



**Managing New Product Development Processes:
An Innovative Approach for SMEs**

by

Bingwen, Yan

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Supervisor: Prof. O. D. Makinde

Co Supervisor: Dr. O. S. Franks

Bellville

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DECLARATION

I, Yan Bingwen, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed: 

Date: 6 November 2010

ABSTRACT

Many companies are currently focusing on how to stay innovative, how to innovate and how to create an innovation climate in their companies. Why is innovation vital to companies? New Product Development (NPD) can be a key factor in this regard. Companies believe that NPD is their life blood; it can be the better way to survive firmly and be more competitive. In addition, the strategy of how to manage NPD process effectively and efficiently is becoming a powerful way of achieving a competitive edge. As Small and Medium Enterprises (SMEs) play a significant role in South African economic development, it is critical for companies especially (SMEs) to seek an ideal way to manage innovation productively. However, to be innovative is not easy for any organization and it should be managed effectively.

The effective management of innovation and NPD in SMEs is investigated in this study. Innovation and NPD has already become the key drivers of sustainability and competitiveness for many companies especially SMEs.

Innovation and NPD as the main subjects that are carefully studied, discussed and understood in larger corporations and multinational enterprises. It would appear that the same cannot always be said when it comes to SMEs.

The following research questions can be asked:

- How does the current body of knowledge regarding innovation and NPD influence and impact on innovation and NPD in a SME?
- How does a SME cope with relatively limited resources when attempting to develop a new product?
- How does the informal nature of a SME impact on NPD?
- Does a SME use a structured process to manage NPD?

In the current dynamic manufacturing environment, SMEs must innovate successfully if they wish to maintain a competitive advantage. It is therefore this study attempts to answer the research questions the study comprises:

- an applicable literature survey in the areas of managing innovation and new product development,
- an investigation into the business environment and interaction typical SMEs encounter during new product innovation,
- the development of a proposed model for the NPD process in SMEs,
- an industry acceptability survey of the proposed NPD model and
- a case study of the development of a new product, mapped onto the developed alternative NPD process.

Exploring the literature and discovered:

- a lack of addressing the impact of innovation and NPD on SMEs
- a lack of practical and appropriate guidelines to ensure successful innovative product development in SMEs.

The study proposed a basic NPD management model, which takes the key components of NPD management such as management commitment, employee involvement, product launching strategy, quality assurance, customer satisfaction, and feedback of new products.

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GLOSSARY OF TERMS

A

AMA American Marketing Association

ASGISA Accelerated and Shared Growth Initiative for South Africa

B

BBBEE Broad-Based Black Economic Empowerment

BEE Black Economic Empowerment

C

CI Continuous Improvement

CPI Consumer Price Index

D

DEDT Department of Economic Development and Tourism

DTI Department of Trade and Industry

DTI UK Department of Trade and Industry, UK

E

EIU Economist Intelligence Unit

F

G

GDP Gross Domestic Product

H

I

IPA Institute of Personnel Management

IMF International Monetary Fund

J

JIPSA Joint Initiative on Priority Skills Acquisition

K

L

LPD Lean Product Development

M

N

NPD New Product Development

O~P

Q

QLFS Quarterly Labour Force Survey

R

S

SACOB South African Chamber of Business

SAMI South Africa's Mineral Industry

SARB South African Reserve Bank

SEDA

Small Enterprise Development Agency

SMME and SME

In South Africa, the Department of Labour uses the acronym SMME for Small, Micro and Medium Enterprises and SME as Small, Medium-sized Enterprises.

Stats SA

Statistics South Africa

T~Z

PUBLICATIONS

This study has contributed to the following publications:

1. Yan, B., and Makinde, O, D. (2010). Impact of Continuous Improvement on New Product Development within SMEs in the Western Cape, South Africa. Accepted by African Journal of Business Management. AJBM-10-728. Publication is in progress.
2. Maladzhi, W.R., Jacobs, K., Yan, B., and Makinde, O.D. (2010). Improving New Product Development through Innovative Leadership Qualities within SMEs. Journal of Economic Computation and Economic Cybernetics Studies and Research, 44(2):175-186.
3. Yan, B., and Makinde, O, D. (2009). Modelling the Long Term Impact of Existing Products on Perceived Value of New Products. Conference proceeding of the IEEM 2009 International conference, Hongkong, December 2009. 978-1-4244-4870-8/09/\$26.00 ©2009 IEEE, pp.1136-1140.
4. Yan, B. (2010). An Approach to New Product Development Management in SMEs. Conference proceeding of the IEEM 2010 International conference, Macao, December 2010. 978-1-4244-8502-4/10/\$26.00 ©2010 IEEE, pp.1072-1076.
5. Yan, B., and McLaren, P. (2010). Measuring After-sales Service Quality in Automobile Retails: an Application of the SERVQUAL Instruments. Conference proceeding of the IEEM 2010 International conference, Macao, December 2010. 978-1-4244-8502-4/10/\$26.00 ©2010 IEEE, pp.2090-2094.
6. Yan, B., and Jacobs, K. (2009). Evaluating Employee Responses to the Lean Enterprise System at a Manufacturing Company in Cape Town, South Africa. International Journal of Control and Automation. 2(1):11-22.

CHAPTER 1: GENERAL ORIENTATION OF THE STUDY

1.1 INTRODUCTION

This study reports the findings on the critical components of managing New Product Development (NPD) process within Small and Medium-sized Enterprises (SMEs) in South Africa. NPD is the process of designing and launching new products / services into the market, products that are original, improved or brand new by means of research and development activities. NPD is probably the most important process for many companies as it improves and develops the company's innovativeness. In essence, NPD is a source of attracting customers once the developed products have a high quality. This chapter provides a general orientation of the study. It contains the background of the study, a formulation of the research questions, an articulation of the research aims, objectives and related significance of the study, statement of the purpose and scope of the study, selection of research philosophy and methodology. This chapter also provides an overview of South Africa's economy and the overall situation of SMEs' contribution to the national economy.

1.2 BACKGROUND OF THE STUDY

NPD studies are markedly broad. Over the past decades, a number of researchers (such as Cooper, 1979b; Cooper and Kleinschmidt, 1987, 1993a; Maidique and Zirger, 1984) investigated many aspects of innovation. What emerged from such work was that one of the key themes in innovation research was to identify the factors that are associated with NPD success. In facing vigorous competition globally, many manufacturing and engineering companies have adopted various techniques or advanced methods in order to be innovative and competitive. Although NPD brought many new opportunities to companies, however, the potential risks underpin the NPD process causes

a number of cases of failure due the inadequate management process in NPD. Empirical studies thus point to high failure rates of new products, especially in consumer markets (Brockhoff, 1999; Crawford, 1987; Urban and Hauser, 1993). It is therefore development of an effective and efficient management approach in NPD process is highly expected to companies, particularly those small and vulnerable businesses.

