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## **A Workable Model for Small, Medium and Micro Enterprises Hosted in Selected Incubators in South Africa**

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### **ABSTRACT**

The South African Government, in line with international thought, recognises the potential of the contribution of SMME's to the overall economy of the country. Government and the private sector have introduced agencies and operations to support the development of SMME's. Given this support, SMME's continue to face serious challenges and barriers leading to failure, for example, finance, government policy and communication, marketing, infrastructure, limited use of technology, weak business management, training and skills development. Of these, this paper will focus on the latter three areas of failure, namely, limited use of technology, weak business management and training, since these have a more direct bearing on the study. To stem the tide of failure and offer support and solutions, the challenge was met by the formulation of entrepreneurial incubation strategies. This paper provides an account of Maturity Models which are discussed in an historical context, reviewing past models, to trace the origins of such models. Innovation is seen as a means to meet the objectives of sustainable acceleration of economic growth and the creation of wealth to reduce poverty and improvement of quality of life. The paper describes a valuable model, enabled by an electronic driver, to assess the improvement of maturity of SMME's to transform them

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so that they are enabled to align their management and processes. This model is provided in the form of the People, Innovation, Capability and Maturity Model (PICaMM).

**KEYWORDS:** Capability, Incubation strategy, Innovation, Maturity, People, Technology.

## 1. INTRODUCTION

A People, Innovation, Capability and Maturity Model (PICaMM) is being developed and will be tested for implementation in select incubators in South Africa with the aim of assisting SMME's to improve their management and processes. The model is expected to help enterprises to evaluate their level of maturity regarding the management of the workforce, new ideas, products and services, knowledge, skills and training. Improvement is evaluated along a 'step-wise' continuum of staged levels, one to five, where, at the fifth level the enterprise will be able to align its processes and activities with its business objectives to become more successful and competitive in gaining market share.

## 2. BACKGROUND

The South African government has set as a priority the development of Small, Medium and Micro-Enterprise (SMME) sector initiatives as a nationally concerning issue. In keeping with global thinking about the role of SMME's, the government recognises the potential of SMME's to be strong economic drivers. They have the ability to address critical socio-economic challenges such as unemployment, alleviation of poverty and engendering economic growth.

One of the major areas of need in developing the SMME sector is Information and Communication Technology (ICT) as a means to access information, links into international markets and business competitiveness (Presidential National Commission on Information Society and Development: PNC on ISAD, 2004).

In 2003, the National Small Business Act (1996) was amended and published in the Government Gazette. The Schedule ammended to define, across five columns, enterprises by sectors, size of class, number of full time employees, turnover and gross asset value. According to the amended table the size of class describes as a Micro enterprise one which has five full-time employees, a Very Small enterprise as having ten to twenty full-time employees, a Small enterprise as having fifty full-time employees and a Medium enterprise as having one hundred to two hundred employees. The following Table 1 shows an abbreviated version of the Schedule, excluding the 'sector' column designating types of industries.

Table 1. Summary Extract: Abbreviated Schedule from the National Small Business Amendment Act (2003)

Size of Enterprise	Number of Employees	Annual Turnover	Gross Assets
Medium	100 – 200	R 5m – R 64m	R 3m – R 23m
Small	50	R 3m – 32 m	R 1m – R 6m
Very Small	10 – 20	R 0.50m – R 6m	R 0.5m – R 2m
Micro	5	R 0.20m	R 0.10m

To acquire a broader view of development and function of SMME's, the researcher would like to direct the focus onto other countries, which are in the process of advancing activities to promote the role that their SMME's play in the growth of their economies.

## 3. SMME'S IN OTHER COUNTRIES

From a global perspective SMME's have also been found to make a significant contribution to the economies in their respective countries. Fakude (2007:198) notes that in other countries of the world, it is in the SMME's where job creation and economic growth is seen. Opportunities are exploited and gaps are found to develop technological expertise and entrepreneurship is encouraged.

In the report prepared for the Presidential National Commission (PNC) on ISAD (2004), it was stated that for the Global Entrepreneurship Monitor (GEM), 37 countries were compared and from this comparison it was established that the highest levels of entrepreneurial activities were noted as being those in developing Asian countries, after which came Latin American countries. Figure 1 below indicates the levels of entrepreneurial development.

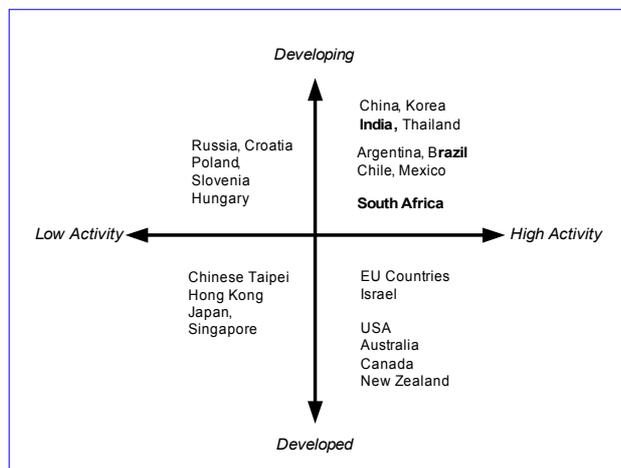


Figure 1. Entrepreneurial Activity in Developed and Developing Countries (Business Development for SMME's: 2004)

For the purpose of this study the researcher will focus on two developing countries which demonstrate activities that can be used as an appropriate comparative measurement with South Africa, namely India and Brazil.

### 3.1 The India – Brazil – South Africa (IBSA) Tri-lateral Relationship

IBSA was established by the foreign ministers of the respective countries in Brazil, in 2003. Its purpose was to create a co-operative alliance to benefit such areas as social development, disarmament, infrastructure development, healthcare, sustainability, economic development and poverty alleviation (Davies, 2006).

At the India – Brazil – South Africa Tri-lateral Summit, 2006, Davies (2006), made the observation that strengthening co-operation in the strategic area of small business development was critical. This meeting was used to seek to build further on the existing co-operation between the Small Enterprise Development Agency (SEDA) of South Africa, the National Small Business Industry Corporation (NSIC) of India and the Servicos Brasileiros as Micro e Pequenas Empresas (Sebrae) of Brazil. Davies went on to say that small business development is a priority for all three governments and economies and that South Africa is probably furthest behind, largely due to the interventions of apartheid that precluded black people from operating in business. Even after the 1994 elections leading to democracy and the emergence of small business development strategies, barriers to success continued to exist. For example, limits to capacity and experience, credit and services not extended to new enterprises and a culture that did not see entrepreneurship as a first option, are all obstacles to the success of SMME's.

