	Funding from CIS, EIP, ISP, Training Support Programs, Incubators, Shadowing etc.
6	Jointly owned/Shared (cluster)	Location element	33%	Funding from CIS, EIP, ISP Training Support Programs, Incubators, Shadowing etc
7	Transport networks	Infrastructure element	75%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.
8	% of local ownership	Economic Element	67%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions
9	Manufacturing Readiness Level	Economic Element	20%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions

Anglo American has established a sophisticated Local supplier development strategy which was initiated in 2012. In 2010 it started a local procurement policy but soon after establishment it realised that no impact was being made on the local communities in which it operates as the supply chain structures sourced goods from well established HDSA in metropolitan regions. The strategy for local supplier development seeks to have sustainable, responsible local procurement practices that build

a resilient supply chain for the organisation, and that contribute to the economic and social development of the communities in which it operates (Iekgotla, 2014).

Anglo American, through its Zimele fund (social development fund), assists local SMEs through seed funding, mentorship programmes, entrepreneurial coaching and hands on experiential learning. It has partnered with Aurik, training facilitators, to establish its own business and technical training incubator. The incubator assists all start up entrepreneurs and established business owners to enhance their business acumen skills and if any further training is required for specific skills the incubator will arrange for it. The incubator selects a certain amount of candidates per year via its online application process where the business case of the entrepreneur is submitted and evaluated to determine selection. The incubator is also used in conjunction with Anglo American's supply chain department where promising business owners from local communities are sent, to receive the necessary training on required skill development.

The local supplier development strategy seeks to identify local supplier opportunities by:

- Scanning its entire value chain from exploration through to mine closure services and identifying opportunities within each sector
- Spend analytics- Analyse funds spent at mines on various products with various suppliers. Constantly seeking opportunity for high volume low risk items.
- Un-bundling large contracts from international suppliers to identify smaller items or services
- Encourage its multinational suppliers to source locally,
- Ring fence certain services and supplies at mines for local suppliers only. Eg. Transportation, minor workshop/machining jobs, food services, supply of overalls etc.

Each business unit in Anglo American is assigned targets for local procurement spend each year and the progress is reported on a quarterly basis to executive management.

Anglo Platinum's (a business unit of Anglo American) Modikwa Platinum mine, situated 50km north of Steelport, in the Magakala local community, started a local supplier development project in 2013. Spend analytics were conducted and opportunities were identified on a volume and value basis. Opportunities for local suppliers in categories of reducing lead times from current suppliers and costs were identified. The supply chain department then matched the opportunities with current and potential capable local suppliers, some already on the vendor list of the mine and others not. After careful consideration of the required capabilities vs current and potential capabilities, three suppliers that were showing considerable potential in expanding their businesses were identified.

The mine identified larger maintenance and repair jobs for the supplier in terms of:

- Maintenance and repair of pumps and compressors including machining of casings, and flanges
- Construction and repairing of ventilation ducts
- Welding, boring, grinding and drilling jobs

The supplier did not have the required space in his workshop nor equipment and in some instances the certified skills for the opportunity presented. Another concern was the funding requirements necessary to acquire all equipment. The mine initiated a nine month incubation and training programme with the supplier through its Zimele fund. The supplier was sent on extensive training programmes including business management training hosted through Zimele's incubator. (Govender, 2015)

Zimele also assisted him with funding through their Sebeza fund (Co-funded through Government). Figure 4-24 illustrates the structure of the Zimele fund.



Figure 4-23: Construction of the workshop for local supplier (Govender, 2015)

enormously to the mine in two ways. Firstly the response time to breakdowns and maintenance have been reduced by 50% on average due to the fact that the work was currently being done by numerous suppliers in Polokwane (situated 1 and a half hours away) and secondly the average cost of the repairs have reduced by 25%. Dippenaar (2016) maintains that it is difficult to quantify the exact benefit of the reduced turnaround time in maintenance as some of the work is related to a certain cycle of production being halted, which means that any improvement is paramount. Dippenaar (2016) stated that the project most probably paid itself off after the first 10-12 months.

By mapping this case study out on the HLMSD framework a clear sequence of events can be identified, as per the LMS development life cycle.

4.4.7 Analysis of case study 2

From evaluating the case study, the following summary of the themes can be identified in accordance with the framework developed:

- Clear strategy of opportunity identification for Local suppliers (spend analysis and Pareto method)
- Clear sequence of events followed (Identifying opportunity for supplier, establish criteria for supplier, evaluate potential suppliers against requirements, establish the development needs of the suppliers, select best conforming supplier and initiate development)
- Life cycle of the development project followed the life cycle stages of the development road map.
- Supplier development from social and educational life cycle requirement right through to longevity and integration.
- Incubators established by the company and utilised to train and provide necessary skills to local suppliers.
- Local supplier development strategy implemented throughout the organisation (incorporating local supplier into the value stream)

During the interview with Dippenaar (2016) the various inputs of the revised LMS development model were inserted for the three proposed LMS suppliers. The required criteria for each key element were selected from the proposed criteria established in Table A-2 to Table A-7 of Appendix A and the various levels for each criterion were inserted. The inputs into the model are represented from Table 4-6 to Table 4-9. These represent the inputs of the final supplier selected by Anglo Platinum (the inputs for the LMS were according to its state before any development was made). The

same applies to the other two suppliers. The inputs for the other suppliers were also generated and can be viewed in Tables B-1 to Table B12 of Appendix B.

Table 4-6: Inputs to model for Modikwa case study (Social and educational Phase)

Social Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Societal Needs				Year 1	Year 2
Community Access to Health and Welfare	3	3	20%		n/a

Competence Element	Required level (1-5)	LMS current level (1-4)	Weighting (0-1)	Annual Investment required for LMS to comply	
Skills & Education				Year 1	Year 2
Manufacturing and operational Skills	3	2	50%	R 45 000.00	n/a
Business Acumen skills	3	2	30%	R 25 000.00	n/a

Table 4-7: Inputs to model for Modikwa case study (Infrastructure and Technology Phase)

Location Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Proximity				Year 1	Year 2
Proximity to local community	4	4	20.00%	n/a	n/a

Infrastructure Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Physical Infrastructure				Year 1	Year 2
Equipment & tools	3	2	40%	R 1 250 000.00	n/a
Facility and supporting infrastructure	3	2	40%	R 2 000 000.00	n/a

Table 4-8: Inputs to model for Modikwa case study (Business security Phase)

Economic Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Manufacturing Competence				Year 1	Year 2
Quality Assurance systems/processes	3	1	40.00%	n/a	n/a
Manufacturing Readiness Level	3	2	60.00%	n/a	n/a

Table 4-9: Inputs to model for Modikwa case study (Longevity and Integration Phase)

Competitiveness Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
				Year 1	Year 2
Competitive manufacturing processes					
Effective and efficient manufacturing processes	3	1	40.00%		n/a
Integrated into greater Procurement value streams	3	2	30.00%		n/a
Compliance to regulatory Policies					
BBBEE Rating	4	5	30.00%		n/a

The results of the model are shown in Figure 4-25 of the final supplier selected. The proposed action plan generated by the model is illustrated in Table 4-10. The model clearly quantifies and identifies the current position of the LMS on the road map. What is interesting to note is that the key elements that the LMS does not conform to on the road map are exactly where Modikwa mine focused its attention and resources to develop the LMS. This becomes evident from the Action Plan generated by the model which illustrates the criteria under each key element that the LMS does not conform to. The percentage on non-conformance is illustrated as well as the required investment.

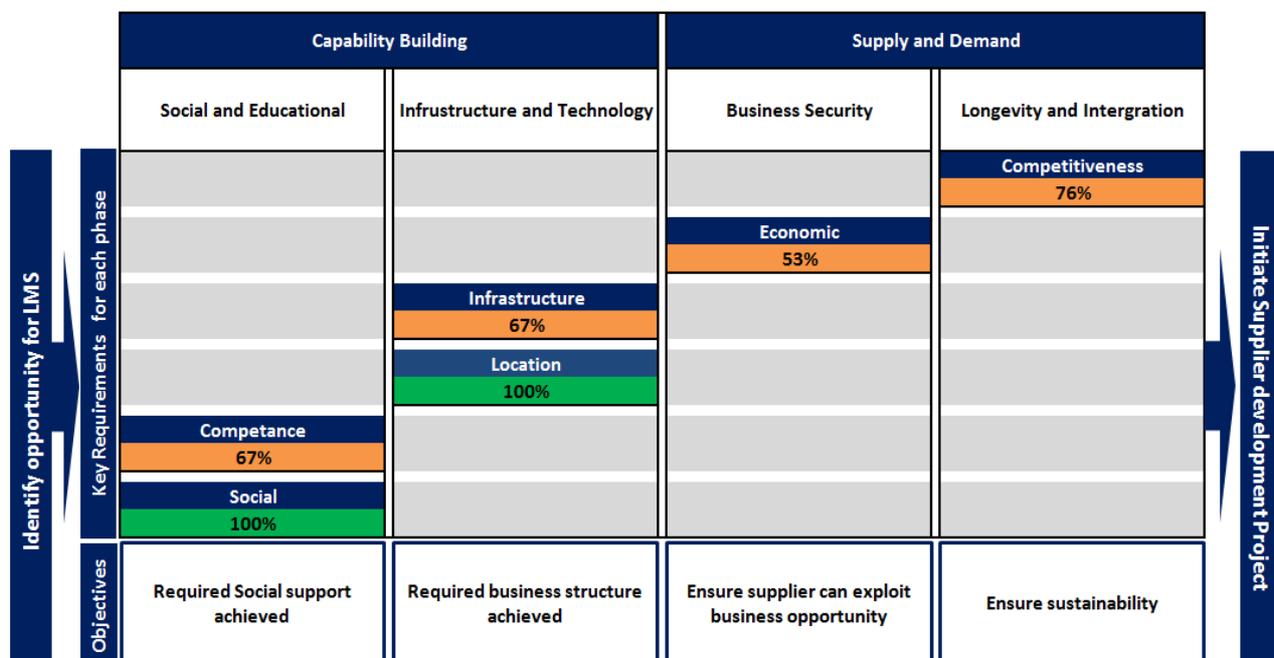


Figure 4-25: Results of the model for the selected LMS



Table 4-11 illustrates the comparison between the “suggested options to consider” for developing the LMS, generated by the model, against what Modikwa mine conducted during the development project.

Table 4-10: Generated action plan for selected supplier

Action Plan for Local Manufacturing Supplier Development					
Priority	Key Focus Areas	Life cycle element of LMS	Compliance %	Suggested Options to consider	Investment required
1	Manufacturing and operational Skills	Competence element	67%	Funding from CIS, EIP, ISP, Training Support Programs, Incubators, Shadowing etc.	R 85 000
2	Business Acumen skills	Competence element	67%	Funding from CIS, EIP, ISP Training Support Programs, Incubators, Shadowing etc.	R25 000
3	Equipment & tools	Infrastructure element	67%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.	R 1 250 000
4	Facility and supporting infrastructure	Infrastructure element	67%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.	R 2 000 000
5	Quality Assurance systems/processes	Economic element	33%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	R -
6	Manufacturing Readiness Level	Economic element	67%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	R -
7	Effective and efficient manufacturing processes	Competitiveness element	33%	MCEP funding, Shadowing, Internship programs with host	R -

				company, Improvement project at LMS, Fund development etc.	
8	Integrated into greater Procurement value streams	Competitiveness element	67%	MCEP funding, Shadowing, Internship programs with host company, Improvement project at LMS, Fund development etc.	R -

By comparing the results of the other two suppliers (represented in Figure B-1 and Figure B-2 of Appendix B) it is evident why Modikwa mine did not select these suppliers. From the inputs to the model it is clear that higher investment costs were required in order to bring the LMS's to the required conformance levels. The action plans generated for these two suppliers are illustrated in Table B-13 and Table B-14 of Appendix B.

Table 4-11: Comparison between suggested solutions of model vs actual

Criteria	Suggested Options from Model	Solutions implemented by Modikwa
Manufacturing and operational Skills	Training Support Programmes, Incubators, Shadowing etc.	Training offered through Incubator by Anglo American
Business Acumen skills	Training Support Programmes, Incubators, Shadowing etc.	Training offered through Incubator by Anglo American
Equipment & tools	Establish Funding mechanisms, gifting, cluster, Joint co-operation etc.	Established funding through the Anglo Zimele Fund
Facility and supporting infrastructure	Establish Funding mechanisms, gifting, cluster, Joint co-operation etc.	Established funding through the Anglo Zimele Fund
Quality Assurance systems/processes	Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	Training offered through Incubator by Anglo American
Manufacturing Readiness Level	Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	Training offered through Incubator by Anglo American
Effective and efficient manufacturing processes	Shadowing, Internship programmes with host company, Improvement project at LMS, Fund development etc.	Training offered through Incubator by Anglo American. Regular meeting held with LMS on site to assist.

Integrated into greater Procurement value streams	Crate a supply contract with LMS	Issued LMS with supply contract
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4.4.8 Shortcomings of revised model

In the Modikwa case study presented the mine selected the most appropriate supplier to develop, based on the ability of the supplier to meet the specified criteria. This decision support is lacking in the current model. In order to fully support the decision making process the model should be able to determine the probability of the LMS to achieve the desired manufacturing criteria. From the literature review and previous case studies conducted the key elements contributing toward the LMS's capability of achieving certain manufacturing criteria are; Competence, Infrastructure and Economic. Competitiveness is not considered as the LMS would not be able to reach that phase without ensuring the actual product can be produced according to technical specifications. Table 4-12 illustrates the criteria to include in the calculation of the conformance to desired specifications.