SMEs are being increasingly recognised as “the life blood of modern economies” (Ghobadian and Gallea, 1996). The situation of World Economic Crisis in the recent years, it also affected South Africa’s economic development, where poverty and wastage of valuable resources, of both human and capital natural are the main challenges.

Many SMEs are under high pressure to survive under these economic circumstances. They are struggling with innovations and many of them have failed. The reasons that caused these failures are because SMEs lack the necessary skills and rarely produce successful new products. An analysis by Zhang and Doll (2001) showed that most products do not fail at the end but at the beginning of their manufacturing process. In other words, the product is poorly conceived and the processes are not well managed, focused and with purpose. Khurana and Rosenthal (1998) suggested that the real key to product development success lies in the successful performance of the front-end activities. Furthermore, Cooper (1997) posited that unclear product strategy is one of the most common problems in NPD. Statistics show that 75 per cent of NPD projects fail and 50 per cent of resources devoted to innovation are spent on products that are commercial failures (Cooper, 1990). The strategic solution is to effectively manage the NPD process.

NPD can be a costly, lengthy and complex process with many pitfalls and problems. There are limited resources and choices for SMEs to be innovative regarding NPD. Hence, it is required that SMEs have the necessary knowledge, skills, good understanding of new products and ability to manage NPD process. Currently, there are scant studies focused on the minimum level of knowledge and skills for South African SMEs to manage their NPD

process. In this regard, therefore understanding of the key elements and identifying minimum requirements for successful NPD is crucial to SMEs. Thus, if companies wish to maintain competitiveness and grow steadily, they need adhere to a basic NPD model which covers key components for effective NPD management. NPD is one of the key drivers of sustainability and competitiveness for many companies especially SMEs.

1.3 STATEMENT OF RESEARCH QUESTIONS

Why is innovation crucial to SMEs? One of the essential viewpoints is that innovation contains a number of factors associated with NPD success. In this regard, NPD is a key factor in SMEs. The strategy of creating an effective and efficient NPD process for SMEs is paramount to achieving a competitive edge. When dealing with the development of a new product they should be mindful of the risks of waste and inefficiency creeping at any stage. Otherwise, once the new product enters the manufacturing stage and reaches the customer in poor quality and performance weaknesses, as a result of inefficient design and development activity, it can be the road to ruin for the company.

It is well documented in the literature that successful innovation and NPD often depend on their effective and creative collaboration across functional and disciplinary barriers in an organization. It has been shown that companies interact intensively with their customers are successful. Therefore, this study embarked on the development of a NPD management model for SMEs, the following research questions can be asked:

- How does the current body of knowledge regarding innovation and NPD impact on NPD management in SMEs?
- How does a SME cope with relatively limited resources when attempting to develop a new product?
- How does the informal nature of a SME impact on NPD?

- What are the key components in managing NPD processes within SMEs?
- Why it is important for SMEs to follow a structured process to manage their NPD?

1.4 SOUTH AFRICA'S ECONOMY

This section provides an overview of South Africa's economy in terms of gross domestic product (GDP) growth rates and trends. GDP is one of the critical elements in measuring industrial development. In particular, GDP is an important output of a country's national accounts and a key indicator to reflect change in economic growth. For a better understanding of the influence of GDP trends in South Africa, this section explored the available information of GDP, the trend of real GDP and discussed the key industrial sectors that are relevant to the currently study. The key sectors includes primary sector, secondary sector tertiary sector, and non-agriculture sector are discussed. Finally the status of employment in South Africa was explored.

1.4.1 GDP Trend in South Africa

South Africa although being a world leader in mining, dominating many sectors in the global industry, its mining sector does not contribute as significant as others. According to the 2002 annual review by the Chamber of Mines, South African mining continues to be the most important earner of foreign exchange. Gold accounts for one-third of all exports. Other mined products include manganese, chrome, platinum, coal and diamonds. According to table 1.1, the manufacturing sector was 20 per cent in 2001, accounting for one-fifth of the GDP. The main economic pillars of South Africa (manufacturing, services and trade sectors) for the period of 1994 to 2001, and their roles in terms of their contribution to South African GDP during the period.

Table 1. 1: Comparison of Contributions to GDP

Economic Sector	Contribution to GDP (1994)	Contribution to GDP (2001)
Primary		
Agriculture, forestry and fishing	5.0%	4.2%
Mining and quarrying	7.4%	5.8%
Secondary		
Manufacturing	20.5%	20.0%
Tertiary		
Trade, tourism, catering and hotel	14.0%	13.7%
Financial, real estate and business services	16.3%	19.6%

Source: Stats SA, *Gross Domestic Product, 2nd quarter 2002*.

Metals, engineering and auto, especially steel related products led the sector. The service industry, another most important contributor to GDP, includes finance, tourism and the retail sector. The contributions of the agriculture, forestry and fishing sector were 5.0 per cent and 4.2 per cent in 1994 and 2001 respectively.

According to *EIU South Africa Country Report September 2002*, GDP growth in South Africa declined from a high of 2.6 per cent in 1997 to a low of 0.8 per cent in 1998. Table 1.2 shows that the economy recovered in 1999 and the trend continued into 2000 where GDP growth reached 3.4 per cent, largely due to good performances in the manufacturing and export sectors, government's policies of fiscal discipline, loosening of exchange controls, and tax reforms. However, the economy's pace tapered off in 2001 and grew by 2.2 per cent, which was less than the forecast. Both the continued slowdown in global economic activity and the sharp decline in gold and platinum prices contributed to the slower growth in 2001. Preliminary indicators for the first quarter of 2002 showed GDP growth at 2.2 per cent quarter-on-quarter.

Table 1. 2: South Africa: Real GDP growth

Year	1997	1998	1999	2000	2001
GDP at constant 1995 prices (R bn)	683.7	735.5	802.8	887.8	975.1
Real GDP growth	2.6%	0.8%	2.1%	3.4%	2.2%

Source: *EIU South Africa Country Report September 2002*

A report of the International Monetary Fund (IMF, 2007) shows the selected South African economic indicators. In spite of the indicator of GDP that is shown in Table 1.3, there are also other indicators such as CPI (metropolitan areas, annual average), broad money, unemployment rate (percent), national government budget balance (percent of GDP), national government debt (percent of GDP), external current account balance (percent of GDP), and External debt (percent of GDP), etc. The Real GDP is the benchmarked figure through which all other indicators are calculated. Thus, this section will cover more detailed discussion of the real GDP.