### 3.2 SMME's in South Africa

#### 3.1.1 Government Support

The South African Government has introduced a number of agencies and operations to support the development of SMME's. According to Agupusi (2007), through the Department of Trade and Industry (dti) the two key government agencies established for small business development are the Small Enterprise and

Development Agency (SEDA) and Khula Enterprise Limited which offer a range of programs to foster new business start-ups and building the capacity of existing ones. Agupusi goes on to say that micro and survivalist businesses have been helped by the South Africa Micro-credit Apex Fund (SAMAF), through Khula, to make financial support available to them, mostly in rural areas and townships. Other agencies include the National Empowerment Fund (NEF), the Industrial Development Corporation (IDC) and the Gauteng Enterprise Propeller (GEP).

In addition to the government institutions and mechanisms, organisations such as the Tshumisano Trust, for example, has assisted SMME's by implementing the Technology Station Programme (TSP) developed by the Department of Science and Technology to provide technical and financial support to Technology Stations which extends to SMME's technology solutions, services and training (Tshumisano KPI Report, 2004/5).

### **3.2.2 Non-Government Organisation (NGO) and Private Sector Support for SMME's**

The Small Enterprise Foundation (SEF) a non-profit NGO, states as its goal, to work towards provision of sustainable finance support, with the view to alleviate poverty and unemployment in the rural areas, amongst survivalist groups (Small Enterprise Foundation: 2008).

The Small Business Project (SBP) initiated in 1997, as a small business development agency, (Sikhakhane, 2003), has set-up the Business Linkage Programme (BLP) in an attempt to link SMME's to corporate champions as partners (Tyali, 2003). This is just a small sample of NGO's and private sector support.

Further support is offered to SMME's by the major commercial banks, private companies, close corporations and section 21 companies. Whilst SMME's receive support from both Government, mentioned previously, and Non-Governmental Organisations and Private Sector, they continue to face serious challenges and barriers, leading to failure.

## **4. WHY SMME'S FAIL**

Among the inhibiting factors facing SMME's, often external to the organisation, are finance, Government policy and communication, marketing and infrastructure. Others which are internal to the organisation include lack of use or limited use of technology, weak business management, training and skills development (SMME Surveys: 2004, 2007; Snyman *et al.* 2008: 4). It is on these internal factors that the researcher will focus attention since they have a more direct bearing on this study.

### **4.1 Technology**

Technology does not assure SMME success or competitiveness; however, SMME's that make effective use of technology tend to be more competitive than those that do not (SME Survey, 2007). Sanders, quoted in the SME Survey 2007, tells us that technology is a real business enabler and that companies today optimise efficiency by utilizing technology opportunities. He goes on to say that if competent levels of IT maturity have been reached successful delivery of the company strategies will be enabled.

To continue to be competitive and ensure future growth, IT infrastructure has to interface with the needs of the business and have the flexibility to adapt to changing markets (SME Survey, 2007).

Managing the complexity, reliability, variety of products, vendor solicitation, integration into existing systems, ever changing developments in technologies and the costs related to all of these issues, are some of the challenges facing SMME's. Research conducted by analysts from Ovum, reported in the SME Survey, 2007, found that the major problem that mid-sized IT businesses faced was managing cost (30%) followed by staying current with technology changes (18%) (SME Survey, 2007). The enterprise needs to have mature business management strategies in place to meet these challenges.

## 4.2 Weak Business Management

Where the existing management culture and processes are weak or immature, producing the right IT actions to ensure effective planning, resource allocations, budgeting and governance, the foundations of the organisation will be unstable (Benson *et al.* 2004:7–8).

Small business owners are often more concerned with operational objectives at the expense of developing and adhering to a strategic plan (SME Survey 2007). The survey goes on to identify the result of prioritizing operational objectives over business strategy as being focused on cash-flow issues, so small business owners often go to their accountant for advice when they should be seeking the advice of specialist mentors to enhance business expertise.

In the absence of strong leadership from management, according to Bell (2006:127), the purpose, vision and values of the organisation are not well defined. Alignment of systems and structures become flawed or disjointed and execution of the business will be haphazard, due to non-intentional application of leadership.

Development of the workforce, in terms of training and skills upliftment falls under the responsibility of management and leadership and will be discussed in the next section.

## 4.3 Training and Skills Development

A number of inhibitors of skills development are identified by Johnson (2002), arising from research conducted in the United Kingdom. He provides the following list of inhibitors:

- **Limited drivers for training.** For example, SME's are not as likely to experience the same high levels of business change and new technology as larger businesses.
- **Ignorance of available initiative provision.** SME's are sometimes less informed than are large organisations as to initiatives that are available to assist with training.
- **Preference for informal training.** This was a significant finding and emphasizes the need for training initiatives to be presented informally as well as formal approaches.
- **Ignorance of the benefits of training.** SME's often do not believe skill development leads to business benefits, or if they do, the benefit is marginal.

As part of their skills-development mandate, the Sector Education and Training Authorities (SETAS) are implementing skills development programmes aimed at assisting SME's by enabling them to start and manage their businesses successfully (Integrated Strategy on Promotion of Entrepreneurship and Small Enterprises: 2.1.9). However, in the light of Johnson's assertions above, there are a number of inhibitors at play which prevent successful outcomes of Setas programmes, for example, Setas do not appear to be playing a leading role in providing ICT skills to their constituencies (Business Development For SMME's, 2004).

In discussing the critical shortage of certain skill sets necessary for economic development, Fakude (2007:200) mentions project management, engineering and technical skills as being fundamental to economic growth. He goes on to state that resources must be focused towards development of skills since one of the greatest risks to the economy is that there are not skills enough to match economic growth.

Confidence in ability to perform tasks successfully through training and skills augmentation drives competitiveness forward in SMME's so that they feel empowered to meet the standards required to acquire market share. They do, of course, need to be supported and this is very much the purpose behind the incubator initiatives, and will be discussed next.

## 5. INCUBATORS IN SOUTH AFRICA

It is clear from the discussion above that SMME's do fail in South Africa for many reasons. To stem this tide of failure and offer support and solutions, the challenge was met by the formulation of an entrepreneurial incubation strategy through the establishment of the Southern African Technology Incubator Network (SATIN) project. This incorporated the initiatives of Bodibeng Technology and KwaZulu-Natal Innovation Support Center (KZNISC), who provided development resources and Softstart BTI being the lead user of the implementation phase of the project (infoDev: 2006).