Table 4-12: Criteria used for manufacturing conformance

Competence	infrastructure	Economic
Manufacturing and Operational skills	Equipment and tools	Manufacturing readiness Level
Business acumen skills	Facility and supporting infrastructure	Quality and assurance processes/systems
	Technology readiness	
	Business administrative functions	

The calculation for the overall conformance to manufacturing capability is calculated in a similar manner to the original conformance except that the weighting from each different key element/phases needs to be incorporated. This calculation is only applicable to the criteria identified in Table 4-8. The calculation of the probability is represented in equations 4.4 and 4.5.

Let R_{ms} = The required level for LMS in criteria m for supplier s $m \in (1,2,...n)$, $s \in (1,2,...n)$

Let C_{ms} = The current level for LMS in criteria m for supplier s $m \in (1,2,...n)$, $s \in (1,2,...n)$

Let W_{1ms} = The original weighting assigned to Criteria m for supplier s $m \in (1,2,...n)$, $s \in (1,2,...n)$

Let W_{2s} = The sum of all the weightings for each criteria for supplier s.....s $\in(1,2,...n)$

Let Y_s = The total probability of achieving requirements of supplier s.....s $\in(1,2,...n)$

$$W_{2s} = \sum_{m=1}^n W_{1ms} \dots \dots \dots (\text{Equation 4.4})$$

$$Y_s = \sum_{m=1}^n \left(\frac{R_{ms}}{C_{ms}} \right) * \left(\frac{W_{1ms}}{W_{2s}} \right) \dots \dots \dots (\text{Equation 4.5})$$

These formula were then incorporated into the model such that the output included a graph representing the Probability of each considered LMS conforming to the manufacturing requirements. Using the inputs from the Modikwa Case study the model produced the results shown in Figure 4-26.

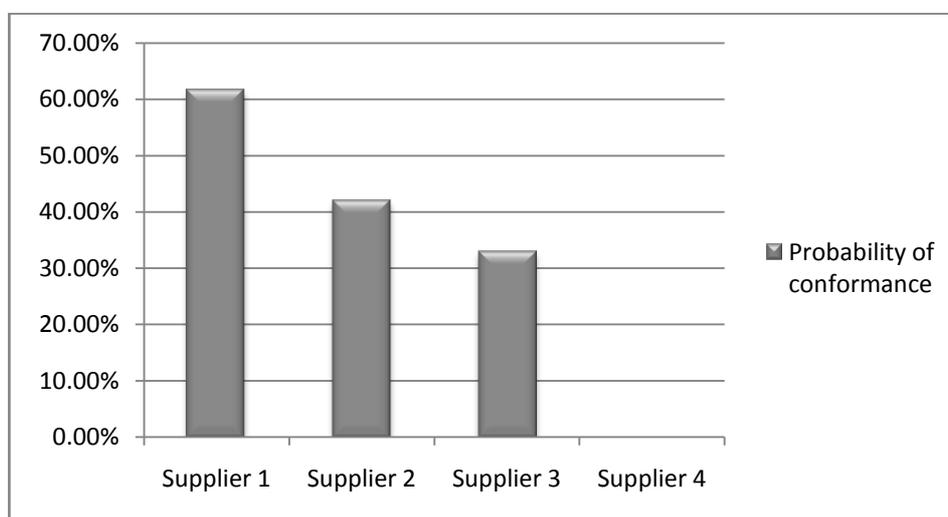


Figure 4-26 Output of model (Probability of LMS Conforming to requirements)

The next decision support criterion to consider is the investment vs. reward. The Modikwa case study illustrated the importance of complying with BBBEE regulations. In order to support the decision of selecting a supplier on these criteria, the cost of developing a certain supplier vs. the BBBEE level will need to be illustrated. This information can be extracted from the input tables of the model and represented in a heat map to illustrate how each of the suppliers compares during the assessment. An example of this output is represented in Figure 4-27 from the inputs of the Modikwa case study.



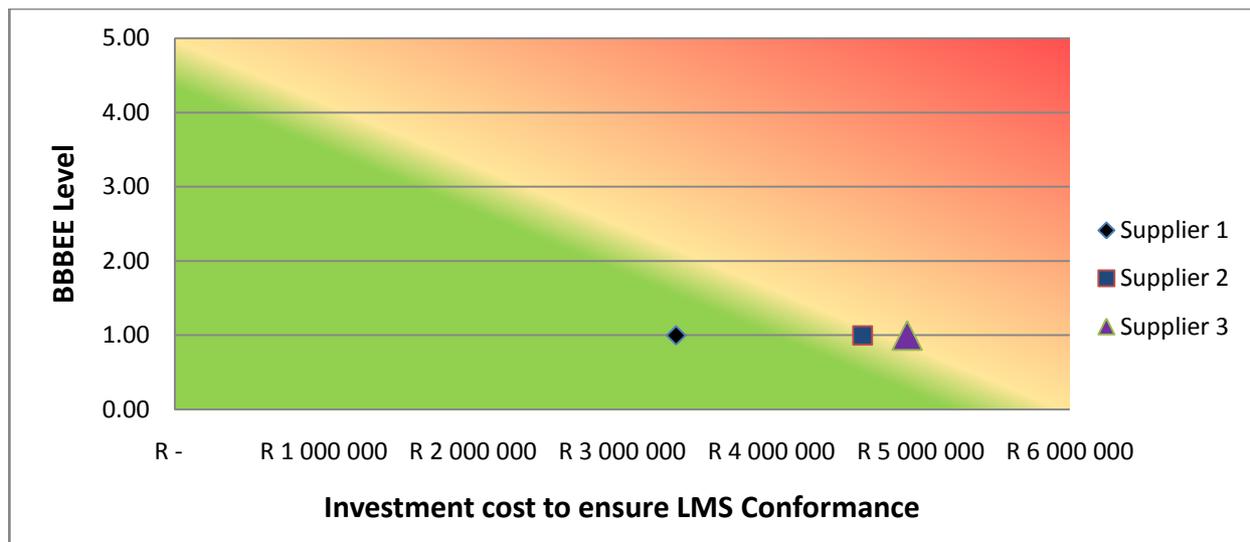


Figure 4-27 BBEE level versus investment cost for LMS to conform

In the example presented LMS 1 was selected although each LMS had the same BBEE score. This further validates the heat map as the consensus would be to select the LMS with the least amount of investment required depending on the benefit of its BBEE score. This is important as the better the BBEE rating of a supplier is, the higher the percentage procurement recognition the company would receive. This in turn affects the BBEE rating of the company and spending additional funds on the development of a LMS, will gain the company additional points on their score card (as represented in **Error! Reference source not found.5**).

The contribution the LMS makes within its community was also a relevant decision making criteria for Modikwa. This can be illustrated by incorporating the predicted annual spend of a company on a LMS as a function of the percentage of products produced locally, the percentage of employees employed locally and the local ownership. This represents the similar framework established by Kaizer in defining “local” (Kaizer, 2014). The decision support required in this instance is evaluating the value add the LMS will bring to the local community. In order to incorporate this into the model the predicted annual procurement spend with the LMS will need to be included in the inputs of the model. The updated input sheets for this are represented in Appendix B, Table B-15. Figure 4-28 illustrates the heat map created for the out puts of the model. The x-axis represents the average of the percentage of employees employed from the local community and the percentage of the local ownership of the LMS. The y-axis represents the average of the percentage of the final product produced locally and the annual predicted procurement spend with the LMS.

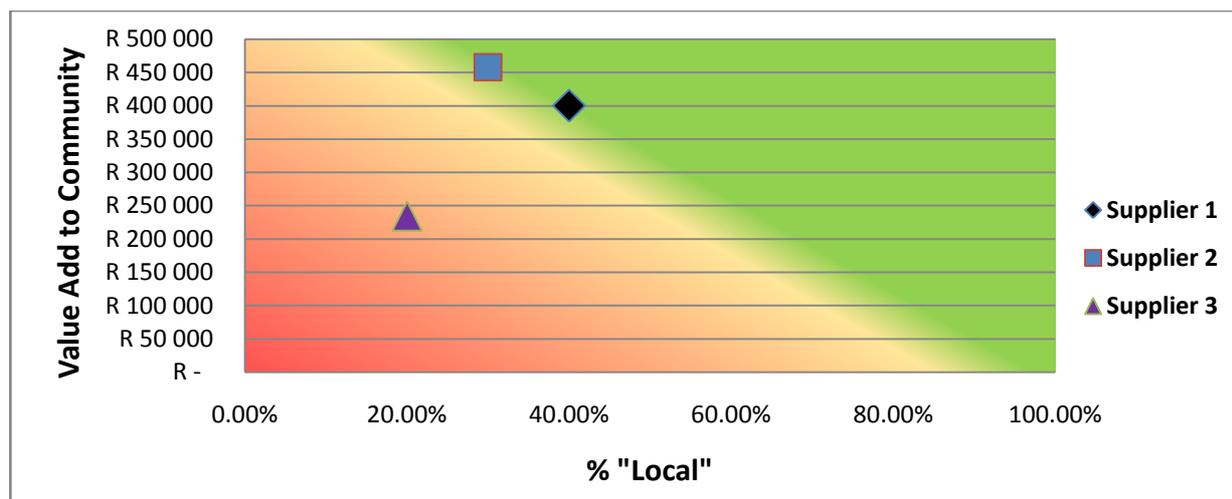


Figure 4-28 Output of model (Value add to community vs. Localness)

Using a hypothetical example, the outputs of the model are illustrated in Figure 4-29 which now form the decision support criteria for selecting a LMS for development.

4.4.9 Case Study 3 – Howden Africa

Howden Africa is a manufacturing company that specialise in air and gas transfer equipment across numerous applications and industries. Their main facility is situated in Booyens, Johannesburg. Their core product and service offering involves designing and manufacturing of industrial fans, heat exchangers, cooling and refrigeration systems, ventilation systems, gas cleaning and compressors (Howden Africa, 2015). The key customers of Howden Africa are Eskom, Anglo American, Sibanye Gold, Sasol, SAB miller and Sappi. Due to the stringent requirements of Eskom and most mining houses to only conduct business with BBBEE compliant suppliers, Howden Africa needs to ensure that they retain their status of compliance (BBBEE rating of four or better).

Due to the stringent requirements of Eskom and most mining houses to only conduct business with BBBEE compliant suppliers, Howden Africa needs to ensure that they retain their status of compliance (BBBEE rating of four or better). In 2012 Howden Africa transformed one of their workshops (work shop 10) into a training facility. This facility was used to train current inexperienced labourers on the manufacturing requirements in the various workshops. In 2015 Eskom signed a contract with Howden Africa to give training and internships to 30 applicants every year for a duration of three years (Buys, 2016).

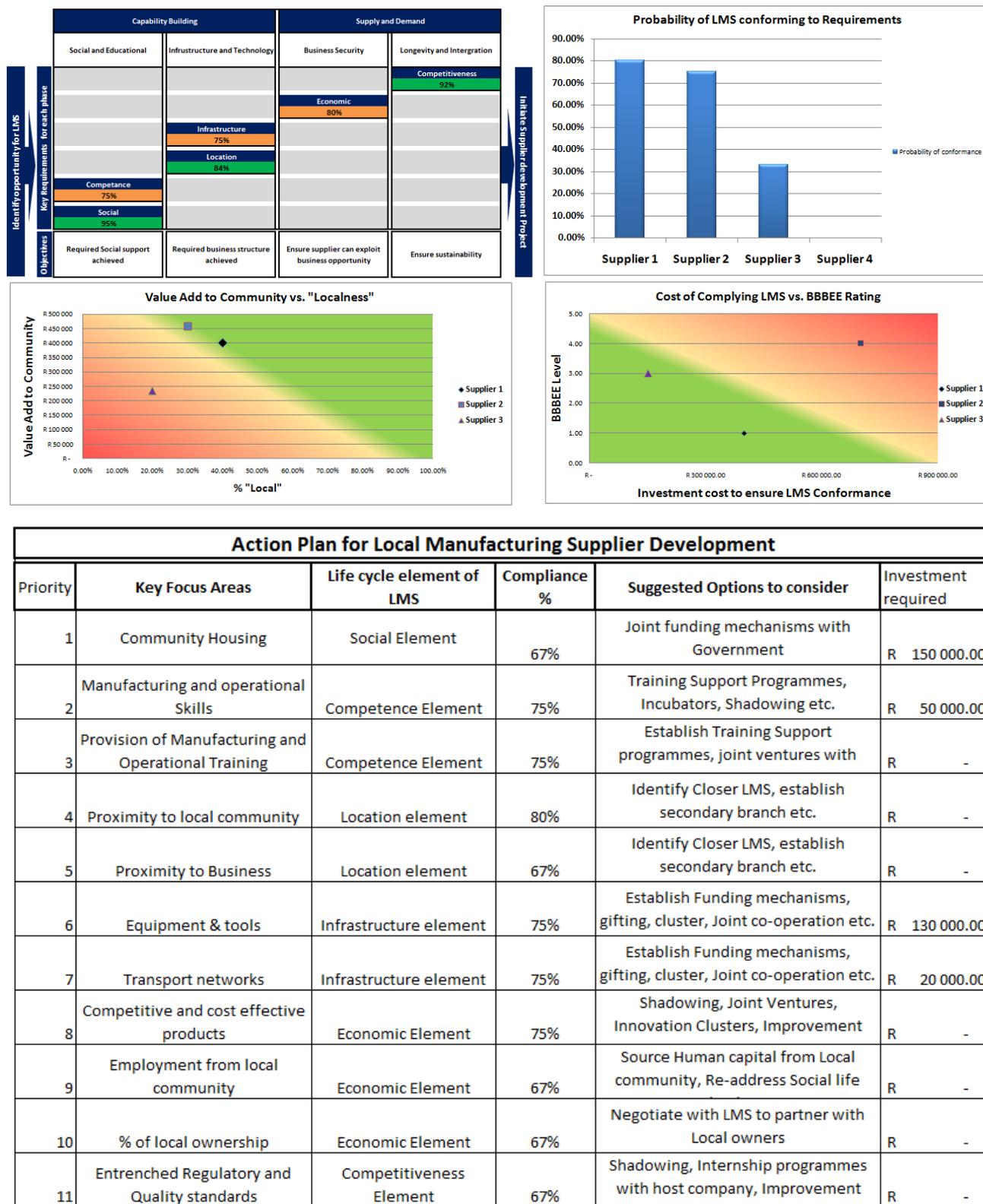


Figure 4-29: Generated Outputs of the second iteration of the conceptual model

The objectives of the agreement is for Howden Africa to source apprentices graduating from certificated courses and provide them with industry related experience. Eskom benefits from this in



that it can source trained and skilled labourers who are familiar with the products of Howden Africa. The benefits to Howden Africa include a more established relationship with Eskom and contribution towards their BBBEE rating for skills development.