Table 1.3 indicates the selected economic indicators during the period of 2003 to 2007 in South Africa. In 2003, the real GDP in South Africa was 3.1, which grew by 5 per cent in 2006 and continued to grow by 4.8 percent in the first quarter of 2007, indicating that conditions for business remained favourable.

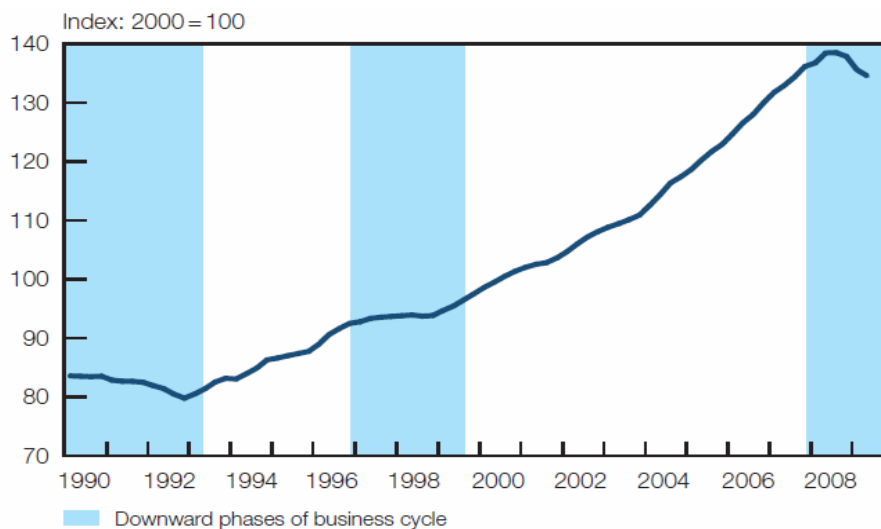
Table 1. 3: South Africa: selected economic indicators (2003-2007)

	2003	2004	2005	2006	2007 Proj.
Real GDP	3.1	4.8	5.1	5	4.8
CPI (metropolitan areas, annual average)	5.8	1.4	3.4	4.7	6.3
CPIX ^{1,2}	4	4.3	4	5	6.1
Broad money ²	12.9	13.1	20.5	22.5	22.3
Unemployment rate (percent)	28	26.2	26.7	25.5	24.2
National government budget balance (% of GDP) ³	-2	-1.7	-0.6	0.4	0.7
National government debt (percent of GDP) ³	35.4	35.1	33.9	31.4	28.3
External current account balance (% of GDP)	-1.1	-3.2	-4	-6.5	-6.5
External debt (percent of GDP)	22.9	20.1	19.1	22.4	21.7
Gross reserves (SARB, in months of next year's total imports)	1.6	2.6	2.9	3.3	3.5
International liquidity position of SARB (billions of U.S. dollars) ²	4.8	11.4	17.2	23	26
U.S. dollar exchange rate (rand per U.S. dollar) ²	6.64	5.63	6.33	6.97	...

(Sources: South African Reserve Bank; IMF, International Financial Statistics; and staff estimates and projections)

1. The CPIX is equal to the CPI excluding interest payments on mortgage loans.
2. End of period.
3. Calendar year.

The latest data of South African GDP can be found from the Annual Report 31 March 2009 of South African Reserve Bank (SARB). Figure 1.1 showed a general trend of South African real GDP from 1990 to 2008, it basically indicated that the real GDP was risen up since 1993 until 2008.



**Figure 1. 1 Real gross domestic product
(Source: SARB, Annual Report 2008/09)**

According to the report, after 40 quarters of uninterrupted economic growth, South Africa's real gross domestic product declined at a seasonally adjusted and annualised rate of 1,8 per cent in the fourth quarter of 2008. The report further indicated that in the first half of 2009, real gross domestic product contracted at an annualised rate of 4,5 per cent. This could be attributed to the sharp and synchronised decline in global economic activity during the second half of 2008, which continued into the first half of 2009 (SARB, 2008/09).

Real gross domestic product increased at an average annualised rate of about 4 per cent from the final quarter of 1999 to the final quarter of 2007 (SARB, 2008/09). This was notably higher than the growth rate of 3,1 per cent

registered in the upward phases of 1986–1989 and 3,7 per cent registered in 1993–1996, but less than the growth rate of 5,3 per cent attained in the upward phases of 1978–1981 and 6,4 per cent in 1983–1984 (SARB, 2008/09). Real growth ran out of steam in the first three quarters of 2008, falling below trend and signalling the onset of a downswing, which intensified as growth subsequently turned negative: On balance, the level of real gross domestic product in the second quarter of 2009 shrank by 3 per cent compared with its recent peak in the third quarter of 2008, reflecting the negative impact of the deep recession in the world economy (SARB, 2008/09).

1.4.2 The Key Economic Sectors in South Africa

In South Africa, there are four main economic sectors that is categorised table 1.4, which including primary sector (agriculture and mining), secondary sector (manufacturing, construction, electricity, gas and water), tertiary sector (commerce, transport and communication, financial and other services), and non-agricultural sector (SARB, 2008/09).

Table 1. 4: Real GDP (%) change at seasonally adjusted annualised rates

Sectors	2007		2008		2009	
	Year	1st half	2nd half	Year	1st half	
Primary sector	0,8	-2,1	7,5	0,9	-11,8	
Agriculture.....	2,9	20,4	23,9	18,8	-2,3	
Mining	0,0	-11,0	-0,2	-6,5	-16,8	
Secondary sector	6,1	5,8	-3,5	2,9	-12,7	
Manufacturing	4,5	5,4	-7,4	1,2	-19,4	
Electricity, gas and water.....	3,0	-3,6	0,3	-1,2	-5,0	
Construction	17,1	13,6	12,4	13,9	13,1	
Tertiary sector.....	5,4	3,4	1,9	3,5	-0,1	
Commerce	5,2	1,5	-4,5	0,5	-2,4	
Transport and communication.....	5,6	3,7	3,8	4,0	-0,7	
Financial and other services	6,8	4,1	3,2	5,0	-1,0	
Non-agricultural sector	5,2	3,1	0,4	2,8	-4,2	
Total	5,1	3,5	0,9	3,1	-4,5	

Source: SARB, Annual Report 2008/2009

A sectoral analysis during the prolonged 1999–2007 upward phase of the business cycle, the growth in real gross domestic product was widely spread

among the main sectors, with the exception of the mining industry where production, on balance, rose very little (SARB, 2008/09).