Support for the incubator initiative also came from the Government by the consolidation of small enterprise interventions across various government departments. By doing so, the Small Enterprise Development Agency Technology Programme (stp) was established (dti: 2006). Their purpose is "to develop innovative technology based platforms that result in the creation of sustainable, globally competitive SMME's that contribute towards the accelerated growth of the economy" (SEDA: 2006).

It would appear that a great number of SMME's are not aware of the incubator initiatives taken to support them. According to a random survey of 202 SME's, conducted by SME Survey in 2007, 41% of business decision makers are aware of the incubation initiative, but, only 20% understand their role. Once the roles of the incubator and its services had been explained, 53% of the SMME respondents expressed their willingness to join the incubator programme (SME Survey:2007). Goldstuck (2007), points out that until such time more start up business owners are made aware of the programme, what it offers and the benefits to be gained, the impact of this initiative will be limited (SME Survey:2007).

Incubators provide well established business models which facilitate SMME potential for economic growth to sustain work opportunities and social upliftment. In the next section the origin and subsequent role and benefits business models play and their contribution to the success of business ventures, will be addressed.

## **6. ORIGINS OF MATURITY MODELS**

Management models and theories provide tools to organisations to help them to direct, control and develop effective ways to manage their technology, innovation and processes. Models, used constructively, create a pathway through what can sometimes be regarded as complex, unpredictable and challenging aspects of the organisational operations and may offer a surer basis upon which to proceed in solving organisational problems.

In this study, the definition of maturity is in agreement with that of the Capability Maturity Model Integrated (CMMi) which informs that, maturity is the degree of process improvement across a predetermined set of process areas in which goals within the set are attained CMMi (2002: 624).

Maturity models have, as their origin in quality and improvement models which have been in use since the early 1900's. The researcher has selected a few of these models as examples of where maturity models came from, namely The European Foundation Quality Management (EFQM) model, as well as the quality models of Shewhart, Deming, Juran and Crosby. According to Kerzner (2001: 1087), although many experts have contributed to the success of the quality movement, the most significant are Deming, Juran and Crosby.

### **6.1 Quality Models**

#### **6.1.1 The European Foundation Quality Management (EFQM) Model**

EFQM provides a framework to help organisations in the establishment of management systems to become competitive through excellence in performance, customer service, people and society initiatives which they achieve through partnerships, resources and processes (ten Have *et al.* 2003: 68).

The model comprises nine criteria, being, five organisational areas (enablers) and four performance areas (results). The organisational areas are operational in managing the organisation's leadership, policy and

strategy, people, partnerships and resources, and processes. The performance areas provide a diagnostic tool to measure the organisations health in terms of fitness, achievements, results of its customer, people and society and finance initiatives. From the performance results a feedback loop co-ordinates the learning effect of the process and acts as a measure of improvement (ten Have *et al.* 2003:68-70).

### 6.1.2 Shewhart Cycle

Walter Shewhart (1891–1967). Shewhart, a mathematician with special interest in the field of statistics, maintained that by keeping the production process under statistical control, the outcome would then become predictable, measurable and manageable (Cutler, 2001). Shewhart adapted the Scientific Method of iteration to manufacturing process improvement in presenting a cycle of repeatable activities which came to be known as the Shewhart Cycle, comprising of Planning, Doing Checking and Action (Brower, 2004). Shewhart was a mentor to W. Edwards Deming, who continued to champion Shewhart's methods and insights (Cutler, 2001).

### 6.2.3 The Deming Cycle

William Edwards Deming (1900–1993). Deming popularized the Shewhart Cycle but made the change from 'Check' to 'Study' since he believed it was closer to Shewhart's intent (Wikipedia:2008). In describing the cycle, ten Have *et al.* (2003:66–67) explain that the cycle refers to a sequence of four steps aimed at continuous improvement and learning:

1. Planning: Plan the improvement required.
2. Do the activity as per the plan.
3. Study the results and measure them.
4. Act on adapting the objectives/improvements.

Deming insisted that processes had to be placed under statistical analysis and control to ensure quality repeatability and that processes must be continuously refined and are set out in his 14 Points for Quality Management Kerzner (2001:1087).

### 6.1.4 Juran's 10 Steps to Quality Management and the Juran Trilogy

Joseph Juran (1904–2008). With the publication of his book in 1951, 'Juran's Quality Control Handbook', still the standard reference work on quality, Juran introduced his 10 Steps to Total Quality Management. They identify ten ways of improving the quality processes and management within an organisation Bank (1992:70).

Juran expressed three quality-related processes essential to Quality Management, these being, Quality Planning, Control and Improvement. These three became known as 'Juran's Trilogy'. He describes the Quality Planning Process as the process for preparing to meet goals. The Quality Control Process, he maintained, was the process for meeting quality goals during operations. The process for breaking through to unprecedented levels of performance was the Quality Improvement Process Bank (1992:71–73).

### 6.1.5 Philip B Crosby

Crosby's (1926 – 2001) approach differed greatly from the academic, scientific, statistical approaches of Shewhart, Deming and Juran. His was much more of a pragmatic, quality management philosophy. He introduced four essentials of quality management, which he called 'the absolutes' Bank (1992:76):

1. Quality is defined as conformance to requirements, not as goodness.
2. Quality is achieved by prevention, not appraisal.
3. The quality performance standard is 'zero defect'.

4. Quality is measured by the price of non-conformance, not indexes.

In the manner in which it relates to this study, the researcher identifies as an important contribution, Crosby's Quality Management Maturity Grid. The grid is explained by Fraser, Moultrie and Gregory (2002) as a matrix which describes typical behaviour exhibited by an organisation at five levels of maturity (uncertainty; awakening; enlightenment; wisdom; certainty), for each of six aspects of quality management (management understanding and attitude; quality organisation status; problem handling; cost of quality as a percentage of sales; quality improvement actions; summation of company quality position), to achieve quality management excellence.

In 1989 an adaptation of Crosby's Quality Management Maturity Grid, the Capability Maturity Model, was developed by Watts Humphrey at the Software Engineering Institute (SEI), Carnegie Mellon University, Pittsburgh, Pennsylvania and will be discussed further in the next section (CMMI 2006: 5; Curtis, Hefley and Miller 2002:8).