In October 2015 Howden Africa embarked on a supplier development project to further increase its BBBEE rating. The project first involved identifying an opportunity for a local supplier. The supply chain department was tasked to identify an opportunity for a local supplier and then to adjudicate the various possible suppliers to select the most appropriate one. After a categorised procurement spend analysis it was found that the top 5 categories included, Manufacturing of heat exchange plates, Ventilation ducting, Gas cleaning, electrical control and instrumentation and Bearings.

These categories were then assessed to determine the required skills, competency levels required and possible local suppliers. From this analysis it was found that the cages used to support the filter bags in the gas cleaning products was the best product to outsource to a LMS. In 2014 Howden Africa spent just over R7 million on filter bag cages. Figure 4-30 represents the design of the filter bag cage.

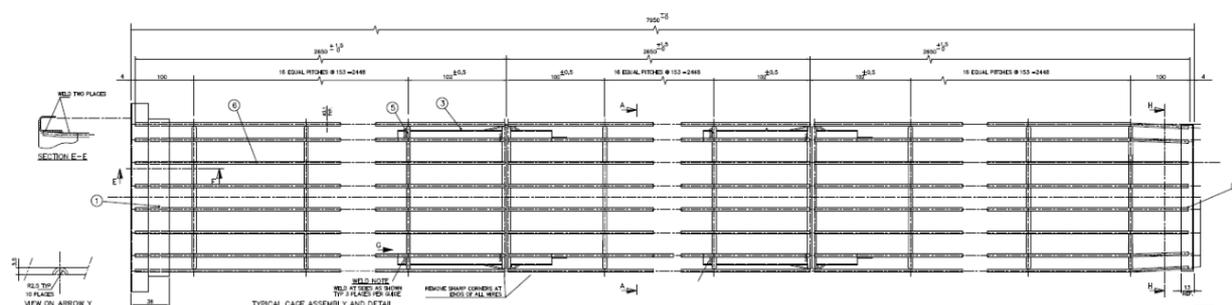


Figure 4-30 design drawing of filter bag cage (Howden Africa,2016)

Two local suppliers were considered for the opportunity. Due to confidentiality concerns there anonymity need to be preserved and will be referred to as supplier 1 and supplier 2. Supplier 1 is a level 1 BBBEE company situated in Chamdor, Roodepoort. They produce small filter cages for the food and beverage industries. Supplier 2 is a Level 2 BBBEE company situated in Vanderbijl park. Supplier 2 provide installation and manufacturing services of minor steel structures to mines and surrounding industries in the area. This includes supporting structures for overland conveyors, underground ventilation support structures at mines etc.

The supply chain department of Howden Africa conducted detailed investigations at each suppliers' premises to establish their current capabilities in terms of manufacturing, quality assurance processes

and current equipment. From the evaluation it was established that Supplier 1 was the most competent supplier as they already possessed some knowledge of the product (albeit on a much smaller scale). To ensure that Supplier 1 could meet the technical requirements of producing the cages, Howden Africa offered training to a number of the artisans at its training facility for a duration of 4 weeks. The training was conducted in such a manner that the artisans that completed the training would be able to train other artisans back at Supplier 1's premises.

It was found however that Supplier 1 was struggling with their cash flow as most of their customers were only paying them after sixty days. Howden Africa structured an interest free 2 year loan agreement of R1million to Supplier 1. The conditions of the loan were that Supplier 1 could draw funds from the loan when Howden Africa issued them with a purchase order. This ensured that they could procure all raw materials required for production without negatively affecting their cash flow. Once Howden Africa paid Supplier 1 they needed to refund the cost of raw materials back into the loan. Capital required to further expand their business or employ more staff could be extracted from the loan provided that it was in conjunction to support the manufacturing of cages and Howden Africa approves it. This capital did not need to be refunded. The structure of this loan agreement meant that Howden Africa carried the costs of the interest rates. This however benefited them as it forms part of the supplier development category in the BBBEE score card which further contributed towards their rating. The structure of the loan Agreement is represented in Figure 4-31.

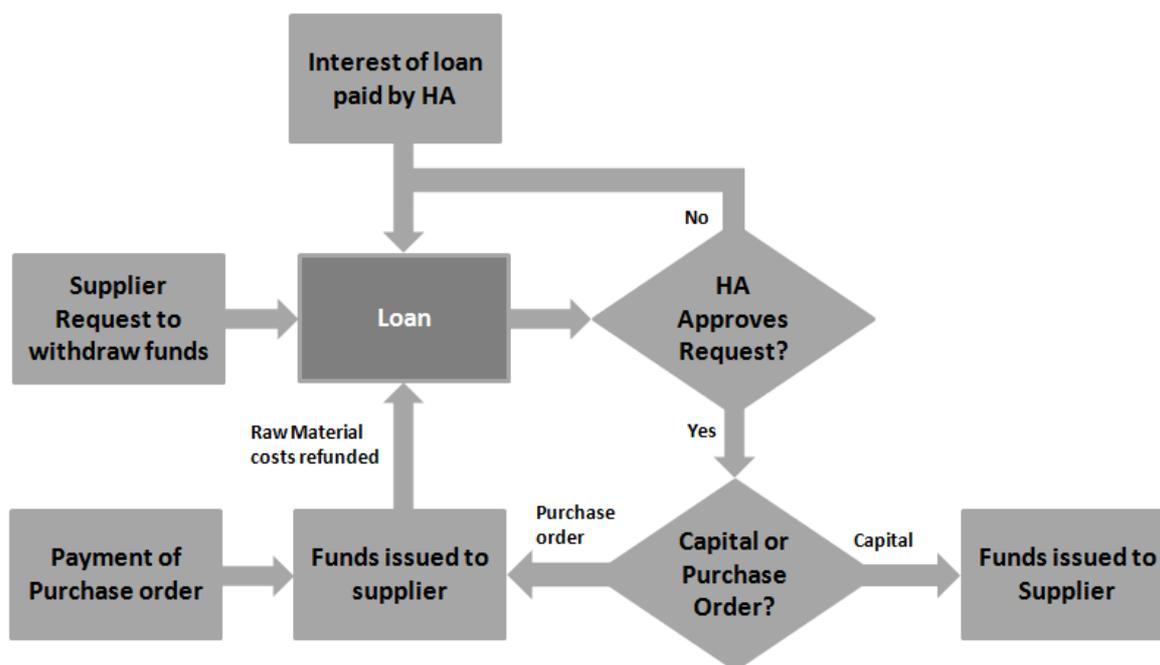


Figure 4-31: Structure of Howden Africa Loan to Supplier 1

4.4.10 Analysis of Howden Africa case study

From the case study it is evident that the reason Howden Africa embarked on the local supplier development project was to enhance its current BBBEE rating. This was due to the fact that the majority of its key customers could only conduct business with a level 4 BBBEE suppliers or better.

For the validation of the LMS development model it is important to first test whether the prerequisite steps of the model are valid. The model states that an opportunity for the LMS needs to be identified. The suggested tools from the model to support this decision are illustrated in Table 4-13.

Table 4-13: Suggested tools for identifying opportunity for LMS

Method	Breif description
Pareto Analysis	Repetitive high value, high risk or high volume items that make up a considerable contribution to an organisations product or service offering
Sole vender supplied items	Items that are sourced from a single vendor with no compition in the market
Imported poroducts	Items that could be sourced locally with the benefit of reduced lead times, exchange rates, ease of communication, local costs etc.
Spend Analysis	Segregate spend according to categories; Potential for export, lack of competitiveness, ever increasing priced products, imported products, high spend products, and repetitive spend/High volume.

The second step of the process is to determine the required criteria that the supplier needs to conform to. This was done through analysing the bill of materials of certain products and establishing their manufacturing requirements. Figure 4-32 represents the sequence of events followed by Howden Africa during the case study. It is evident from this case study that the same sequence of events is followed, as structured in the LMS development model.

Further data was collected from Howden Africa, regarding the case study presented, in order to validate the model. The supply chain manager at Howden Africa, assisted during the inputs of the model with regards to the information and criteria of the two proposed suppliers.

The inputs for each supplier and the levels assigned to each of the required criteria are illustrated in Appendix C from Table C-1 to Table C-12. The results of the model illustrating the conformance of each of the suppliers along the LMS development road map are represented in Figure 4-33 and Figure 4-34. It is evident that the competence level of Supplier 2 is less than that of Supplier 1 as it did not have any prior experience in manufacturing of filter cages.

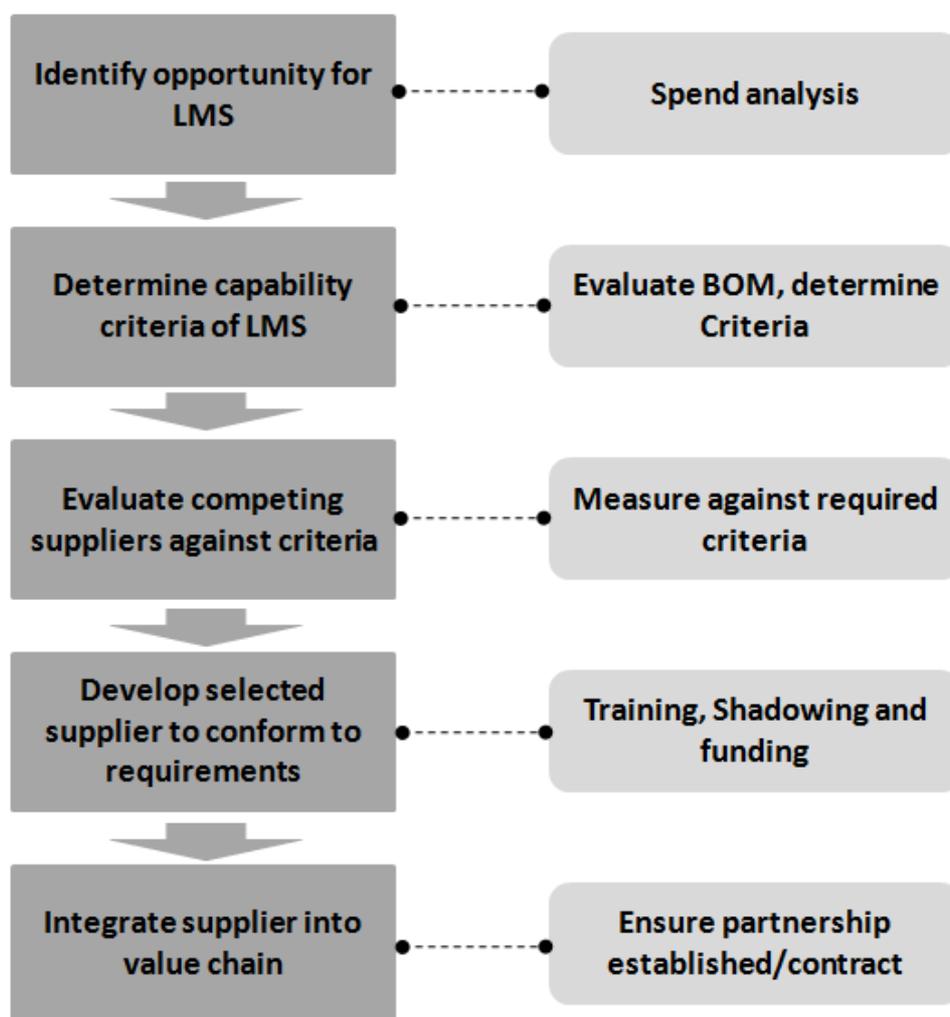


Figure 4-32: Sequence of events and actions during supplier development in Case study

The similar conclusion is made for the infrastructure element. Both suppliers met all the social and location criteria required from Howden. The lower scoring of Supplier 2 in the economic element was mainly due to its manufacturing readiness level. The competitiveness score for each supplier was relatively high. This is due to the fact that both suppliers already had quality control procedures and systems in place and both their BBBEE ratings met the requirements from Howden Africa.

From the information provided by Howden Africa it was stated that an additional R200000 would be required to upgrade the facilities of Supplier 2, to be able to manufacture the cages. Both suppliers would have had access to the R1million loan as this counted toward Howden Africa’s BBBEE rating.