According to table 1.4, in comparing real value added by the secondary and tertiary sectors, it showed a rapidly increase at average annualised rates of 4,5 per cent and 4,7 per cent, respectively. The onset of the current downward phase of the business cycle mainly manifested itself in declines in real value added by the manufacturing and commerce sectors, and in the further deterioration in mining production in the course of 2008 (SARB, 2008/09). By the early months of 2009, the adverse impact of the recession was clearly evident as the declines in real value added became broad-based. Consequently, with the exception of construction, and community, social and personal services, all other sectors of the economy contracted in the first half of 2009 when compared with their counterparts in the second half of 2008.

1.4.2.1 Primary Sector

The primary sector is consists of agriculture and mining industries in South Africa. This has discussed below.

Agricultural Sector

South Africa has a dual agricultural economy: a well-developed commercial sector and a predominantly subsistence sector. In the agricultural sector, according to the SARB (2008/09) Annual Report, real value added declined at an annualised rate of 2,3 per cent in the first half of 2009, compared with an increase of 23,9 per cent recorded in the second half of 2008.

Farmers not only experienced a decline in the production of maize, but also a more general moderation in the growth of their gross income from livestock, field crops and horticultural production as they were adversely affected by the deterioration in the terms of trade in the agricultural sector (SARB, 2008/09).

Mining Sector

South Africa is a world leader in mining, it has the world's largest resources of platinum-group- metals (87,7 percent) of world total, manganese (80 percent), chromium (72,4 percent), gold (40 percent) and alumino-silicates (SAMI, 2008). South Africa also accounts for over 40 percent of the global production of the following mineral commodities: ferrochromium, platinum-group-metals and vanadium. It is also the world's leading producer of chrome ore, vermiculite and alumino-silicates, and is among the top three producers of gold, manganese ore, titanium minerals and fluorspar (SAMI, 2008). The country is famous for its abundance of mineral resources, accounting for a significant proportion of world production and reserves, and South African mining companies are key players in the global industry.

Base on the table 1.4, the mining sector proceeded at an annual rate of 6,5 per cent in 2008, however, it became more pronounced as it shrank at an annualized rate of 16,8 per cent in the first half of 2009, mainly on account of a decline in output volumes of the non-gold segment of the industry duo to the buoyant foreign demand for basic metal and mineral products, still evident in the early part of 2008. It reversed quickly from the middle of 2008 when the global financial crisis led to a recession in many countries. These demand constraints, coupled with the sharp decline in commodity prices, subsequently prompted the South African mining industry to scale down output.

1.4.2.3 Secondary Sector

The secondary sector includes manufacturing, construction, electricity, gas and water industries. This sector has a majority numbers of Small, Micro, Medium-sized Enterprises (SMMEs), which has a significant contributions to the national economy. Thus this section provides a broad discussion on the manufacturing sector.

Manufacturing Sector

South Africa has a considerably developed, established and diversified manufacturing industry sector. Since 1994 the country's manufacturing sector has particularly focused on creating employment opportunities and fostering economic empowerment, along with the objective of advancing economic growth in the country (MBendi, 2010).

The manufacturing sector has a more positive support base (Rogerson, 2004). This sector has created a view in increasing the competitiveness of South African manufacturing economy both in regional and worldwide. Rogerson (2004) commented that the vast range of objectives for small business support has not helped develop a focused approach. Manufacturing production contracted markedly during the past year, its quarter-to-quarter rate of decline accelerating from 9,4 per cent in the third quarter of 2008 to annualised rates of no less than 22 per cent in the subsequent two quarters before moderating somewhat to about 10,9 per cent in the second quarter of 2009 (SARB, 2008/09). The decline in manufacturing output essentially reflected weaker demand, both domestically and from abroad. Manufacturers responded to the weaker demand by cutting output even more than the fall in demand and, consequently, reducing inventories, thereby accentuate the near-term downturn.

According to table 1.4, the real GDP-Percentage change at seasonally adjusted annualised rates for the 1st half of 2009 has declined to 19.5 negatively. The decline in manufacturing production brought about a substantial reduction in the pressures on the stock of capital and labour resources employed in the sector. As a result, the utilisation of production capacity fell sharply from an average of 82,7 per cent in the second half of 2008 to 78 per cent in the first half of 2009 (SARB, 2008/09). Estimates indicate that labour productivity has also declined recently, confirming that businesses are using their inputs substantially less intensively. Real value added by the sector supplying electricity, gas and water declined at an annual rate of 1,2 per cent in 2008, compared with an increase of 3 per cent registered in 2007. This decline in output was mainly the result of the

curtailment of electricity supply and periodic load shedding, following the capacity constraints experienced by Eskom since the beginning of 2008, amplified by weakening demand towards the end of the year. In addition, real output in the subsector responsible for water supply was negatively affected by the abundant rain and relatively cooler weather conditions experienced in the first half of 2009.

According to 2010/11 – 2012/13 Industrial Policy Action Plan (IPAP) by DTI (2010), manufacturing accounts for the biggest share of the production sectors of the economy, for example, it was 54.3 per cent in 2008. In terms of manufacturing sector, particularly in automobile and motor manufacturing industry, it has been showed that the automotive sector has grown more than doubled in size since 1994. However, it still remains certain challenges such as localisation and employment generation (DTI, 2010).

The natural resource-based sectors have also demonstrated relatively strong growth (DTI, 2010). For example, the capital- and energy-intensive sectors, most of them were well-established through a variety of apartheid-era industrial policies. According to Figure 1.2, a number of manufacturing and automotives companies have grown considerably since 1994. These companies have become worldwide recognised and competitive such as petro-chemicals, steel, aluminium, paper and pulp, and cement (DTI, 2010).