## **7. MATURITY MODELS**

A Capability Maturity Model may be defined, according to the Capability Maturity Model Integrated (2002:617), as containing the essential elements of effective processes for one or more disciplines. It also describes an evolutionary improvement path from ad hoc, immature processes to disciplined, mature processes with improved quality and effectiveness.

### **7.1 The Capability Maturity Model (CMM)**

The CMM was initially developed for software and systems engineering by Humphrey at the SEI. He noted that the Crosby Quality Management Grid, when applied to long term individual practices and technologies was not greatly successful. He concluded that an approach that addressed the whole of the organisation, not just its individual processes, would gain more successful outcomes Curtis, Hefley and Miller (2002:8).

In concept, as described by ten Have *et al.* (2003:32–33), the CMM provides for continuous process improvement over five staged levels. The staging allows for integration of improved practices, through an evolutionary path towards more sophisticated or mature processes. As the organisation moves through the five maturity levels, processes become more and more predictable, effective and controlled ten Have *et al.* (2003:33).

### **7.2 The Capability Maturity Model Integration (CMMi)**

The CMMi models have expanded the CMM concept to multiple disciplines and are designed to help organisations improve their product and service development, acquisition and maintenance processes. The models include systems engineering, software engineering, integrated product and process development, supplier sourcing, process management and project management SEI: Carnegie Mellon (2002).

The Capability Maturity Model Integration (2002:1) advises that, organisations can use a CMMi model to assist them to set process-improvement objectives and priorities in order to create improvements. They can also provide guidance to ensure stable, capable and mature processes.

The models can be tailored to 'best-fit' an organisations needs. There are two representations that can be selected, namely, continuous or staged. Each has a distinct set of criteria for use. The continuous representation uses capability levels to measure process improvement, whereas, the staged representation

measures maturity levels, which are in the interest area of this study, since they apply to an organisations overall maturity.

### **7.3 The People Capability Maturity Model (P-CMM)**

The CMM had as its focus software and systems engineering; its adaptation in the CMMI was aimed at improving process maturity in organisations. It was not until 1995, according to Curtis, Hefley and Miller (2002:4), that the emphasis for continuous capability improvement was directed towards the workforce of organisations through the development of the P-CMM.

The objective of the P-CMM is to improve capability in such areas as knowledge, skill and ability to perform the organisations process activities. The P-CMM, described by Curtis, Hefley and Miller (2002:4), is an evolutionary improvement path from ad hoc workforce practices to mature practices which results in continuously improved capabilities of the workforce to a level of performance excellence.

Having looked at the development of quality and maturity models the researcher would now like to direct attention to how new ideas, products and services can be addressed through innovation management.

## **8. INNOVATION**

According to Williams (2007:9) the goal today is to embed the innovation culture into each and every area of the company. He goes on to say that this is achieved by providing organisations with behaviours, characteristics and systems of a growing and maturing innovative organisation.

The National Systems of Innovation (NSI) define innovation (R&D Strategy 2002:9) as:

*“the introduction into a market (economic or social) of new or improved products and services”*

The key objective of technology and innovation missions is acceleration of economic growth and the creation of wealth on a sustainable basis and improvement of quality of life and reduction of poverty R&D Strategy (2002:31–32).

### **8.1 The National Systems of Innovation (NSI)**

A National System of Innovation can, according to Patterson, Adams and Mullin (2003:1) be defined as:

*“A system of interacting private and public firms (either large or small), universities and government agencies aiming at the production of science and technology to enhance quality of life and sustainable economic growth.”*

These same authors maintain that the NSI approach has, as its focus, benefits to citizens and society and aligns its interactions and linkages to ensure effective and sustainable outputs.

The National Systems of Innovation, on which economic growth through innovation is reliant, has a number of key weaknesses. Among these are funding, human resources, declining research and development in the private sector, intellectual property and fragmented government science and technology management R&D Strategy (2002:11–12).

By way of example of innovative work undertaken to enhance quality of life and sustainable economic growth, the researcher turns to the efforts made at Tshwane University of Technology in support of SMME's.

## 8.2 Innovation at Tshwane University of Technology

Tshwane University of Technology (TUT), through their Technology Station in Electronics (TSE), an initiative of the Department of Science and Technology, offers support to SME's and students. Their aim is to increase competency and capability of SME's, and thus reinforce the efforts of SME's to become more competitive in the electronic, electrical and ICT sectors of industry. According to Jacobs and Herselman (2008), at first the focus of the initiative was directed towards design and development in the Product Life Cycle. After noting a gap between electronic design and manufacture a decision was taken to realign the TSE by a paradigm shift aiming at bridging the gap to deal with newly designed prototypes and products, referred to as an 'innovation chasm'.

Jacobs and Herselman (2008), explain that the TSE supports the idea-innovation chain which refers to linkages between scientific research and the industrial innovation chain. TSE applies the idea-innovation chain by using the capacity and competence of the Faculty of Engineering and the Built Environment to assist industry with projects, services and training. Experience gained and feedback from industry is used to improve curricula and research, inclusive of innovation activities.

The researcher intends that this study will support the initiatives of the TSE and TUT and those of others housed in the incubators selected for this study, assisting SMME's. Support will be by way of providing the proposed maturity model, PICaMM, as a tool for SMME's to develop innovation capacity and manage their ideas-innovation processes along a maturity improvement pathway from random processes to aligned processes. It is envisioned that feedback received from the SMME's participating in this research will augment the knowledge of scientific research and product and process innovation through developing of SMME organisations in the technology sector.

## 9. PEOPLE, INNOVATION, CAPABILITY AND MATURITY MODEL

From the overview of the origin of maturity models and innovation, as previously discussed, it is feasible to expand on their principles which form the foundation and subsequent framework for the composite People, Innovation, Capability and Maturity Model (PICaMM), as depicted in Table 2, the Framework Levels of PICaMM.