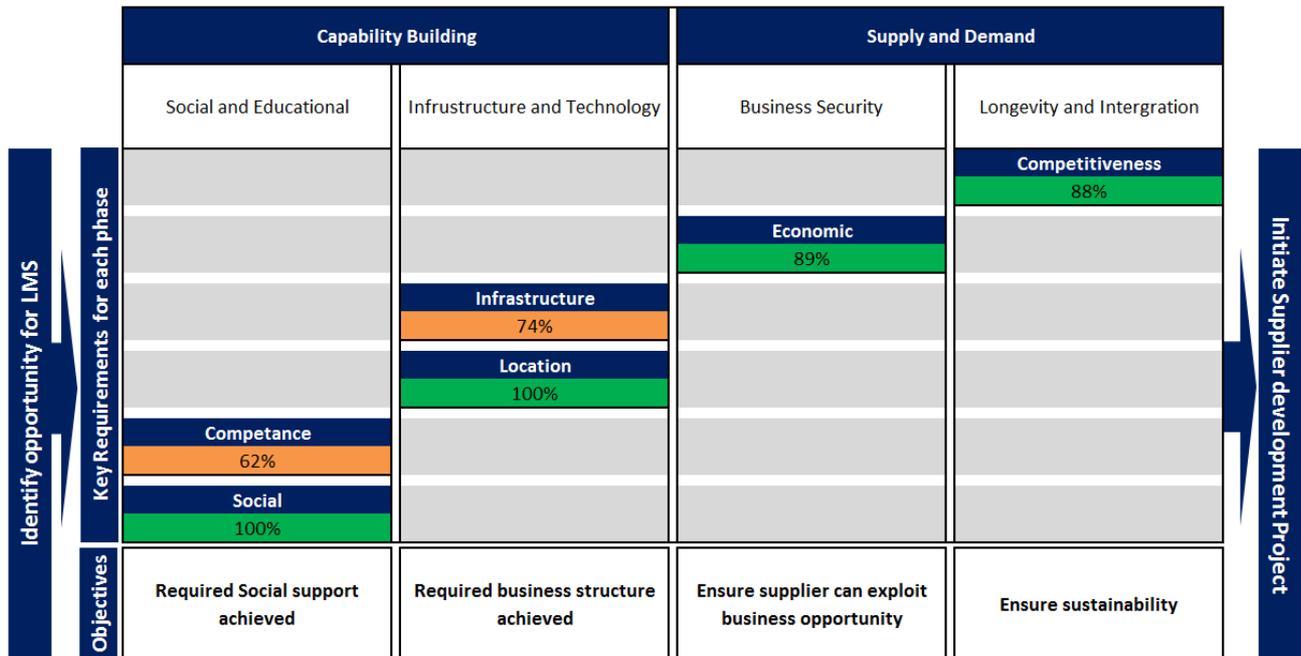


Figure 4-33 Results of model for Supplier 1

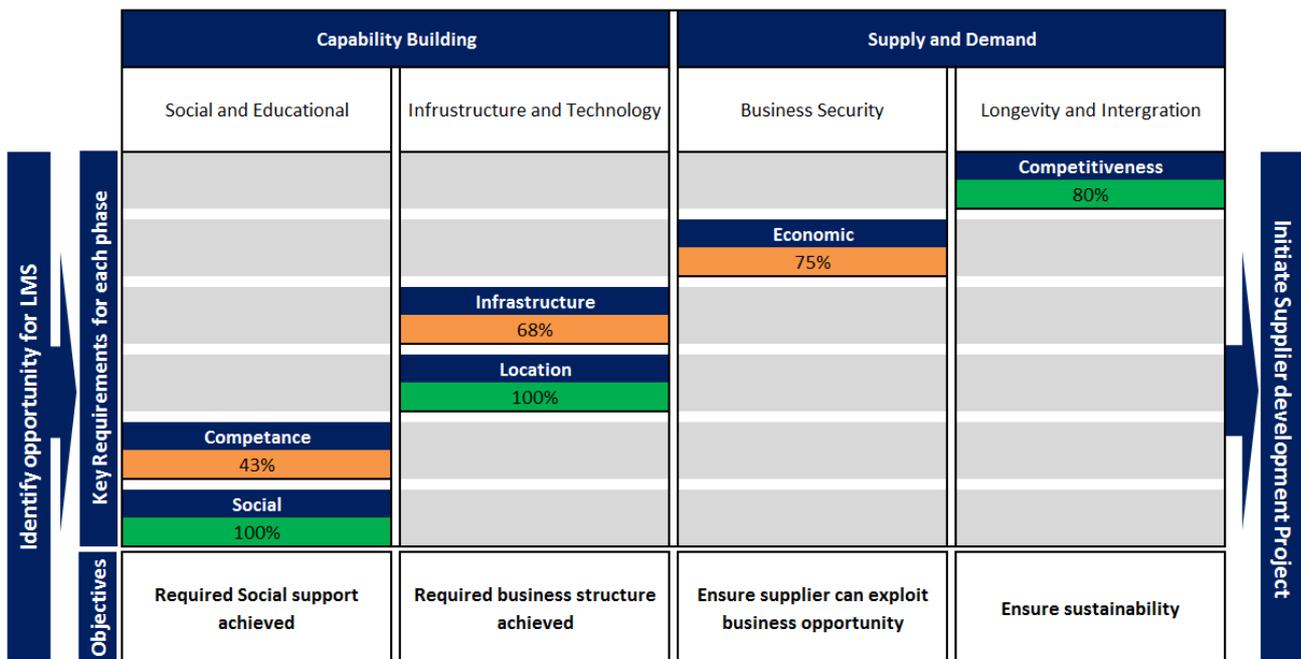


Figure 4-34 Results of model for Supplier 2



The outputs from the model in terms of the decision support tools are represented in Figure 4-35 to Figure 4-37.

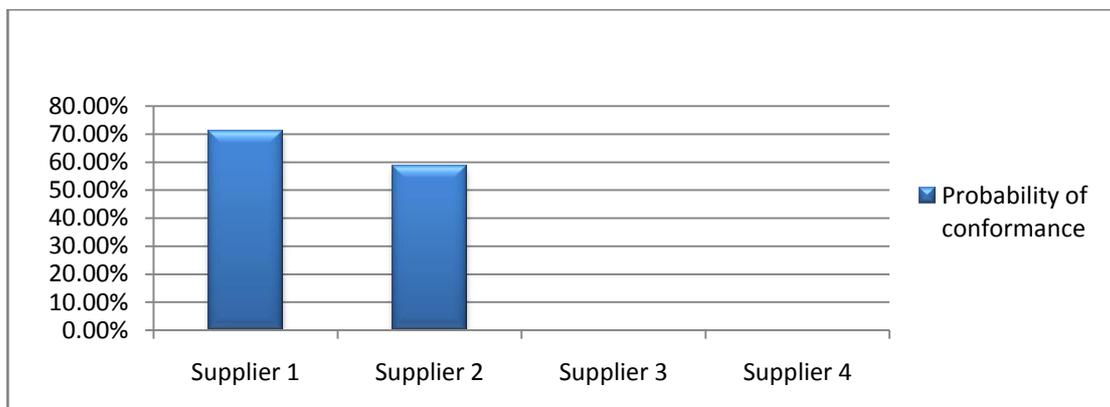


Figure 4-35 Outputs of model (Conformance probability)

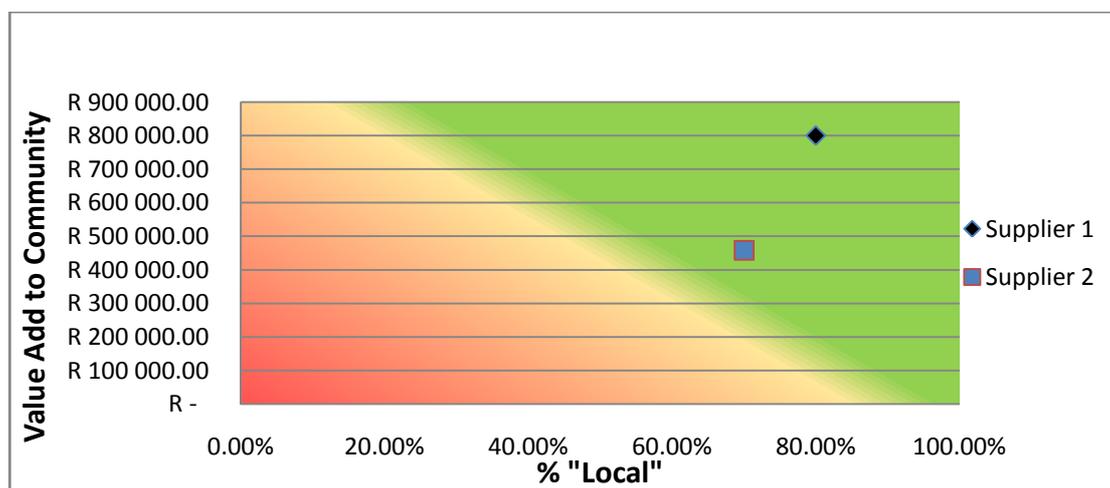


Figure 4-36 Outputs from model (Value add vs Localness)

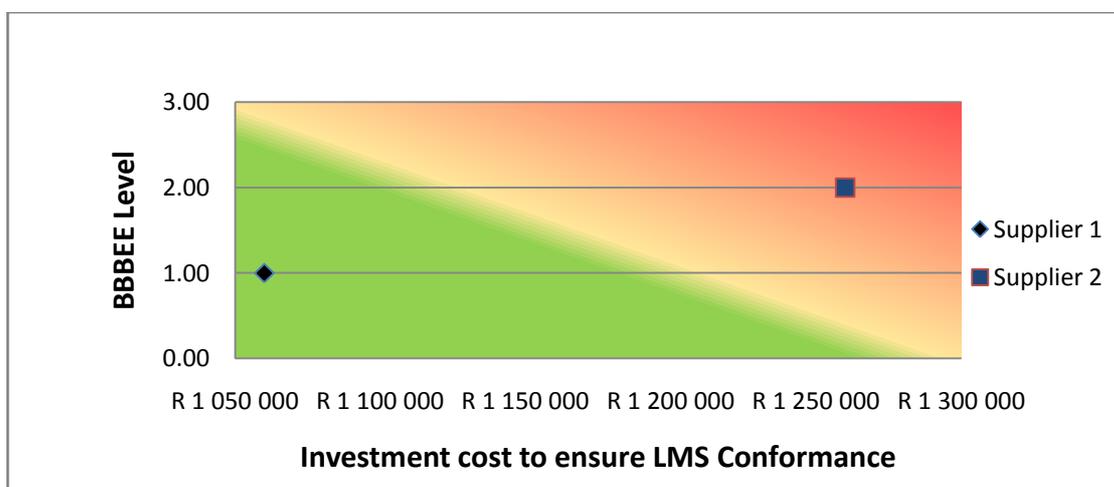


Figure 4-37 Outputs of model (Investment cost vs BBBEE rating)

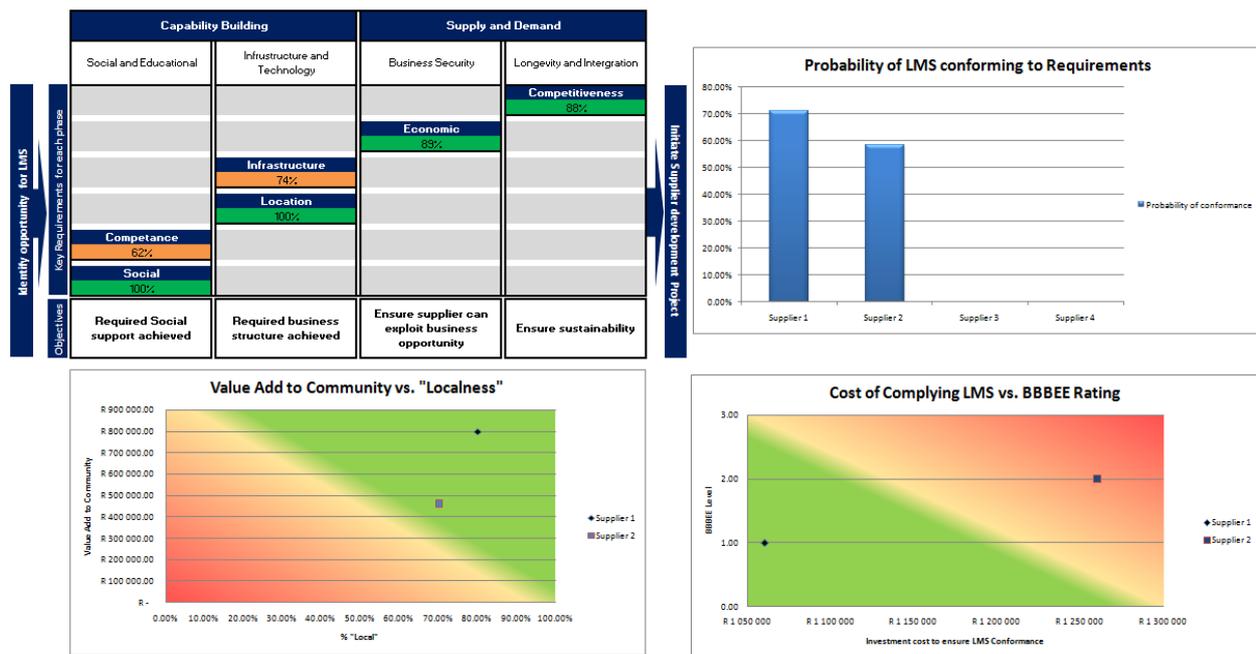


The outputs of the model show that Supplier 2 has the lowest possibility of conforming to the required specifications and would incur a greater required investment to improve on their compliance. Howden Africa predicted to spend an average R5million per annum on cages. The heat map for the value add to the community shows that both suppliers would contribute positively as both have a high level of employment from the local community. The percentage of local ownership of each supplier was also relatively high in this regard. This is evident in the BBBEE rating of each supplier although Supplier 1 has a rating of 1 whereas Supplier 2 has a lower rating of 2. This means that 135% of the procurement spend on Supplier 1 contributes towards Howden Africa's BBBEE scoring whereas only 125% of its spend will be recognised with Supplier 2.