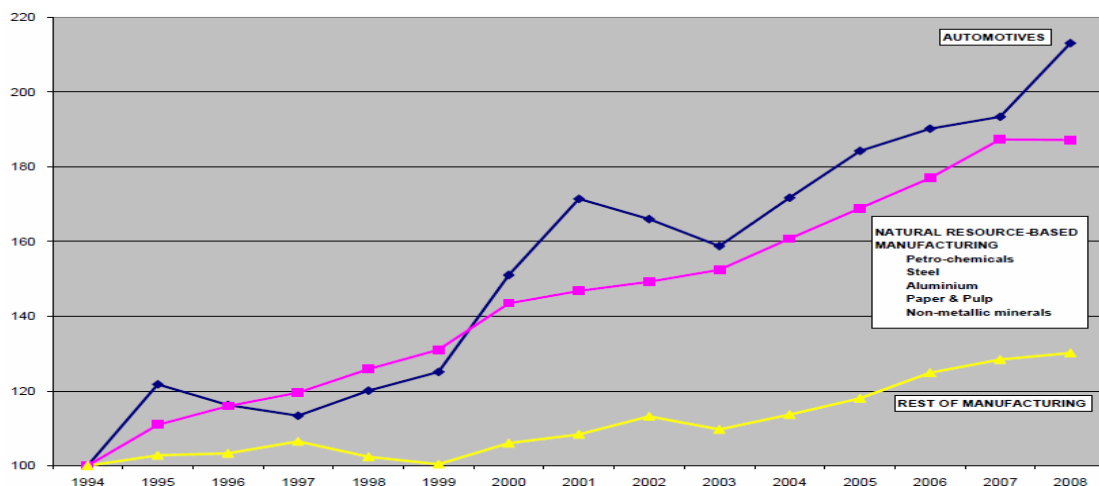


Figure 1. 2: Manufacturing growth 1994 -2008, indexed (1994=100)
 (Source: Quantec)

The impact in South Africa has been experienced across all major catalogs with production declining accompanied by considerable job losses across the major employment sectors (DTI, 2010:13). Figure 1.3 indicates that the physical volume of production in manufacturing sector has turned down drastically as a result of the crisis and remains below the level of 2005.

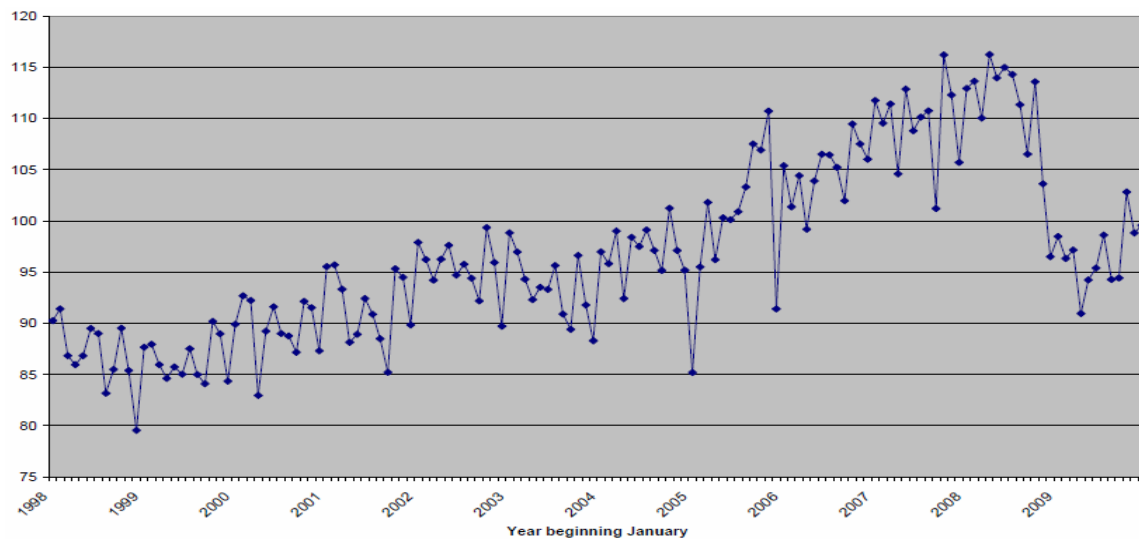


Figure 1. 3: Physical volume of manufacturing production: indexed to 2005=100 (Source: Stats SA)

According to DTI (2010), within the manufacturing sector, the largest sub-sectors have been affected considerably, and the massive majority of the 27 manufacturing sub-sectors experienced declining rates of production in the fourth quarter of 2009 compared to the same period in 2008. Furthermore, the major declines were experienced by large sectors such as autos, basic chemicals and other fabricated metal products, these sectors account for almost 25 per cent of manufacturing production, and total manufacturing production declined by 4 per cent during that period (DTI, 2010).

Construction Sector

The contraction in real value added by the mining sector proceeded at an annual rate of 6,5 per cent in 2008, but became more pronounced as it shrank at an annualised rate of 16,8 per cent in the first half of 2009, mainly on account of a decline in output volumes of the non-gold segment of the industry

(SARB, 2008/09). Construction is one of the sectors most severely affected by the recession.

According to SARB (2008/09), growth in real value added by contractors in the construction industry remained positive, accelerating from 12, 4 per cent in the second half of 2008 to 13, 1 per cent in the first half of 2009. Although contractors benefited from the work generated by the capital expansion programmes of general government and public corporations, the decline in residential building activity impacted adversely on the value added by the sector. In addition, activity of construction companies was also hampered by the reduced availability of debt finance for new and existing construction projects.

In contrast to the marked declines in real value added by the primary and secondary sectors in the first half of 2009, the real value added by the tertiary sector declined marginally. As the largest component – contributing around 63 per cent of aggregate gross domestic product – the performance of the services sector helped to cushion the severe decline in real economic activity in the first half of 2009 (SARB, 2008/09).

In order to contribute to the economy development, the construction industry needs to participate in the effort to meet rapid socio-economic development in South Africa. The industry need to provide affordable basic construction items of reasonable quality.

Electricity, gas and water

Real value added by the sector supplying electricity, gas and water declined at an annual rate of 1,2 per cent in 2008, compared with an increase of 3 per cent registered in 2007 (SARB, 2008/09). This decline in output was mainly the result of the curtailment of electricity supply and periodic load shedding, following the capacity constraints experienced by Eskom since the beginning of 2008, amplified by weakening demand towards the end of the year.

In the first half of 2009 output declined further at an annualised rate of 5 per cent – broadly in line with the progressive deterioration in real economic output and the subsequent slowdown in domestic demand. In addition, real output in the subsector responsible for water supply was negatively affected by the abundant rain and relatively cooler weather conditions experienced in the first half of 2009 (SARB, 2008/09).

1.4.2.4 Tertiary Sector

The tertiary sector includes commerce, transport and communication, financial and other services, and (SARB, 2008/09). In contrast to the marked declines in real value added by the primary and secondary sectors in the first half of 2009, the real value added by the tertiary sector declined marginally. As the largest component – contributing around 63 per cent of aggregate gross domestic product – the performance of the services sector helped to cushion the severe decline in real economic activity in the first half of 2009 (SARB, 2008/09).

SARB (2008/09) indicates that the relative stability of the tertiary sector stemmed from robust growth in real value added by the subsector community, social and personal services, which increased at an annualised rate of 3 per cent in the first half of 2009. However, real value added by the sectors supplying transport, storage and communication as well as financial services contracted moderately in the first half of 2009. This was broadly in keeping with the decline in domestic and foreign merchandise trade volumes, the subdued performance of the equity and fixed property markets, and the fact that the declining trend in interest rates and the slowdown in credit extension put a squeeze on the profit margins of financial institutions (SARB, 2008/09).