Table 2. Framework Levels of PICaMM

<b>Innovation Maturity</b>	<b>People Maturity</b>	<b>Capability Maturity</b>
<p><b>Level 1: Random</b></p> <p>Not open to new ideas – risk adverse.</p> <p>Risk tied to cost</p> <p>Maintaining the 'status quo'</p>	<p><b>Level 1: Random</b></p> <p>Inconsistent performance</p> <p>Skills insufficient and training not undertaken</p> <p>Ad-hoc work practices</p>	<p><b>Level 1: Random</b></p> <p>Processes are often partially defined or informally applied</p> <p>Unpredictable implementation</p> <p>Processes ad-hoc and unstable</p>
<p><b>Level 2: Emerging</b></p> <p>Poorly developed structures to manage innovation</p>	<p><b>Level 2: Emerging</b></p> <p>Managed processes emerge but are still at low levels</p>	<p><b>Level 2: Emerging</b></p> <p>Managed processes are still at low levels but there is more planning, adherence to policy, and identified resources and responsibilities produce successful outputs</p>

<p><b>Level 3: Specified</b></p> <p>The organisation defines expected innovation processes</p>	<p><b>Level 3: Specified</b></p> <p>The organisation defines expected competencies</p>	<p><b>Level 3: Specified</b></p> <p>The process is defined.</p>
<p><b>Level 4: Measurable</b></p> <p>Reasonable risk is tolerated.</p> <p>Metrics, training , campaigns, ideas solicited from employees all become part of organisational strategic plans</p>	<p><b>Level 4: Measurable</b></p> <p>Competency is quantified and thus becomes predictive</p> <p>Processes become more institutionalised</p>	<p><b>Level 4: Measurable</b></p> <p>The process is managed quantitatively</p> <p>Greater performance stability is created and quality and process performance standards are met</p>
<p><b>Level 5: Aligned</b></p> <p>Entire organisation is involved in ongoing innovation techniques with Snr. Mgt. taking leadership and oversight.</p> <p>Centralised Ideas Database created.</p> <p>Ideas generation is encouraged.</p>	<p><b>Level 5: Aligned</b></p> <p>Whole organisation focuses on ongoing development and improvement</p> <p>Alignment between organisational objectives and improvements are monitored</p>	<p><b>Level 5: Aligned</b></p> <p>All employees are responsible for continuous improvements</p> <p>Causes of performance problems are more easily dealt with</p> <p>Aligned processes are institutionalised</p>

This model is designed, primarily, to focus on improvement of organisational elements, namely, people, innovation and process maturity, resulting in a mature, transformed organisation, characterised by alignment of the elements as reflected diagrammatically in Figure 2 below.

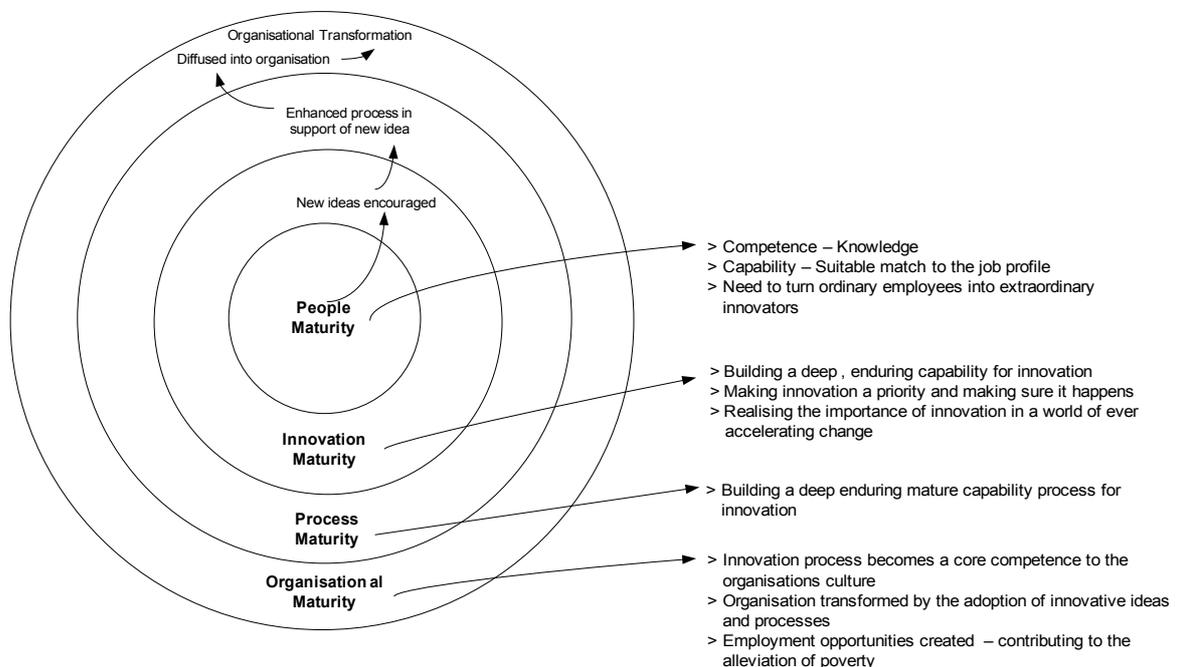


Figure 2. People, Innovation, Capability and Maturity Model (PICaMM)

The PICaMM depicts five levels of progressive improvement on ascendancy from random practices (low maturity) to aligned practices (high maturity). The model can be incorporated alongside the existing business model structures, which, in combination, form the greater organisational structure. The maturity levels are assigned as:

- Level 1: Random
- Level 2: Emerging
- Level 3: Specified
- Level 4: Measurable
- Level 5: Aligned

Figure 3 shows the levels and description of the function of each.

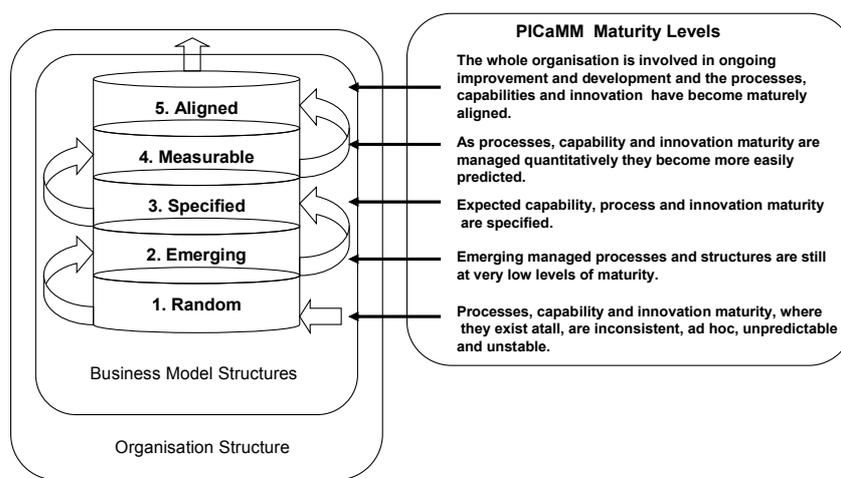


Figure 3. PICaMM Maturity Levels and Functionality

In development is a prototype of an electronic tool which enables the assessment of the levels of maturity. It is envisaged that the tool will generate an electronic evaluation of the organisation as a whole or an evaluation of the individual level of maturity within the SMME, culminating in an 'AS-IS' report of the maturity status of the organisation. From this report, through collaboration between the SMME and the incubator staff, the 'TO-BE' criteria are developed.