It is evident from the decision support tools of the Model that Supplier 1 would have been chosen as the best suited supplier to develop further. The overall outputs of the model including the action plan for the recommended supplier 1 is represented in Figure 4-38

4.4.11 Shortcomings of model for the second iteration

From the analysis of the case study it is evident that the current model could effectively provide the supporting decision tools necessary in order to select the appropriate supplier to develop. The only short coming from the outputs of the model is that there needs to be a clearer project management approach to roll out the development project. In order to offer a holistic LMS development road map, the local supplier development project management tool developed by (Forsman, 2008), will be incorporated into the final decision support function of the tool. This is represented in Table 4-14. The final LMS road map was presented to industry related experts and feedback on the validity of the tool was given. This feedback is represented in Appendix D.



Action Plan for Local Manufacturing Supplier Development					
Priority	Key Focus Areas	Life cycle element of LMS	Compliance %	Suggested Options to consider	Investment required
1	Manufacturing and operational Skills	Competence Element	50%	Training Support Programmes, Incubators, Shadowing etc.	R 60 000.00
2	Equipment & tools	Infrastructure element	75%	Establish Funding mechanisms, gifting, cluster, Joint co-operation etc.	
3	Facility and supporting infrastructure	Infrastructure element	75%	Establish Funding mechanisms, gifting, cluster, Joint co-operation etc.	
4	Technology Readiness	Infrastructure element	67%	Training, Partnerships, linking with learning institutions, Funding Mechanisms, etc.	
5	Supporting Business Administrative functions	Infrastructure element	67%	Establish Funding mechanisms, gifting, cluster, Joint co-operation etc.	R 1 000 000.00
6	Quality Assurance systems/processes	Economic Element	75%	Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	
7	Manufacturing Readiness Level	Economic Element	75%	Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	
8	Effective and efficient manufacturing processes	Competitiveness Element	67%	Shadowing, Internship programmes with host company, Improvement project at LMS, Fund	
9	Entrenched Regulatory and Quality standards	Competitiveness Element	75%	Shadowing, Internship programmes with host company, Improvement project at LMS, Fund	

Figure 4-38 Outputs from model (Action plan for Supplier 1)



Table 4-14: Success factors and key elements for a project to develop local suppliers

(source: (Forsman, 2008))

Success factor	Element of success	Focus of assessment
Project preparation	<ul style="list-style-type: none"> • Clarity of business impact • Balance between project goal and resources 	<ul style="list-style-type: none"> • Identifying business opportunity and impact • Realistic project goal and resource allocation
Entrepreneurial success	<ul style="list-style-type: none"> • Richness of opportunity • SME business ability 	<ul style="list-style-type: none"> • Status of industry evolution and promising niche markets • Managerial skills of SME owner, Know-how and expertise in area, ability and capability to capitalise on opportunity
Change management	<ul style="list-style-type: none"> • Need for change • Communication 	<ul style="list-style-type: none"> • Identify reasons for change • Effectiveness of information distribution about the change and feedback gathering
Project management	<ul style="list-style-type: none"> • Planning and documentation • Identifying key stakeholders • Control and feedback on progress • Risk management and problem solving • Training 	<ul style="list-style-type: none"> • Sophisticated planning and documentation • Level of defined responsibilities and authorities between responsible parties • Monitoring progress • Identify risks, manage risks sophisticated practices for problem solving • Sufficiency, practicality, level and timing of training for local suppliers
Project success	<ul style="list-style-type: none"> • Efficiency • Impact on local supplier 	<ul style="list-style-type: none"> • Meeting budget and schedule goal • Solving suppliers problems and providing continued growth opportunities

CHAPTER 5: CONCLUSION

In order to grow the local economy organisations need to start supporting local businesses. The manufacturing industry in South Africa poses great opportunities for the development of local manufacturing suppliers. The government has gone through great strides to support the local development of the manufacturing industry. This is evident in the supporting policies and funding mechanisms it has created through the DTI in conjunction with certain state owned enterprises and companies from the private sector. The problem organisations still face is to effectively determine the maturity level of a LMS in conjunction to the organisation's required technological or capability requirements.

The objective of this thesis was to develop a strategic local manufacturing supplier development roadmap as a decision support tool. The roadmap illustrates four phases of the required development of a LMS to ensure its sustainability. Each phase has certain key elements that need to be developed/in place before the LMS can progress to the next stage. These stages are social and educational, infrastructure and technology, business security and longevity and integration. The first two phases constitute the capability building of the LMS which forms part of the informal business development of the LMS. The second two phases form part of the formal business development of the LMS categorised as supply and demand.

A mathematical model was created to quantify the actual conformance of a LMS to each key element along the development stages of the roadmap. Further decision support tools are incorporated into the model together with an action plan to focus on the key required development areas of a LMS depending on where it lies on the roadmap. The various supporting functions, funding mechanisms and stakeholders that arise along the development stages of a LMS have been incorporated into the framework. This allows the action plan to suggest possible solutions to the short comings of the LMS for various required criteria.

The outputs to the model include; an action plan to develop LMS (detailing which requirements for which the LMS needs to be developed, with suggested possible funding structures or support); heat maps illustrating the comparison of various suppliers based on the investment vs. reward (BBEE and value add to local community), the calculated position of the LMS on the development road map and a project management plan for developing the supplier.

The framework can be used to evaluate the most appropriate supplier to develop based on; the calculated probability of it conforming to specified requirements, the cost of developing the supplier to conform vs. the reward gained depending on its BBBEE score and the value add the LMS will bring to the local community. The framework can further be utilised to track the progress of developing suppliers once the development program has been initiated.

The contribution this study has made to literature is providing a detailed strategic roadmap for LMS development. The roadmap quantifies the developmental needs of an LMS based on structured requirements in order to meet an organisations objective. The roadmap further determines the foundational requirements for an LMS to ensure its development along the prescribed phases where various funding mechanisms or supporting structures have been allocated to each phase to assist in the development. The phases and the application of various funding and support mechanisms, along these phases, where empirically proven in this research to assist in local supplier development.

The current model does not include the financial benefit an organisation would achieve by developing an LMS. This could prove to be a valuable inclusion to the framework as it could enhance the decision making process for selecting a LMS based on the financial impact it would have on an organisation. Key elements that could be included in this regard would be the cost saving the organisation would achieve vs. the overall cost for the development. It is envisioned that various total cost of ownership models could be utilised or further researched to determine how to include this concept into the framework. A further aspect the framework does not explicitly address, is the actual benefit to an organisation's BBBEE score. This would further assist an organisation to quantify the impact local supplier development would have in this regard. It is however assumed in this research that one of the key driving factors for an organisation to develop suppliers is to achieve a better BBBEE score. Quantifying this benefit could be done by assessing the DTI score card based on the requirements to qualify for the supplier development ratings.

BIBLIOGRAPHY

- Ablo, A. D. (2015). Local content and participation in Ghana's oil and gas industry: Can enterprise development make a difference? *The extractive industries and society* , 320-327.
- Adizes, I. (1979). Organizational Passages-Diagnosing and Treating Lifecycle Problems of Organizations. *Organizational Dynamics* , 3-25.
- Ageron, B., Gunasekaran, A., & Spalanzani, A. (2011). Sustainable supply management: An empirical study. *International journal of production* , 168-182.
- AIDC. (2012, December). *Automotive Component Supplier development program*. Retrieved 11 17, 2015, from www.aidc.co.za:www.aidc.co.za/.../REDUCED%20REPORT%20ACSDP%20AIDC%20Final%20Report
- Akarte, M. M., Surendra, N. V., Ravi, B., & Rangaraj, N. (2001). Web based casting supplier evaluation using analytical hierarchy process. *Journal of the Operational Research Society* , 511–522.
- Aksoy, A., & Ozturk, N. (2011). Supplier selection and performance evaluation in just-in-time production environments. *Expert Systems with Applications* , 6351–6359.
- Allan, G. (2003). A critique of using grounded theory as a research method. *Electronic Journal of Business Research Methods*, vol. 2, no. 1 , 1-10.
- Al-Shaikh, F. N. (1998). Factors for Small Business Failure in Developing Countries. *Advances in Competitiveness Research* , 61-71.
- Amesse, F., & Cohendet, P. (2001). Technology Transfer revisited from the perspective of the knowledge based economy. *Research Policy* , 30 (1), 1459-1478.
- Antúnez-de-Mayolo, C. (2012). The role of innovation at the Bottom of the Pyramid in Latin America: Eight Case Studies. *The 2012 International Conference on Asia Pacific Business Innovation & Technology Management* (pp. 134-140). Procedia - Social and Behavioral Sciences.
- Assari, A., Mahesh, T., & Assari, E. (2012). Role of public participation in sustainability of historical city: usage of TOPSIS method. *Indian Journal of Science and Technology* , 2289-2294.
- Baloh, P., Jha, S., & Awazu, Y. (2008). Building strategic partnerships for managing innovation outsourcing. *Strategic Outsourcing, An International Journal* , 100-121.
- Banerjee, A., & Williams, S. A. (2009). International Service Outsourcing – Using Offshore Analytics to Identify Determinants of Value Added Outsourcing. *Indian Institute of Management* .
- Bernstein, A. (2010). *The case for business in developing economies*. Rosebank, South Africa: Penguin Books.



- Beth, S., Burt, D. N., Copacino, W., Gopal, C., Lee, H. L., Lynch, R. P., et al. (2006). Supply chain challenges: Building relationships. *Harvard Business Review on Supply*. Boston: Harvard Business School Press.
- Bhutta, K. S., & Huq, F. (2002). Supplier selection problem: a comparison of the total cost of ownership and analytic hierarchy process. *Supply Chain Management: An International journal* , 17-26.
- Bond, A. (2016, April 15). Director, Consulting. (M. Vermeulen, Interviewer)
- Bryant, A., & Charmaz, K. (2007). *The SAGE Handbook of Grounded Theory*. Los Angeles: Sage.
- Buy, A. (2016, May 11). Group SHE and training manager. (M. Vermeulen, Interviewer)
- Cagliano, R., & Caniato, F. &. (2006). The linkage between supply chain integration. *International Journal of Operations and* , 282-299.
- Cai, S., Souza, R. D., Goh, M., Li, W., Lu, Q., & Sundarakani, B. (2008). The adoption of Green Supply Strategy: An institutional perspective. *Proceedings of the 2008 IEEE ICMIT*, (pp. 1044-1049).
- Caneque, F. C., & Hart, S. L. (2015). *Base of the pyramid 3.0*. New York: Greenleaf.
- Cannon, J. P., & Perreault, W. D. (1999). Buyer–seller relationships in business markets. *Journal of Marketing Research* , 439-460.
- Chan, F. T. (2003). Interactive selection model for supplier selection process an AHP. *International Journal of Production Research* , 3549–3579.
- Chan, F. T., Chan, H. K., Ip, R. W., & Lau, H. C. (2007). A decision support system for supplier selection in the airline industry. *Proceedings of the Institution of Mechanical Engineers, Part B – Journal of Engineering Manufacture* , 741–758.
- Charmaz, C. (2006). *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. London: Sage.
- Cheung, Y. K., & Rowlinson, S. (2011). Supply chain sustainability: a relationship management approach. *International Journal of Managing Projects* , 480-497.
- Choi, T. Y., & Hartley, J. L. (1996). An exploration of supplier selection practices across the supply chain. *Journal of Operations Management* , 333–343.
- Chou, S. Y., & Chang, Y. H. (2008). A decision support system for supplier selection based. *Expert Systems with Applications* , 2241–2253.
- Clarke, R. L., & Gourdin, K. N. (1999). Measuring the Efficiency of the Logistics Process. *Journal of Business Logistic* , 17-33.
- Collins, J. a. (2011). *Great by choice*. New York, USA: Harper-Collins Publishers.