1.4.2.5 Non-agricultural Sector

The more pronounced decline in net inventory investment from the middle of 2008 was the result of a sharp reduction of inventory levels in the mining, industrial and commercial sectors, overshadowing an increase in agricultural

stocks-in-trade resulting from bumper crops. Consequently, the ratio of industrial and commercial inventories to the non-agricultural gross domestic product declined from nearly 13 per cent in 2008 to an average level of 11,1 per cent in the first half of 2009 (SARB, 2008/09).

1.4.3 Employment in Manufacturing Sector

The manufacturing sector accounts for 15 per cent of the South African economy and hence is a huge source of employment for the country. The sector is diversified, dominated by the agro-processing, mining, automotive and clothing and textiles industries. According to DTI (2010), however, the main impact of the crisis has been experienced in employment due to the jobs losses in the recent years, and it has affected the South African economy since the fourth-quarter of 2008.

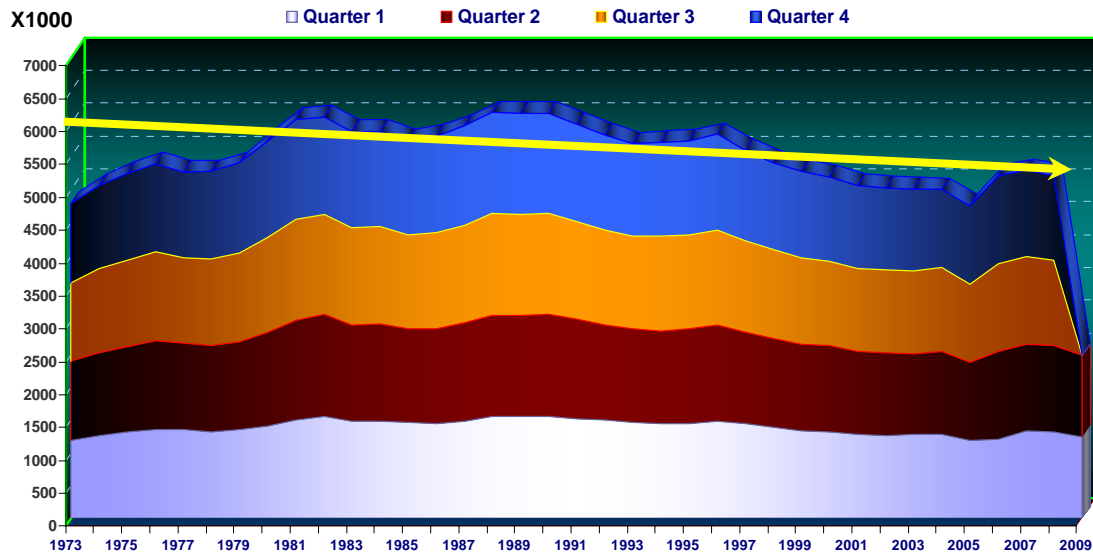
Table 1.5 provides a detailed numbers of employees in the manufacturing sector from March 1973 to June 2009. There were four quarters of each year that presented in the table beside 2009. Based on table 1.5, a general trend of the employment status in the manufacturing sector was analysed by the researcher as showed in Figure 1.4. The trend shows that the number of employees in manufacturing sector has declined since 1981 to the second quarter of 2009.

According to SARB (2008/09), the South African labour market did not escape the dire consequences of the financial market turmoil that intensified and rapidly spread across the globe in the closing months of 2008. The subsequent growth-inhibiting effects and concomitant decline in world commodity prices reduced export earnings, severely affecting employment levels in especially the export-oriented sectors of the domestic economy. Employment losses, particularly in the manufacturing and gold-mining sectors, suppressed growth in overall employment in the formal non-agricultural sector in 2008.

Table 1. 5: Employment in Manufacturing Sector (March 1973~June 2009)

Number	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1973	1,184,100	1,189,000	1,201,300	1,201,700
1974	1,249,000	1,259,800	1,271,900	1,267,700
1975	1,295,100	1,307,600	1,316,000	1,319,500
1976	1,340,500	1,355,205	1,347,800	1,336,100
1977	1,332,400	1,317,200	1,305,500	1,296,500
1978	1,303,700	1,312,100	1,322,000	1,321,400
1979	1,335,400	1,332,743	1,351,600	1,372,900
1980	1,403,800	1,421,400	1,444,222	1,460,522
1981	1,489,422	1,508,322	1,530,722	1,530,322
1982	1,547,922	1,542,618	1,518,222	1,485,427
1983	1,472,227	1,465,827	1,467,827	1,469,839
1984	1,474,739	1,477,940	1,474,442	1,449,042
1985	1,441,037	1,428,988	1,426,001	1,433,866
1986	1,439,629	1,442,892	1,454,257	1,461,821
1987	1,475,685	1,482,640	1,494,804	1,506,667
1988	1,533,012	1,537,389	1,548,855	1,538,946
1989	1,537,887	1,537,974	1,537,561	1,534,573
1990	1,548,939	1,537,511	1,534,362	1,525,247
1991	1,513,464	1,499,484	1,492,366	1,482,960
1992	1,478,608	1,453,151	1,442,467	1,443,217
1993	1,441,598	1,425,626	1,417,818	1,397,079
1994	1,422,695	1,421,815	1,431,699	1,431,972
1995	1,435,162	1,437,553	1,433,377	1,417,940
1996	1,472,087	1,456,367	1,445,487	1,451,629
1997	1,427,508	1,395,636	1,388,665	1,373,906
1998	1,370,827	1,351,568	1,352,919	1,327,823
1999	1,324,016	1,314,488	1,308,376	1,316,010
2000	1,303,717	1,306,795	1,294,590	1,279,560
2001	1,266,059	1,259,672	1,264,826	1,259,936
2002	1,252,717	1,261,309	1,250,028	1,252,596
2003	1,261,730	1,237,013	1,247,065	1,255,242
2004	1,265,037	1,265,357	1,281,867	1,178,342
2005	1,175,643	1,182,057	1,188,696	1,195,421
2006	1,199,794	1,331,332	1,334,258	1,332,753
2007	1,322,103	1,323,498	1,317,528	1,314,982
2008	1,312,405	1,306,586	1,299,846	1,275,421
2009	1,239,455	1,225,243		

(Source: DTI, 2010)



**Figure 1. 4: Total number of employees in manufacturing sector
(March 1973~June 2009)
(Source: DTI, 2010)**

According to IPAP 2010/11 - 2012/13, formal employment growth has come predominantly from the services sector in recent years, particularly in the wholesale and retail and business services sectors (DTI, 2010). Wholesale and retail employment growth has been as a consequence of massive and unsustainable private credit extension, leading to a widening current account deficit; business services employment growth has been driven predominantly by two factors: the outsourcing of activities such as logistics and catering; and the growth in the private security sector (DTI, 2010).