## 10. PROBLEM STATEMENT / RESEARCH QUESTIONS

### 10.1 Problem Statement

It has been shown earlier, that the Government acknowledges SMME's as strong economic drivers. It was also pointed out that in other countries of the world SMME's are making significant contributions to economic growth in those countries that encourage them. The problem arises where, in spite of private and public support and interventions for SMME's in South Africa, many start-up enterprises fail in the first two years due to a number of factors.

For the purpose of this study, attention will be given to three particular causes of failure, namely, poor use of technology, weak business management and training and skills development, as mentioned previously. To address these problems a model is being developed, the People, Innovation, Capability and Maturity Model (PICaMM), which deals with aspects of people, innovation and capability maturity, aimed at assisting nascent technology SMME's in selected incubators in South Africa. Because of their early stage of

development these SMME's may not, as yet, have mature and embedded management and process practices which would lead them to greater competitiveness and success in the delivery of their technological products and services.

PICaMM guides the SMME through a step-wise process of improvement, that is, one which is staged and gradual, on a growth path from management of processes which are either non-existent or barely operational to a set of mature, well defined and measured processes, offering estimable benefit to the success of the enterprise.

While other Capability Maturity Models exist, they are not tailored to meet the unique needs of developing technology SMME's in selected incubators in defined regions of South Africa. There is no other model in existence that is inclusive of all of the elements of PICaMM which are people, innovation and capability maturity.

## 10.2 Research Questions

From the forgoing outline of the problem in the previous section, one major question arises, that being:

How would the People, Innovation, Capability and Maturity Model (PICaMM) assist technological SMME's in selected incubators in South Africa to reach mature levels of people, innovation and capability management and processes?

The major question, stated above, may be more easily clarified when looked at from the perspective of a set of sub-problems issuing from the principle question, such as:

- ◆ How would the PICaMM be effectively implemented in SMME's in the selected incubators?
- ◆ How will the PICaMM be sustained by SMME's in the selected incubators?
- ◆ Will the PICaMM contribute to competitiveness and successful delivery of SMME products and services?

Having provided a Problem Statement and Research Questions, the intentions behind the way in which the goals of this study are to be achieved will be stated in the Research Objectives and will be discussed in the next section.

## 11. RESEARCH METHODOLOGY

### 11.1 Introduction

It is the intention of this research project to develop, test, implement and validate the People, Innovation, Capability and Maturity Model (PICaMM) to assess the current (AS-IS) level of SMME organisational process maturity. This maturity model is designed to evaluate the level of competence and capability of the staff, innovation and processes of the organisation with the view to improving the level of maturity of these processes.

### 11.2 Methodological Approach

A clear well defined methodological staged approach to this research project will be adopted, by clearly defining the required steps to complete each stage. It is expected that there will be variations in the chosen methodology as the project progresses.

Due to the nature of the research project, it is not necessary to start or complete one step in a stage before going on to the next. Some steps will be started out of sequence, others will start simultaneously and others may be left out altogether (Cooper and Schindler, 2003:64).

An overview of the research process, Figure 4, depicts two stages. Stage one, the paper stage, with five steps, commencing with a comprehensive literature study and stage two, the electronic stage, comprising of three steps, culminating with the prototype model (PICaMM), to be implemented in SMME's hosted in the selected incubator organisations.

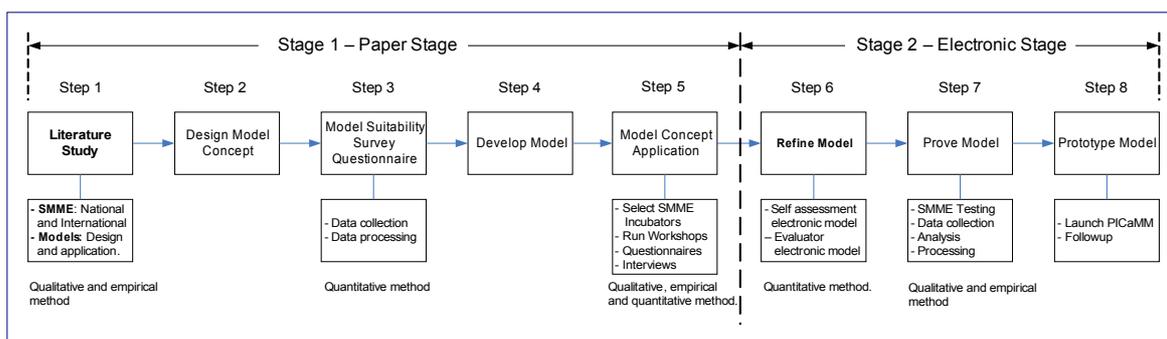


Figure 4. Research Method

The collection of research data will be realised by the review of literature, running a series of SMME workshops, questionnaires and clarification interviews. Ongoing collection of data will be conducted throughout the lifecycle of the research project, culminating in the provision of the PICaMM electronic model. Periodical evaluation will be carried out through measurement and observation of the maturity improvement of the SMME in the incubator, as PICaMM is tested for viability.

This methodology is to be applied within the context of six incubators each housing three SMME's. Each of the SMME's will be comprised of senior management, middle management and staff members. The incubators will be located in Gauteng, KwaZulu Natal and Mpumalanga, as shown in Table 3 below.

Table 3. Distribution of Incubators and SMME Participants

Incubator	Total Incubators	SMME's	Total Participating SMME's	Role of Participant
Gauteng	4	3	12	TBD
KwaZulu Natal	1	3	3	TBD
Mpumalanga	1	3	3	TBD
<b>Total</b>	<b>6</b>	<b>9</b>	<b>18</b>	<b>TBD</b>

\* TBD = To Be Determined

## 12. SUMMARY

This paper has sought to reflect on the contribution of SMME's as economic drivers in South Africa as well as other countries of the world, particularly India and Brazil, with whom South Africa has a tri-lateral relationship. Although the South African Government and Private Sector have accepted responsibility to ensure support for SMME's, their continues to be a high level of SMME failure. Among the challenges and needs expressed by these enterprises are access to finance, Government Policy and Communication,

marketing, infrastructure, limited use of technology, weak business management and training and skills development.