- de Boer, L., Labro, E., & Morlacchi, P. (2001). A review of methods supporting supplier selection. *European Journal of Purchasing and Supply Management* , 75–89.
- Department of public enterprises. (2008). *Introduction to the competitive supplier development programme*. Retrieved February 6, 2016, from South African Government: <http://www.gov.za/documents/introduction-competitive-supplier-development-programme>
- Dickson, G. W. (1966). An analysis of vendor selection system and decisions. *Journal of Purchasing* , 28–41.
- Diouf, B., & Poda, R. (2013). Development of solar home systems for home lighting for the base of the pyramid population. *Sustainable Energy Technologies and Assessments* , 3, 27-32.
- Dodge, R., & Rabbins, J. (1992). An Empirical Investigation of the Organizational Life Cycle Model for Small Business Development and Survival. *Journal of Small Business Management* , 27-37.
- DTI. (2013). *B-BBEE*. Retrieved 04 03, 2015, from Economic empowerment: http://www.dti.gov.za/economic_empowerment/bee.jsp
- Dudley, J., Oosthuizen, G., & Pretorius, J. H. (2015). The evolution of quality management systems to assist manufacturing entrepreneurs in incubation clusters. *International Association for Management of Technology* (pp. 921-930). Cape Town: IAMOT.
- Ecerkale, K., & Kovanci, A. (2005). Outsourcing in Human Resources. *ournal of Aviation and Space Technologies* , 69-75.
- Economic development office. (2008). *Local Purchasing toolkit*. London: Canary Wharf.
- Everett, J., & Watson, J. (1998). Small business failure and external risk factors. *Small business economics* , 371-390.
- Fatimah, Y. A., Biswas, W., Mazhar, I., & Islam, M. N. (2013). Sustainable manufacturing for Indonesian small-and medium-sized enterprises (SMEs): the case of remanufactured alternators. *Journal of Remanufacturing* , 1-11.
- Florida, R. (1996). Lean and Green- The move to Environmentally Conscious Manufacturing. *California Management Review* , 80-105.
- Flyvberg, B. (2006). Five Misunderstandings about case study Research. *Qualitative in Inquiry* .
- Forsman, H. (2008). Business development success in SMEs: a case study approach. *Journal of Small Business and Enterprise Development, Vol. 15 Iss 3* , 606 - 622.
- Ganzenvoort, W. (2015, January 15). *The difference between Enterprise Development and Supplier Development*. Retrieved June 5, 2015, from Collective Value creation: <http://www.collectivevaluecreation.co.za/difference-enterprise-development-supplier-development/>

- Ganzevoort, W. (2015, January 15). *Collective value creation*. Retrieved October 15, 2015, from Lean enterprise and supplier development: <http://www.collectivevaluecreation.co.za/difference-enterprise-development-supplier-development/>
- Gencer, C., & Gurpinar, D. (2007). Analytic network process in supplier selection: A case study in an electronic firm. *Applied Mathematical Modelling* , 2475–2486.
- Gold, S., Seuring, S., & Beske, P. (2010). Sustainable supply chain management and inter-organizational resources: a literature review. *Corporate Social Responsibility and Environmental Management* , 230-245.
- Golicic, S. L., Foggin, J. H., & Mentzer, J. T. (2003). Relationship magnitude and its role in interorganizational relationship structure. *Journal of business logistics* , 57-75.
- Govender, C. (2015, 02 17). *Leveraging local procurement to drive shared value*. Retrieved 03 28, 2016, from www.angloamerican.com
- Greiner, L. (1972). Evolution and Revolution As Organizations Grow. *Harvard Business Review* , 37-46.
- Hall, J. (2000). Environmental supply chain dynamics. *Journal of Cleaner Production* , 455-471.
- Hanks, S. H., Watson, C. J., Jansen, E., & Chandler, G. (1993). Tightening the Life-Cycle Construct: A Taxonomic Study of Growth Stage Configurations in High-Technology Organizations. *Entrepreneurship Theory and Practice* , 5-29.
- Hansen, J. M. (2009). The evolution of buyer-supplier relationships: an historical industry approach. *Journal of Business & Industrial Marketing* , 227-236.
- Hart, S. L. (2015, May 10). *Ready for BoP 3.0?* Retrieved October 25, 2017, from Sustainability next: <http://sustainabilitynext.in/cover-story/ready-for-bop-3-0/>
- Hart, S. L., & Simanis, E. (2008). *The Base of the Pyramid Protocol: Toward Next Generation BoP Strategy*. Ithaca: Cornell University.
- Heizer, J., & Render, B. (2004). *Principles of operations management*. New Jersey: Prentice Hall.
- Hillary, R. (2004). Environmental management systems and the smaller enterprise. *J Clean Prod* , 561-569.
- Hong, G. H., Park, S. C., Jang, D. S., & Rho, H. M. (2005). An effective supplier selection method for constructing a competitive supplyrelationship. *Expert Systems with Applications* , 629–639.
- Hong, G. H., Park, S. C., Jang, D. S., & Rho, H. M. (2005). An effective supplier selection method for constructing a competitive supply-relationship. *Expert Systems with Applications* , 629–639.
- Howden Africa. (2015, september 12). *Howden Africa*. Retrieved august 13, 2016, from www.howden.com: <http://www.howden.com/AboutUs/bu/HAHL/Pages/home.aspx>



- IFM. (2007). *Making the right things in the right places*. Cambridge: University of Cambridge institute for Manufacturing.
- industry, D. o. (2008, May). *The South African department of trade and industry*. Retrieved February 18, 2016, from industrial_development: http://www.thedti.gov.za/industrial_development/docs/nipp/nippreport2008.pdf
- ITGR. (2003). *How To Optimize Outsourcing Relationships*. London: Info-Tech White Paper.
- Kaiser Economic Development partners. (2013). An approach to defining, measuring and monitoring local procurement by the mining industry. *World bank local Content Conference*. Vienna.
- Kaplinsky, R. (2000). Globalisation and unequalisation: What can be learned from value chain analysis. *The Journal of Development Studies* , 117.
- Khan, A. (2014, 10 09). *Government funds available to SMEs in south africa*. Retrieved 03 10, 2016, from Global accounting aliance: <http://www.gaaaccounting.com/government-funds-available-to-smes-in-south-africa/>
- Khan, E. (2012). Education for the Base of the Pyramid People (BoP) using voice internet E-learning. *International Educational Technology Conference IETC2012*. 64, pp. 474-483. Procedia - Social and Behavioral Sciences.
- Klassen, R., & Vachon, S. (2003). Collaboration and evaluation in the supply chain: the impact on plant-level environmental investment. *Production and Operations Management* , 336-352.
- Krueger, R. A., & Casey, M. A. (1994). *A Practical Guide for Applied Research*. Thousand Oaks, CA: Sage Publications.
- Kumar, D., & Rahmanb, Z. (2015). Sustainability adoption through buyer supplier relationship across supply chain: A literature review and conceptual framework. *INTERNATIONAL STRATEGIC MANAGEMENT REVIEW* , 110–127.
- Kwon, I., & Suh, T. (2005). Trust, commitment and relationships in supply chain. *upply Chain Management: An International Journal* , 26-33.
- Kwon, O., Im, G. P., & Lee, K. C. (2007). A multi-agent and case-based reasoning collaboration mechanism for supply chain management under supply and demand uncertainties. *Expert systems with applications* , 690-705.
- Lall, S. (2003). Reinventing industrial strategy: The role of government policy in building industrial competitiveness. *Paper for the Intergovernmental Group on Monetary Affairs and Development*.
- Lee, K.-H. (2009). Why and how to adopt green management into business organizations?: The case study of Korean SMEs in manufacturing industry. *Management Decision*, 47 , 1101-1121.
- Leek, S., Turnbull, P. W., & Naudé, P. (2002). Managing business-to-business relationships: An emerging model. *Journal of Customer Behaviour* , 357-375.



- lekgotla, m. (2014). *mining lekgotla*. Retrieved 03 09, 2016, from Mining Lekgotla anglo american: southafrica.angloamerican.com/.../Anglo-American.../procurement-mining-lekgotla-brochure.pdf
- Liao, S. K., Chang, K. L., & Tseng, T. W. (2010). Optimal selection of program suppliers for TV companies using an analytic network process (ANP) approach. *Asia-Pacific Journal of Operational Research* , 753–767.
- London, T. (2008). The base-of-the-pyramid perspective: A new approach to poverty alleviation. *Proceedings of the sixty-sixth annual meeting of the Academy of Management*.
- London, T., Anupindi, R., & Sheth, S. (2010). Creating mutual value: Lessons learned from serving base of the pyramid producers. *Journal of Business Research* , 63 (1), 582-594.
- Lonmin. (2014). *International Platinum Group metals Association*. Retrieved 02 23, 2016, from www.ipa-news.com/assets/sustainability/case.study4-lonmin.pdf
- Massmart. (2013). www.Massmart.co.za. Retrieved 09 08, 2015, from <http://www.massmart.co.za/iar2013/notes-to-the-annual-group-financial-statements-1-20/>
- McIvor, R. (2010). The influence of capability considerations on the outsourcing decision: the case of a manufacturing company. *International* , 5031-5052.
- Miemiec, Y. (2013, November 21). *The impact of enterprise development in South Africa*. Retrieved November 3, 2015, from University of Stellenbosch Business school: <http://www.usb-ed.com/content/Pages/The-impact-of-enterprise-development-in-South-Africa.aspx>
- Monczka, R., Handfield, R., Giunipero, L., & Patterson, J. &. (2010). *Purchasing*. Hampshire, UK: Cengage Learning.
- Morrison, A., Breen, J., & Ali, S. (2003). Small business growth: intention, ability and opportunity. *Journal of Small Business Management* , 417-25.
- Naude, M., & J.A, B.-W. (2011). Supply chain management problems at South. *Southern African Business Review* , 70-99.
- Nooteboom, B. (1994). Innovation and diffusion in small firms: theory and evidence. *Small Business Economics*, Vol. 6 No. 5 , 327-47.
- Nydick, N., & Hill, N. (1992). Using AHP to structure the Supplier Selection Procedure. *International Journal of Purchasing & Material Management* .
- Office, E. d. (2010). *City of london Corporation*. Retrieved 01 27, 2016, from Local Purchasing Toolkit: www.cityoflondon.gov.uk
- office, E. d. (2010). *Local Purchasing toolkit*. Retrieved 01 28, 2016, from www.cityoflondon.gov.uk: www.cityoflondon.gov.uk/local
- Özdoğan, O. N. (2006). *Outsourcing in terms of Activity Periods in Hotel Enterprises and its Effects on the Financial Performance*. Izmir: Dokuz Eylül University.



- Ozkok, B. A., & Tiryaki, F. (2011). A compensatory fuzzy approach to multi-objective linear supplier selection problem with multiple-item. *Expert Systems with Applications* , 11363–11368.
- partners, K. E. (2014). *Defining local procurement*. Retrieved 05 18, 2016, from Kaiser Vienna: www.kaiseredp.com
- Pearce II, J. &. (2007). *Strategic Management. Formulation, implementation and control. 10th Edition.* . New York: McGraw-Hill Irwin.
- Phele, T., Roberts, S., & Steuart, I. (2004). Industrial Strategy and Local Economic Development: Manufacturing Policy and Technology Capabilities in Ekurhuleni. *African Development and Poverty Reduction: The Macro-Micro Linkage*, (pp. 47-55). Cape town.
- Porter, & Kramer. (2006). Strategy & Society: The link between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review* , 78-93.
- Prahalad, C., & Hart, S. (2002). The fortune at the bottom of the pyramid. *Strategy and Business* , 26 (1/4), 2-14.
- Rinehart, L. M., Eckert, J. A., Handfield, R. B., Page, T. J., & Atkin, T. (2004). An assessment of supplier-customer relationships. *Journal of Business Logistics* , 25-62.
- SA, STATS. (2016, September 01). *STATS SA*. Retrieved September 15, 2016, from Statistics South Africa: http://www.statssa.gov.za/?page_id=1854&PPN=P3041.2&SCH=6591
- Safa, M., Shahi, A., Haas, C. T., & Hipel, K. W. (2014). Supplier selection process in an integrated construction materials management model. *Automation in Construction* , 64-73.
- Şahin, A. G., & Berberoğlu, N. (2001). Decision Making Process of Logistic Outsourcing and 3PL Company Selection Criteria. *Online Academic Journal of Information Technology* , 33-50.
- Sakas, D., & Kutsikos, K. (2014). An Adaptable Decision Making Model for Sustainable Enterprise Interoperability. *2nd International Conference on Strategic Innovative Marketing* (pp. 556-561). Prague: Elsevier Ltd.
- Salloum, C., Al Sayah, M., & Azouri, A. (2015). The Financial Involvement of the Lebanese Banking Sector in Corporate Social Responsibility. *EuroMed Journal of Management* , 21-39.
- Scott, M., & Bruce, R. (1987). Five Stages of Growth in Small Business. *Long Range Planning* , 45-52.
- SEDA. (2006, May). *About SEDA*. Retrieved February 20, 2016, from SEDA: <http://www.seda.org.za>
- Senge, P., & Prokesch, S. (2010). The sustainable supply chain. *Harvard Business Review* , 70-72.
- Shanduka Black Umbrellas NPC. (2010). *Shanduka Black Umbrellas*. Retrieved November 18, 2015, from Shanduka Black Umbrellas: <http://shandukablackumbrellas.org>



- Simanye. (2014, August 30). *Supplier Development: A Global Perspective for the South African market*. Retrieved January 20, 2016, from Simanye: http://www.simanye.co.za/Mobile/wp-content/uploads/2014/09/Supplier_Development.pdf
- Simons, H. (2009). *Case Study Research in Practice*. London: SAGE Publications.
- Simpson, D., Power, D., & Samson, D. (2007). Greening the automotive supply chain: a relationship perspective. *International Journal of Operations & Production Management* , 28-48.
- Srai, J., Christodoulou, P., & Harrington, T. S. (2014). Configuring global value networks within industrial ecosystems. *Supply and service operations* , 38-51.
- Sundaram, R. &. (2002). A comparative study of three different SCM. *International Journal of Physical Distribution and Logistics* , 532-555.
- Tahmooresnejad, L., Salami, R., & Shafia, M. (2011). Selecting the Appropriate Technology Transfer method to reach the technology localisation. *1*. London, UK: Proceedings of the World Congress on Engineering WCE 2011.
- Talluri, S., & Narasimhan, R. (2003). Vendor evaluation with performance variability: A max–min approach. *European Journal of Operational Research* , 543–552.
- Tanyeri, M., & Firat, A. (2005). Outsourcing as a Competition Variable. *Journal of Dokuz Eylul University Institute of Social Sciences* , 268-279.
- TLIU. (2014). *Supplier development*. Retrieved 03 14, 2016, from TLIU: <http://www.tliu.co.za/supplier-development>
- Trivellas, P. (2011). Work motivation and job performance of frontline employees: the mediating role of organizational commitment. *International Conference on Industrial Engineering and Engineering Management* , 1878 – 1882.
- Trivellas, P., & Reklitis, P. (2014). Leadership Competencies Profiles & Managerial Effectiveness in Greece. *Procedia Economics and Finance* , 380-390.
- TRSG. (2013). *TRSG Inc*. Retrieved August 20, 2013, from <http://www.teamtrsg.com/tt%20def.html>
- Vachon, S., & Klassen, R. D. (2008). Environmental management and manufacturing performance: the role of collaboration in supply chain. *International* , 299-315.
- Van Montfort, K. (2006). Life cycle characteristics of small professional service firms. *Journal of Small Business Management* , 417-438.
- van Weele, A. J. (2000). *Purchasing and supply chain management*. London: Thomson Learning.
- Vaxevanou, A., & Konstantopoulos, N. (2014). Basic Principles the Philosophy of Outsourcing. *International Conference on Strategic Innovative Marketing* (pp. 567-571). Madrid: Elsevier Ltd.
- Vaxevanou, A., & Konstantopoulos, N. (2015). Basic Principles the Philosophy of Outsourcing. *Procedia - Social and Behavioral Sciences* , 567-571.