DTI (2010) further indicated that the unsustainable dependence of retail and wholesale employment growth on private credit extension rather than income growth in productive sectors has been demonstrated by the large reversals of employment in this sector in the light of the collapse in credit extension as a consequence of the economic crisis.

According to Stats SA, QLFS, a latest data of employment in each sector is showed in Table 1.6 that manufacturing sector has declined in the comparison with 2008. It was 1,944,000 from October to the end of 2008, and in the same time period in 2009 was 1,742,000.

Table 1. 6: Employment losses across economy

	October-December 2008	October-December 2009	Year-on-Year change
Agriculture	764 000	615 000	-149 000
Mining	321 000	296 000	-25 000
Manufacturing	1 944 000	1 742 000	-202 000
Utilities	86 000	98 000	12 000
Construction	1 191 000	1 085 000	-106 000
Trade	3 164 000	2 873 000	-291 000
Transport	774 000	739 000	-35 000
Finance	1 636 000	1 759 000	123 000
Community and social services	2 661 000	2 628 000	-33 000
Private households	1 298 000	1 135 000	-163 000
Total	13 844 000	12 974 000	-870 000

(Source: Stats SA, QLFS)

As a result, in order to have a long-term growth in employment, all sectors of the economy need to make efforts to create more jobs, particularly the SME sectors, which led by manufacturing and services.

1.5 CHARACTERISTICS OF SMES

In South Africa, the Department of Labour uses the acronym (SMME) for Small, Micro and Medium Enterprises and SME as Small, Medium Enterprises. SMME economy has been actively promoted since 1995. According to the Department of Economic Development and Tourism (DEDT) (2004), small business employ less than 50 people and medium business employ from 50 to 249 people. The Department of Trade and Industry (DTI) (1996) developed the National Small Business Act (Act 102 of 1996) which provides definitions for various SMME categories. The detailed definition of SMMEs is shown in Table 1.7 below.

Table 1. 7: Definitions of SMMEs given by the National Small Business Act

Enterprise Size	Number of employees	Annual turnover	Gross assets, excluding fixed property
Medium	Fewer than 100 to 200, depending on industry	Less than R4 million to R50 million, depending upon industry	Less than R2 million to R18 million, depending on industry
Small	Fewer than 50	Less than R2 million to R25 million, depending on industry	Less than R2 million to R4,5 million, depending on industry
Very small	Fewer than 10 to 20, depending on industry	Less than R200 000 to R500 000, depending on industry	Less than R150 000 to R500 000, depending on industry
Micro	Fewer than 5	Less than R150 000	Less than R100 000

Source: DTI, 1996

More detailed description of SMME in South Africa is defined by the National Small Business Act in the following five categories:

- **Survivalist enterprises:** *The income generated is less than the minimum income standard or the poverty line. This category is considered pre-entrepreneurial, and it includes hawkers, vendors and subsistence farmers (In practice, survivalist enterprises are often categorized as part of the micro-enterprise sector.)*
- **Micro enterprises:** *The turnover is less than the VAT registration limit (that is, R150, 000 per year). These enterprises usually lack formality in terms of registration. They include, for example, spaza shops, minibus taxis and household industries. They employ no more than five people.*
- **Very small enterprises:** *These are enterprises employing fewer than 10 paid employees, except mining, electricity, manufacturing and construction sectors, in which the figure is 20 employees. These enterprises operate in the formal market and have access to technology.*
- **Small enterprises:** *The upper limit is 50 employees. Small enterprises are generally more established than very small enterprises and exhibit more complex business practices.*
- **Medium enterprises:** *The maximum number of employees is 100, or 200 for the mining, electricity, manufacturing and construction sectors. These enterprises are often characterized by the decentralization of power to an additional management layer.*

According to the DTI (1996), a SMME can be defined as an enterprise, which is owner operated and functions with the primary focus of providing a livelihood for the owner and the immediate employees. A SMME distinguishes itself from 'big business' as it typically has a smaller turnover, marginal asset value, smaller number of employees, simpler organisational structures,

generally lower barriers to entry and, less onerous legal obligations and regulative compliance issues (DTI, 1996). A further distinguishing element of a SMME, when compared to 'big business', according to the DTI (1996), is that often the growth, development and ultimate survival of the SMME hinges on the skills level, morality, innovation and resources applied by its owner.

In this study, presently in the Western Cape, South Africa, many manufacturing companies are involved with NPD in their operations. Most of them need to develop new products in order to achieve sustainability and competitiveness. Hence, it is important for them to perform effectively in their NPD process.

1.6 AIMS AND OBJECTIVES OF THE STUDY

The management of NPD processes within SMEs is incredibly different to what occurs within large companies in terms of resources and capacity. Thus this study aims to investigate the key components of managing NPD process by examining these components and provide a guideline for local SMEs in their NPD management processes.

The objectives of this research are to:

- Explore the theoretical framework for NPD management
- Investigate the current NPD process in SMEs
- Identify the minimum requirements of managing product development towards a successful NPD undertaken within the small manufacturing company setting in the Western Cape, South Africa.
- Develop a basic management model as a guide for SMEs' NPD management.

1.7 SIGNIFICANCE OF THE CURRENT RESEARCH

New product development and innovation are crucial to success of business. The previous studies on the success and failure in NPD discloses a number of

critical success factors that indicate what should be done to enhance new product success rates (Johnes and Snelson, 1988., Montoya-Weiss Calantone, 1994., Cooper, 1994., Cooper and Kleinschmidt, 1995., Lester, 1998). Among these factors, one of the key factors is how a company manages for new products.

The findings of this study have attempted to contribute to the building of new knowledge in terms of theory and practice in new product development. Specifically, this study is significant for several reasons.

Firstly, SMEs will be able to realise the importance of the key components in managing their NPD processes, such as management commitment, employee involvement, new product strategy, product quality, and customer satisfaction. Secondly, this study aims to provide a guideline for SMEs to improve their performance in managing their NPD process. Finally, the researcher hopes that the management model can be adopted by all SMEs as a generic model in South Africa, and increase their contributions to the national economic growth.