To meet these needs, and offer support and solutions, entrepreneurial incubators have emerged and seek to derive means to create an empowering environment for SMME's. A selected group of incubators has been identified for this study. In these incubators development and support of SMME's will be highlighted and their value as major contributors to the development of innovative technology based platforms, resulting in creation of sustainability and competitiveness of SMME's towards accelerated growth of both the SMME and the economy of the country.

Maturity Models of the past were described to provide an historical background to trace the origins of such models. Innovation was seen as a means to meet the objectives of sustainable acceleration of economic growth and the creation of wealth to reduce poverty and improvement of quality of life.

Against this background, the research study seeks to provide a valuable model and electronic tool to assess the improvement of maturity of SMME's to transform them so that they are enabled to align their management and processes. This combined model and electronic tool is provided in the form of the People, Innovation, Capability and Maturity Model (PICaMM), which addresses the problem statement and the research questions raised through an appropriate methodological approach in which the model, PICaMM is being developed, tested, implemented and either validated, or invalidated by use in the identified incubators.

## REFERENCES

- AGUPUSI, P. 2007. *Small Business Development and Poverty Alleviation in Alexandra, South Africa*. [Online]. Available from: <http://www.diw.de/document/dokumente/archiv/17/60111/paperagupusi.pdf> [Accessed: 26/03/2008].
- BABIE, E. 2003. *The Basics of Social Research*. 3<sup>rd</sup> ed. Canada: Thomson Wadsworth.
- BANK, J. 1992. *The Essence of Total Quality Management*. Hertfordshire: Prentice Hall
- BELL, A. 2006. *Great Leadership*. Mountain View, CA. Davies-Black Publishing.
- BENSON, J., BUGNITZ, T. & WALTON, W. 2004. *From Business Strategy to IT Action*. New Jersey: John Wiley & Sons, Inc.
- BROWER, G. 2004. *Shewhart Cycle*. [Online] Available from: <http://c2.com/cgi/wiki?ShewartCycle> [Accessed: 27/05/2008].
- BUSINESS DEVELOPMENT FOR SMME's. 2004. *Report Prepared for: The Presidential National Commission on the Information Society and Development*. [Online] [Accessed 25/05/2008].
- CAPABILITY MATURITY MODEL® INTERGRATION (CMMi<sup>SM</sup>) Version 1.1, 2002. Pittsburg: Carnegie Mellon University.
- CAPABILITY MATURITY MODEL® INTERGRATION (CMMI®) 2006. *CMMI® for Development, Version 1.2*. Pittsburg: Carnegie Mellon University.
- COOPER, D. & SCHINDLER, P. 2003. *Business Research Methods*. New York: McGraw-Hill.
- CUTLER, A. 2001. *Biography of Walter A Shewhart*. [Online] Available from: <http://www.sigma-engineering.co.uk/light/shewhartbiog.htm> [Accessed: 27/05/2008].

CURTIS,B., HEFLEY, W. & MILLER, S. 2002. *The People Capability Maturity Model: Guidelines for Improving the Workforce*. Boston: Addison-Wesley.

DAVIES,R. 2006. *Speech at the India-Brazil-South Africa Tri-lateral Summit on Small Business Development*. [Online] Available from: <http://www.info.gov.za/speeches/2006/06091811151006.htm> [Accessed: 05/06/2008].

FAKUDE, N. 2007. *Visions of Black Economic Empowerment*. South Africa: Jacana Media (Pty) Ltd.

FRASER, P., MOULTRIE, J. & GREGORY, M. 2002. *The use of maturity models / grids as a tool in assessing product development capability*. [Online] Available from: <http://www.beterproductdesign.net/maturity.htm> [Accessed: 28/03/2006].

GOLDSTUCK, A. 2007. *SME Survey 2007: What keeps you up at night*. [Online] Available from: [http://www.smesurvey.co.za/content/dynamic.asp?Menu\\_Id=34](http://www.smesurvey.co.za/content/dynamic.asp?Menu_Id=34) [Accessed: 20/05/2008].

INFORMATION DEVELOPMENT PROGRAM. 2006. *Incubator Network Africa. South Africa*. [Online] Available from: <http://www.infodev.org/en/Project.22.html> [Accessed: 16/05/2008].

JACOBS, S. J. 2005. *A Quality Management System For Rural Community Centers*. D.Tech. thesis, Pretoria, TUT.

JACOBS, S.J. & HERSELMAN, M. 2008. *Technology Station in Electronics at the Tshwane University of Technology – strengthening technological innovation activities amongst SME's and students*. (Unpublished: Article) Pretoria: Tshwane University of Technology.

JOHNSON, S. S.a. *Encouraging Training and Development Activities in SME's: Some Lessons from UK Research*. [Online] Available from: <http://www.workinfo.com/free/Downloads/225.htm> [Accessed: 16/05/2008].

KERZNER, H. 2001. *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*. 7<sup>th</sup> ed. New York: John Wiley & Sons, Inc.

MYERS, M. 1997. *Qualitative Research in Information Systems*. [Online] Available from: <http://www.qual.auckland.ac.nz/index.htm> [Accessed: 13/07/2008].

NATIONAL SMALL INDUSTRIES CORPORATION LIMITED. (NSIC). 2004. *Corporate Info*. [Online]. Available from: <http://www.nsic.co.in/working/homelinks/CORPORATE%20INFO.asp?mcode=&gid=5> [Accessed: 06/06/2008].

PATERSON, A., ADAM, R. & MULLIN,J. 2003. *The Relevance of the National System of Innovation Approach to Mainstreaming Science and Technology for Development in NEPAD and the AU*. [Online] Available from: [www.nepad.org/2005/files/documents/125.pdf](http://www.nepad.org/2005/files/documents/125.pdf) [Accessed: 08/02/2008].

PORKESS, R. 2004. *Collins Dictionary of Statistics*. 2ed. Glasgow. Harper Collins Publishers

PRESIDENTIAL COMMISSION on the INFORMATION SOCIETY and DEVELOPMENT. 2004. *SMME's and Information Communication Technologies (ICT's)*. [Online]. Available from: [http://www.pnc.gov.za/index.php?option=com\\_content&task=view&id=88&Itemid=58](http://www.pnc.gov.za/index.php?option=com_content&task=view&id=88&Itemid=58) [Accessed: 20/05/2008].