- Wahab, S., Rose, R., & Osman, S. (2012). Defining the concepts of Technology and Technology Transfer. *International Business Research* , 5 (1), 61-71.
- Walton, S. V., Handfield, R. B., & Melnyk, S. A. (1998). The green supply chain: integrating suppliers in to environmental management process. *International journal of purchasing and material management* , 2-11.
- Weber, C. A., Current, J. R., & Benton, W. C. (1991). Vendor selection criteria and methods. *European Journal of Operational Research* , 2–18.
- Weber, C. A., Current, J. R., & Desai, A. (2000). An optimization approach to determining the number of vendors to employ. *Supply Chain Management: An International Journal* , 90–98.
- Weber, C. A., Current, J. R., & Desai, A. (2000). An Optimization Approach to Determining the Number of Vendors to Employ. *Supply Chain Management* , 90-98.
- Welsch, J. (2001). *Jack Welsch*. St Ives. Great Britain: Headline Book Publishing.
- Wiendahl, H., & Luts, S. (2002). Production in networks. *CIRP Annals - Manufacturing Technology* , 51 (2), 573-586.
- Yildiz, A., & Yayla, A. Y. (2015). MULTI-CRITERIA DECISION-MAKING METHODS FOR SUPPLIER SELECTION: A LITERATURE REVIEW. *South African Journal of Industrial Engineering* , 158-177.
- Ytterhus, B. E. (1999). Environmental initiatives in the retailing sector: an analysis of supply chain pressure and partnership. *Eco-management and auditing* , 181-188.
- Zhu, Q., Sarkis, J., & Lai, K. H. (2008). Confirmation of a measurement model for green supply chain management implementation. *International journal of production economics* , 261-273.

APPENDIX A

Table A1: represent the Key elements for development under the various phases as determined from the Case studies.

Table A1: Key elements for development from case studies

Social and educational		Infrastructure and technology		Business security	Longevity and Integration
Social	Competence	Location	Infrastructure	Economic	Competitiveness
Community Access to Health and Welfare	Manufacturing and operational Skills	Proximity to local community	Equipment & tools	Competitive and cost effective products	Effective and efficient manufacturing processes
Community Housing	Business Acumen skills	Proximity to Business	Facility and supporting infrastructure	Sophisticated local Demand	Entrenched Regulatory and Quality standards
Community Security	Provision for Training	Own facility	Technology Readiness	Cluster integration	Business Improvement Processes and culture
Access to Utilities (Water, Electricity, Sanitation, Roads and transport)		Jointly owned/Shared (cluster)	Transport networks	Employment from local community	Sustainable customer base
			Supporting Business Administrative functions	% of final product produced locally	Market research/R&D facilities
				% of local ownership	Integrated into greater Procurement value streams
				Quality	BBBEE Rating

	Assurance systems/processes	
	Manufacturing Readiness Level	Related ISO compliance
		Alignment to Governmental policies

Tables A2 to Table A-7 represent the continuum levels for each of the elements identified during the case studies. The continuum levels are inserted into the model based on the level required from the end user for the LMS to conform to. The user can also input current conformance level of the LMS into the model using the sane continuum.

Table A2: Continuum levels for the Social element

Key element	Continuum				
Social	Level 1	Level 2	Level 3	Level 4	Level 5
Community Access to Health and Welfare	No Access	Limited Access	Access but with limitations	Available access to Majority	Freely available access to All
Community Housing	No housing	Limited Housing (Mostly Shacks)	Informal Settlement (Housing to Majority)	Available Housing to all (Mix of formal and informal)	Formal Settlement or metropolitan
Community Security	No Security	Limited or vigilantly	Police presents but high crime rates	Police presents with moderate crime rates	Police Presents with Low crime rates
Access to Utilities (Water, Electricity, Sanitation, Roads and transport)	No Access	Limited Access	Access but with limitations	Available access to Majority	Available access to all



Table A3: Continuum levels for the Competence element

Key element	Continuum				
Competence	Level 1	Level 2	Level 3	Level 4	Level 5
Manufacturing and operational Skills	No Skills	Limited basic understanding	Basic skills with formal training	Experience Manufacturing Skills	Expert in field
Business Acumen skills	No Skills	Limited basic understanding	Basic skills with formal training	Experience Manufacturing Skills	Expert in field
Provision for Training	None available	Limited provision available	Provision available at a high cost	Provision available at nominal cost	Free training provided

Table A4: Continuum level for the Location element

Key element	Continuum				
Location	Level 1	Level 2	Level 3	Level 4	Level 5
Proximity to local community	Too far to support or draw resources from	More than 100 km away	Within a 50Km Radius	Within a 20 Km Radius	Based within the community
Proximity to Business	More than 150 km away	More than 100 km away	Within a 50Km Radius	Within a 20 Km Radius	Based within the community
Own facility	Limited Lease agreement	Lease agreement	Rent to Purchase	Financed through Bond	Own facility/premises
Jointly owned/Shared (cluster)	Limited Lease agreement	Lease agreement	Rent to Purchase	Financed through Bond	Own facility/premises

Table A5: Continuum levels for the infrastructure element

Key element	Continuum				
Infrastructure	Level 1	Level 2	Level 3	Level 4	Level 5
Equipment & tools	None	Available but insufficient	Available but average capability	Available and proficient	Best in Class
Facility and supporting infrastructure	None	Available but insufficient	Available but average capability	Available and proficient	Best in Class
Technology Readiness	None	Available but insufficient	Available but average capability	Available and proficient	Best in Class
Transport networks	None	Available but insufficient	Available but average capability	Available and proficient	Best in Class
Supporting Business Administrative functions	None	Available but insufficient	Available but average capability	Available and proficient	Best in Class

Table A6: Continuum levels for the economic element

Key element	Continuum				
Economic	Level 1	Level 2	Level 3	Level 4	Level 5
Competitive and cost effective products	Worst in industry	Poor	Average	Effective	Best in Class
Sophisticated local Demand	None	Available but insufficient	Enough to break even	Sufficient demand	Abundance
Cluster integration	None	Limited	Established	Effective and established	Highly proficient and intergrated
Employment from local community	0-20%	20%-40%	40-60%	60%-80%	80%-100%
% of final product produced locally	0-20%	20%-40%	40-60%	60%-80%	80%-100%

% of local ownership	0-20%	20%-40%	40-60%	60%-80%	80%-100%
Quality Assurance systems/processes	None	Basic but ineffective	Present	Present and effective	High effective
Manufacturing Readiness Level	Manufacturing Concepts Identified	Manufacturing proof of concept	Capability to produce prototype products	Capability and rate confirmed via economic run lengths	Fully production capable process and lean production practices in place

Table A7: Continuum levels for the Competitiveness element

Key element	Continuum				
Competitiveness	Level 1	Level 2	Level 3	Level 4	Level 5
Effective and efficient manufacturing processes	None	Poor	Average	Effective	Best in Class
Entrenched Regulatory and Quality standards	None	Basic but ineffective	Present	Present and effective	Highly effective
Business Improvement Processes and culture	None	Limited	Established	Effective and established	Highly proficient and integrated
Sustainable customer base	none	Solely dependant on 1-3 customers	Dependency spread between numerous customers (10 or more)	New customers joining customer base regularly	Well renound in industry
Market research/R&D facilities	None	Limited	Established	Effective and established	Highly proficient and integrated
Integrated into	None	Limited	Established	Effective and	Highly

greater Procurement value streams				established	proficient and integrated
BBBEE Rating	More than 8	Between 6-4	4	3-2	1
Related ISO compliance	Do not comply	Partially comply	Comply	Comply and exceed	Set the pace
Alignment to Governmental policies	Do not comply	Partially comply	Comply	Comply and exceed	Set the pace

APPENDIX B

The following tables represent the inputs into the model for supplier 2 and 3 from the modikwa validation case study.

Table B1: Model inputs for supplier 2 (Social element)

Social element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Societal Needs				Year 1	Year 2
Community Access to Health and Welfare	3	3	20%		

Table B2: Model inputs for supplier 2 (Competence element)

Competence element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Skills & Education				Year 1	Year 2
Manufacturing and operational Skills	3	1	50%	R 85 000.00	
Business Acumen skills	3	2	30%	R 25 000.00	

Table B3: Model inputs for supplier 2 (Location element)

Location element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Proximity				Year 1	Year 2
Proximity to local community	4	4	20.00%		

Table B4: Model inputs for supplier 2 (Infrastructure element)

Infrastructure element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Physical Infrastructure				Year 1	Year 2
Equipment & tools	3	1	40%	R 2 500 000	
Facility and supporting infrastructure	3	2	40%	R 2 000 000	

Table B5: Model inputs for supplier 2 (Economic element)

Economic element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Manufacturing Competence				Year 1	Year 2
Quality Assurance systems/processes	3	1	40.00%		
Manufacturing Readiness Level	3	1	60.00%		

Table B6: Model inputs for supplier 2 (Competitiveness element)

Competitiveness element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Competitive manufacturing processes				Year 1	Year 2
Effective and efficient manufacturing processes	3	1	40.00%		
Integrated into greater Procurement value streams	3	1	30.00%		
Compliance to regulatory Policies					
BBBEE Rating	4	5	30.00%		

Table B7: Model inputs for supplier 3 (Social element)

Social element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Societal Needs				Year 1	Year 2
Community Access to Health and Welfare	3	3	20%		

Table B8: Model inputs for supplier 3 (Competence element)

Competence element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Skills & Education				Year 1	Year 2
Manufacturing and operational Skills	3	1	50%	R 85 000.00	
Business Acumen skills	3	1	30%	R 25 000.00	

Table B9: Model inputs for supplier 3 (Location element)

Location element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Proximity				Year 1	Year 2
Proximity to local community	4	4	20.00%		

Table B10: Model inputs for supplier 3 (Infrastructure element)

Infrastructure element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Physical Infrastructure				Year 1	Year 2
Equipment & tools	3	1	40%	R 2 800 000	
Facility and supporting infrastructure	3	1	40%	R 2 000 000	

Table B11: Model inputs for supplier 3 (Economic element)

Economic element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Manufacturing Competence				Year 1	Year 2
Quality Assurance systems/processes	3	1	40.00%		
Manufacturing Readiness Level	3	1	60.00%		

Table B12: Model inputs for supplier 3 (Competitiveness element)

Competitiveness element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Competitive manufacturing processes				Year 1	Year 2
Effective and efficient manufacturing processes	3	1	40.00%		
Integrated into greater Procurement value streams	3	1	30.00%		
Compliance to regulatory Policies					
BBBEE Rating	4	5	30.00%		

Figures B1 and B2 below represent the results of the alternative two suppliers considered in the Modikwa case study relative to their compliance along the LMS development roadmap.