R&D STRATEGY. 2002. *South Africa's National R&D Strategy*. [Online]. Available from: [www.chet.org.za/papers/rdstrat.pdf](http://www.chet.org.za/papers/rdstrat.pdf) [Accessed: 03/03/2008].

ROSNOW, R., ROSENTHAL, R. 1998. *Beginning Behavioral Research: A Conceptual Primer*. 3<sup>rd</sup> ed. New Jersey: Prentice Hall.

SANDERS, S. 2007. *SME Survey 2007: Technology makes the South African SME competitive*. [Online] Available from: [http://www.smesurvey.co.za/content/dynamic.asp?Menu\\_ID=140](http://www.smesurvey.co.za/content/dynamic.asp?Menu_ID=140) [Accessed: 20/05/2008].

SEBRAE NACIONAL. S.a. *Sebrae. An agent of development*. [Online]. Available from: <http://www.sebrae.com.br/customizado/institucional/institucional/sebrae-in-english> [Accessed: 06/06/2008].

SEDA. 2006. *seda Technology Programme*. [Online]. Available from: [www.esastap.org.za/esastap/pdfs/present\\_is\\_seda\\_nov2006.pdf](http://www.esastap.org.za/esastap/pdfs/present_is_seda_nov2006.pdf) [Accessed: 06/02/2008].

SOFTWARE ENGINEERING INSTITUTE: CARNEGIE MELLON UNIVERSITY. 2002. *Capability maturity Model Integration (CMMI) for Systems Engineering/Software Engineering/Integrated Product and Process Development/Supplier Sourcing, Version 1.1, Continuous Representation (CMMI-SE/SW/IPPD/SS, V1.1, Continuous)*. [Online]. Available from: <http://www.sei.cmu.edu/publications/documents/02.reports/02tr011.html> [Accessed:02/07/2008].

SIKHAKANE, J. 2003. *SBP News Archive2003: Keep it simple...review regulations often and independently of government to gauge their effect*. [Online] Available from: [www-za.sbp.org.za/docs/News%202003.pdf](http://www.za.sbp.org.za/docs/News%202003.pdf) [Accessed: 27/03/2008].

SMALL ENTERPRISE FOUNDATION. S.a. *The Small Enterprise Foundation*. [Online] Available from: <http://womensnet.org.za/enterprise/sef.html> [Accessed: 13/06/2008].

SME SURVEY. 2004. *South Africa's SMEs buoyant*. [Online] Available from: <http://www.theworx.biz/sme04a.htm> [Accessed:03/05/2008].

SME SURVEY. 2007. *Executive Summary*. [Online] Available from: <http://www.smesurvey.co.za> [Accessed: 20/05/2008].

SME SURVEY. 2007. *Technology makes the South African SME competitive*. [Online] Available from: [http://www.smesurvey.co.za/content/dynamic.asp?Menu\\_ID=140](http://www.smesurvey.co.za/content/dynamic.asp?Menu_ID=140) [Accessed: 20/05/2008].

SME SURVEY, 2007. *IT for competitive advantage*. [Online] Available from: [http://www.smesurvey.co.za/content/dynamic.asp?Menu\\_Id=38](http://www.smesurvey.co.za/content/dynamic.asp?Menu_Id=38) [Accessed: 20/05/2008].

SME SURVEY. 2007. *What keeps you up at night?* [Online] Available from: [http://www.smesurvet.co.za/content/dynamic.asp?Menu\\_Id=34](http://www.smesurvet.co.za/content/dynamic.asp?Menu_Id=34) [Accessed: 20/05/2008].

SNYMAN, A., SAAYMAN, M. & ALIE, W. 2008. *Evaluating the efficacy of a government funded SME-programme in tourism in the Republic of South Africa*. [Online] Available from: [www.iipt.org/.../Concurrent/Presentations/Micro-Enterprise/Snyman&Alie-Presentation.pdf](http://www.iipt.org/.../Concurrent/Presentations/Micro-Enterprise/Snyman&Alie-Presentation.pdf) [Accessed: 05/03/2008].

SOUTH AFRICA. Department of Trade and Industry. 2006. *SEDA Technology Programme (stp)*. [Online] Available from: <http://www.thedti.gov.za/offering/offering.asp?offeringid=762> [Accessed: 16/05/2008].

SOUTH AFRICA. Department: of Trade and Industry. 2007. *Integrated Strategy on the Promotion of Entrepreneurship and Small Enterprises*. [Online] Available from: [www.dti.gov.za/smme/07AnnualBusinessSummit.htm](http://www.dti.gov.za/smme/07AnnualBusinessSummit.htm) [Accessed: 27/03/2008].

SOUTH AFRICA. 1996. *National Small Business Act, 1996*. [Online]. Available from: <http://www.info.gov.za/acts/1996/a102-96pdf> [Accessed: 26/03/2008].

SOUTH AFRICA. 2003. *National Small Business Amendment Act, 2003*. [Online]. Available from: <http://www.info.gov.za/gazette/acts/2003/a26-03pdf> [Accessed: 26/03/2008].

STEYN,H., BASSON, G., CARRUTHERS, M., DU PLESSIS, Y., PROZESKY-KUSCHKE, B., KRUGER, D., VAN ECK, S & VISSER, K. 2003. *Project Management: A Multi-Disciplinary Approach*. Pretoria: FPM Publishing.

ten HAVE, S., ten HAVE, W., STEVENS, F., van der ELST, M. & POL-COYNE, F. 2003. *Key Management Models*. London: Prentice Hall.

TSHUMISANO TRUST. 2004/5. *KPI Report: Enhancing SMME Competitiveness Through Technology*. [Online]. Available from: <http://www.tshumisano.co.za/beta/PDF/KPI-Report2005.pdf> [Accessed: 26/03/08].

TYALI, L. 2003. *SBP News Archive 2003: Special support for Limpopo Province small businesses*. [Online] Available from: [www-za.sbp.org.za/docs/News%202003.pdf](http://www-za.sbp.org.za/docs/News%202003.pdf) [Accessed: 27/03/2008].

WIKIPEDIA. 2008. *PDCA*. [Online] Available from: [http://en.wikipedia.org/wiki/Shewhart\\_cycle](http://en.wikipedia.org/wiki/Shewhart_cycle) [Accessed: 12/05/2008].

WILLIAMS, P. 2007. *Introduction to IM2 – Innovation Maturity Model*. [Online]. Available from: [www.thinkforachange.com/IM2Model.htm](http://www.thinkforachange.com/IM2Model.htm) [Accessed: 20/02/2008].