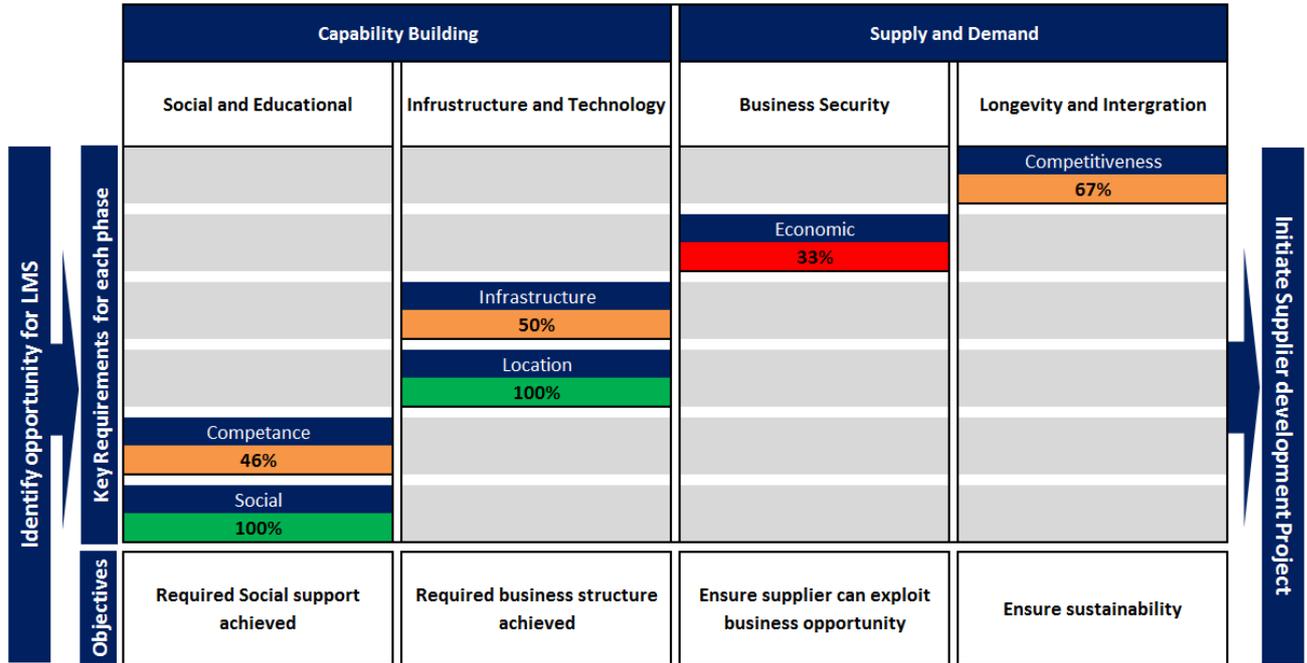


Figure B-1: Results of second LMS considered in the Modikwa case study

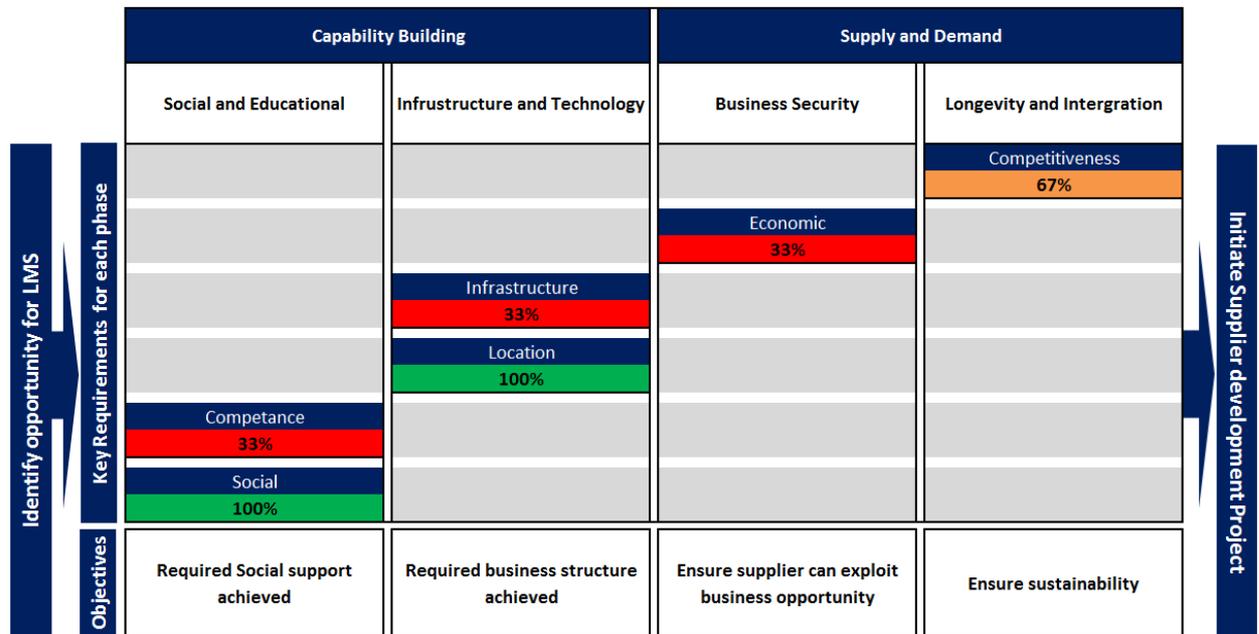


Figure B-20-1: Results of third LMS considered in the Modikwa case study



Tables B-13 and B14 represent the action plans from the output of the model for supplier 3 and 4 from the Modikwa case study.

Table B13: Action Plan for Supplier 2 from Modikwa case study

Action Plan for Local Manufacturing Supplier Development					
Priority	Key Focus Areas	Life cycle element of LMS	Compliance %	Suggested Options to consider	Investment required
1	Manufacturing and operational Skills	Competence Element	33%	Funding from CIS, EIP, ISP, Training Support Programmes, Incubators, Shadowing etc.	R 85 000
2	Business Acumen skills	Competence Element	67%	Funding from CIS, EIP, ISP Training Support Programmes, Incubators, Shadowing etc.	R 25 000.00
3	Equipment & tools	Infrastructure element	33%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.	R 2 500 000
4	Facility and supporting infrastructure	Infrastructure element	67%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.	R 2 000 000
5	Quality Assurance systems/processes	Economic Element	33%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	
6	Manufacturing Readiness Level	Economic Element	33%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	
7	Effective and efficient manufacturing	Competitiveness Element	33%	MCEP funding, Shadowing, Internship	
	processes			programmes with host company, Improvement project at LMS, Fund	

				development etc.	
8	Integrated into greater Procurement value streams	Competitiveness Element	33%	MCEP funding, Shadowing, Internship programmes with host company, Improvement project at LMS, Fund development etc.	

Table B14: Action Plan for Supplier 3 from Modikwa case study

Action Plan for Local Manufacturing Supplier Development					
Priority	Key Focus Areas	Life cycle element of LMS	Compliance %	Suggested Options to consider	Investment required
1	Manufacturing and operational Skills	Competence Element	33%	Funding from CIS, EIP, ISP, Training Support Programmes, Incubators, Shadowing etc.	R 85 000
2	Business Acumen skills	Competence Element	33%	Funding from CIS, EIP, ISP Training Support Programmes, Incubators, Shadowing etc.	R 25 000
3	Equipment & tools	Infrastructure element	33%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.	R 2 800 000
4	Facility and supporting infrastructure	Infrastructure element	33%	Funding from SEDA, CIS,EIP, cluster, Joint co-operation etc.	R 2 000 000
5	Quality Assurance systems/processes	Economic Element	33%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation	

				Clusters, Partner with Learning institutions	
6	Manufacturing Readiness Level	Economic Element	33%	Funding from BBSDP, MCEP, SEDA, Shadowing, ISO training, Innovation Clusters, Partner with Learning institutions	
7	Effective and efficient manufacturing processes	Competitiveness Element	33%	MCEP funding, Shadowing, Internship programmes with host company, Improvement project at LMS, Fund development etc.	
8	Integrated into greater Procurement value streams	Competitiveness Element	33%	MCEP funding, Shadowing, Internship programmes with host company, Improvement project at LMS, Fund development etc.	
1	Manufacturing and operational Skills	Competence Element	33%	Funding from CIS, EIP, ISP, Training Support Programmes, Incubators, Shadowing etc.	R 85 000

The input sheet to include the procurement spend in the model is represented in table B15.

Table B15: Inputs into model for procurement spend

Financial inputs					
	Year 1	Year 2	Year 3	Year 4	Year 5
Annual Projected Procurement spend with LMS	R -	R -	R -	R -	R -
Annual Projected Savings for utilising LMS	R -	R -	R -	R -	R -

APPENDIX C

The inputs into the model for each of the suppliers considered in the Howden Africa case study, used during the framework validation, are represented in Tables C1 to Table C12.

Table C-1 Model inputs for supplier 1 Howden Case study (Social element)

Social Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
				Year 1	Year 2
Societal Needs					
Community Access to Health and Welfare	4	4	20%		
Utilities					
Water	3	3	30%		
Electricity	3	3	30%		
Roads and transport	3	3	20%		

Table C-2 Model inputs for supplier 1 Howden Case study (Competence element)

Competence Element	Required level (1-5)	LMS current level (1-4)	Weighting (0-1)	Annual Investment required for LMS to comply	
				Year 1	Year 2
Skills & Education					
Manufacturing and operational Skills	4	2	70%	R 60 000	
Business Acumen skills	3	3	30%		

Table C-3 Model inputs for Supplier 1 Howden Case study (Location element)

Location Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
				Year 1	Year 2
Ownership of Area					
Own facility (Land)	3	3	10.00%		
Jointly owned/Shared (cluster)	1	1	30.00%		
Proximity					
Proximity to local community	3	3	35.00%		
Proximity to Business	3	3	25.00%		

Table C-4 Model inputs for Supplier 1 Howden Case study (Infrastructure element)

Infrastructure Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Physical Infrastructure				Year 1	Year 2
Equipment & tools	4	3	30%		
Facility and supporting infrastructure	4	3	30%		
Technology Readiness	3	2	20%		
Transport networks	2	2	20%		

Table C-5 Model inputs for Supplier 1 Howden Case study (Economic element)

Economic Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Market off-take opportunity				Year 1	Year 2
Competitive and cost effective products	4	4	10.00%	R 1 000 000.00	
Contribution to local Community					
Employment from local community	3	3	15.00%		
% of final product produced locally	4	4	20.00%		
% of local ownership	5	5	10.00%		
Manufacturing Competence					
Quality Assurance systems/processes	4	3	10.00%		
Manufacturing Readiness Level	4	3	35.00%		

Table C-6 Model inputs for Supplier 1 Howden Case study (Competitiveness element)

Competitiveness Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
Competitive manufacturing processes				Year 1	Year 2
Effective and efficient manufacturing processes	3	2	30.00%		
Entrenched Regulatory and Quality standards	4	3	20.00%		
Sustainable Profit and Market growth					
Integrated into greater Procurement value streams	3	2	20.00%		

Compliance to regulatory Policies					
BBBEE Rating	3	4	30.00%		

Table C-7 Model inputs for Supplier 2 Howden Case study (Social element)

Social Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply		
				Year 1	Year 2	
Societal Needs						
Community Access to Health and Welfare	4	4	20%			
Utilities						
Water	3	3	30%			
Electricity	3	3	30%			
Roads and transport	3	3	20%			

Table C-8 Model inputs for Supplier 2 Howden Case study (Competence element)

Competence Element	Required level (1-5)	LMS current level (1-4)	Weighting (0-1)	Annual Investment required for LMS to comply		
				Year 1	Year 2	
Skills & Education						
Manufacturing and operational Skills	4	1	70%	R 60 000		
Business Acumen skills	3	3	30%			

Table C-9 Model inputs for Supplier 2 Howden Case study (Location element)

Location Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply		
				Year 1	Year 2	
Ownership of Area						
Own facility (Land)	3	3	10.00%			
Jointly owned/Shared (cluster)	1	1	30.00%			
Proximity						
Proximity to local community	3	3	35.00%			
Proximity to Business	3	3	25.00%			

Table C-10 Model inputs for Supplier 2 Howden Case study (Infrastructure element)

Infrastructure Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply		
				Year 1	Year 2	
Physical Infrastructure						
Equipment & tools	4	2	30%	R 200 000.00		
Facility and supporting infrastructure	4	3	30%			
Technology Readiness	3	2	20%			
Transport networks	2	2	20%			

Table C-11 Model inputs for Supplier 2 Howden Case study (Economic element)

Economic Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
				Year 1	Year 2
Market off-take opportunity					
Competitive and cost effective products	4	3	10.00%	R 1 000 000.00	
Contribution to local Community					
Employment from local community	3	3	15.00%		
% of final product produced locally	4	4	20.00%		
% of local ownership	5	4	10.00%		
Manufacturing Competence					
Quality Assurance systems/processes	4	3	10.00%		
Manufacturing Readiness Level	4	2	35.00%		

Table C-12 Model inputs for Supplier 2 Howden Case study (Competitive element)

Competitiveness Element	Required level (1-5)	LMS current level (1-5)	Weighting (0-1)	Annual Investment required for LMS to comply	
				Year 1	Year 2
Competitive manufacturing processes					
Effective and efficient manufacturing processes	3	2	30.00%		
Entrenched Regulatory and Quality standards	4	3	20.00%		
Sustainable Profit and Market growth					
Integrated into greater Procurement value streams	3	2	20.00%		
Compliance to regulatory Policies					
BBBEE Rating	4	4	30.00%		

APPENDIX D

This section incorporates the feedback received from industry related experts regarding the validity of the LMS road map. The Road map was presented to four individuals from various companies and their feedback was given accordingly. From the feedback it can be seen that the roadmap could contribute greatly towards assisting the industry in effectively developing local suppliers.



Figure D-1: Feedback from Meyerton Engineering



Figure D-2: Feedback from Howden Power

**MEMO**

To Marius Vermeulen
From Johan Dippenaar
Date 10/11/2016
Subject Feedback on Local manufacturing supplier development framework

Dear Marius Vermeulen,

After analysing your proposed framework for developing local manufacturing suppliers the following feedback is given to the relevance of the tool:

- Structured detailed process for identifying local suppliers to develop
- Sound analytical tools prevalent in the model to base the decision criteria on
- Gap analysis given in the framework to focus the areas of development for a supplier
- Relevant stages of development for a local supplier given with key areas of development in each phase
- Ability to track the development of a supplier as the project is rolled out.

The Framework follows a logical sequence of events in order to develop a local supplier. This tool can easily be utilised in order to ensure that the best suitable supplier is selected for further development and all critical aspects of its development are identified in order to meet a company's requirements.

One aspect of the framework that could potentially be investigated further would be the financial benefits to the company in utilising a local supplier. This would enhance the framework's capability in order to conduct a trade off between developing a local supplier and utilising an existing supplier.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Johan Dippenaar'.

Johan Dippenaar
Category manager: Anglo Platinum
E-mail: Johan.dippenaar@angloamerican.com
Tel: 011 638 2432

Figure D-3: Feedback from Anglo Platinum



Figure D-4: Feedback from Virtual Consulting