1.8 PROPOSITIONS

The propositions of this study seek to accept/reject are as follows:

1. *Management support and commitment*

Proposition 1.1: Management in Successful SMEs is more likely to delegate authority easily than less successful SMEs.

Proposition 1.2: Management in Successful SMEs is not more likely to take personal responsibility to specify the job / process requirements than less successful SMEs.

Proposition 1.3: Management in Successful SMEs is more likely to accept employees' ideas and suggestions on product(s) than less successful SMEs.

Proposition 1.4: Management in Successful SMEs is more likely to support decision making on the NPD process than less successful SMEs.

Proposition 1.5: Management in Successful SMEs is more likely to make available equipment and materials for NPD than less successful SMEs.

Proposition 1.6: Management in Successful SMEs is more likely to offer training opportunities to employees than less successful SMEs.

2. *People involvement*

Proposition 2.1: Employees in Successful SMEs are more likely to contribute ideas for product than less successful SMEs.

Proposition 2.2: Employees in Successful SMEs are more likely to have regular communication with management than less successful SMEs.

Proposition 2.3: Employees in Successful SMEs are more likely to communicate with management easily than less successful SMEs.

Proposition 2.4: Employees in Successful SMEs are more likely to feel at home while they are working in the company than less successful SMEs.

Proposition 2.5: Employees in Successful SMEs are more likely well informed by management about customer requirements than less successful SMEs.

3. *Product strategy*

Proposition 3.1: Management team in Successful SMEs is more likely having a clear vision of the final product during NPD process than less successful SMEs.

Proposition 3.2: Management team in Successful SMEs is more likely to ensure its resource availability for NPD than less successful SMEs.

Proposition 3.3: Successful SMEs are more likely to assess the capability for a new product to be developed than less successful SMEs.

Proposition 3.4: Management in Successful SMEs is more likely to be competent and knowledgeable on NPD than less successful SMEs.

Proposition 3.5: Successful SMEs are more likely to provide training opportunities to develop individuals than less successful SMEs.

Proposition 3.6: Successful SMEs are more likely to seek ideas from customers for NPD than less successful SMEs.

Proposition 3.7: Successful SMEs are more likely to seek ideas for continuous improvement for product(s) from relevant industry than less successful SMEs.

Proposition 3.8: Successful SMEs are more likely to have a NPD management team to support NPD than less successful SMEs.

Proposition 3.9: Successful SMEs are more likely to involve outside experts for NPD when there is a necessity than less successful SMEs.

Proposition 3.10: Management in Successful SMEs is not more likely to concern the cost of carrying R&D team for NPD than less successful SMEs.

Proposition 3.11: Successful SMEs are more likely to embark on market research actively for NPD than less successful SMEs.

Proposition 3.12: Successful SMEs are more likely using the results of market research to make decision for product than less successful SMEs.

Proposition 3.13 Successful SMEs are more likely to have a good working relationship with suppliers than less successful SMEs.

Proposition 3.14: Successful SMEs are more likely to seek ideas from suppliers for NPD than less successful SMEs.

Proposition 3.15: Successful SMEs are more likely to embrace continuous improvement culture in NPD than less successful SMEs.

4. Customer satisfaction

Proposition 4.1: Successful SMEs are more likely to satisfy their customers through the good quality of their product(s) than less successful SMEs.

5. Quality assurance

Proposition 5.1: Successful SMEs are more likely to be stimulated by customer satisfaction through improving the quality of product(s) continuously than less successful SMEs.

Proposition 5.2: Successful SMEs are more likely to discuss with customers with what improvements need to be made than less successful SMEs.

Proposition 5.3: Management in Successful SMEs is more likely to insist on high quality for the products than less successful SMEs.

6. Feedback

Proposition 6.1: Successful SMEs are more likely to enable continuous improvement to take place through the feedback from customers than less successful SMEs.

Proposition 6.2: Successful SMEs are more likely to enable continuous improvement to take place through the feedback from quality assurance process than less successful SMEs.

Demographic variance

Proposition

1. age
2. gender
3. education
4. work experience
5. Job title
6. Industrial sector

1.9 FORMULATION OF RESEARCH PROBLEM

In recent years, the numbers of SMEs that are interested in NPD have increased rapidly. The development of new, innovative products is one of the key factors for both companies and national economic growth. The importance of innovation to corporate NPD success is now firmly established, and is reflected in the continuing interest of how this process might be most effectively and efficiently “managed”.

1.9.1 Problem Statement

Today, within a high competitive manufacturing environment, SMEs must seek new ways to innovate successfully in order to maintain competitive advantage. Many companies have been implementing various processes to stay innovative, however, innovation is a tough task to any organization and it needs to be well managed. It is a necessity for survival in dynamic and complex markets and in uncertain economic circumstances. Therefore, the problem statement of this study is described as: ineffective and inefficient NPD process within SMEs culminating in establishing costs and timeframes to market for new products.

1.10 RESEARCH PHILOSOPHY

The philosophical perspective of the current study does fall into a single domain, either a phenomenological or positivistic paradigm. According to Zuber-Skerritt (2001), the positivist mainly uses quantitative paradigm and the phenomenological, interpretive, mainly are qualitative paradigm of inquiry.

Zuber-Skerritt and Fletcher (2007) highlighted that the phenomenological paradigm assumes that knowledge can be created on the basis of personal and professional experience and reflection on this experience, and that (grounded) theory can be derived from and grounded in experiential data from multiple perspectives and through triangulation of methods. They further stated that for positivists, who believe in “objective truth” and facts that can be researched by detached, neutral observers, action researchers argue that the nature, behaviour and minds of human beings constitute a complex whole, which cannot be observed objectively, or be understood accurately through a part, by outside researchers.

In considering the advantages and disadvantages of various methods, this research selected an integrated method in combining both qualitative and quantitative data to enable triangulation take place.

1.10.1 Dimensions of NPD Management

There were a number of dimensions of NPD management that were discussed in great detail from the current literature. However, many dimensions cannot be applied in SMEs due to their limited resources and capabilities. Thus the key factors which were closely related to NPD management for SMEs are derived from these dimensions and formed the theoretical framework of this study.

The framework of this study contains the six major factors of NPD management is showed in Figure 1.5. The six major factors are: management

support, people involvement, NPD process, NPD strategy, company resources, and continuous improvement.



Figure 1. 5: Six main factors of a successful new product

The definitions of success dimensions from various researchers are listed in Appendix A.

1.11 RESEARCH DESIGN AND METHODOLOGY

1.11.1 Selecting research design or paradigm

This research contains six phases, and each phase carries a single chapter. This is showed by the following diagram (Figure 1.6):

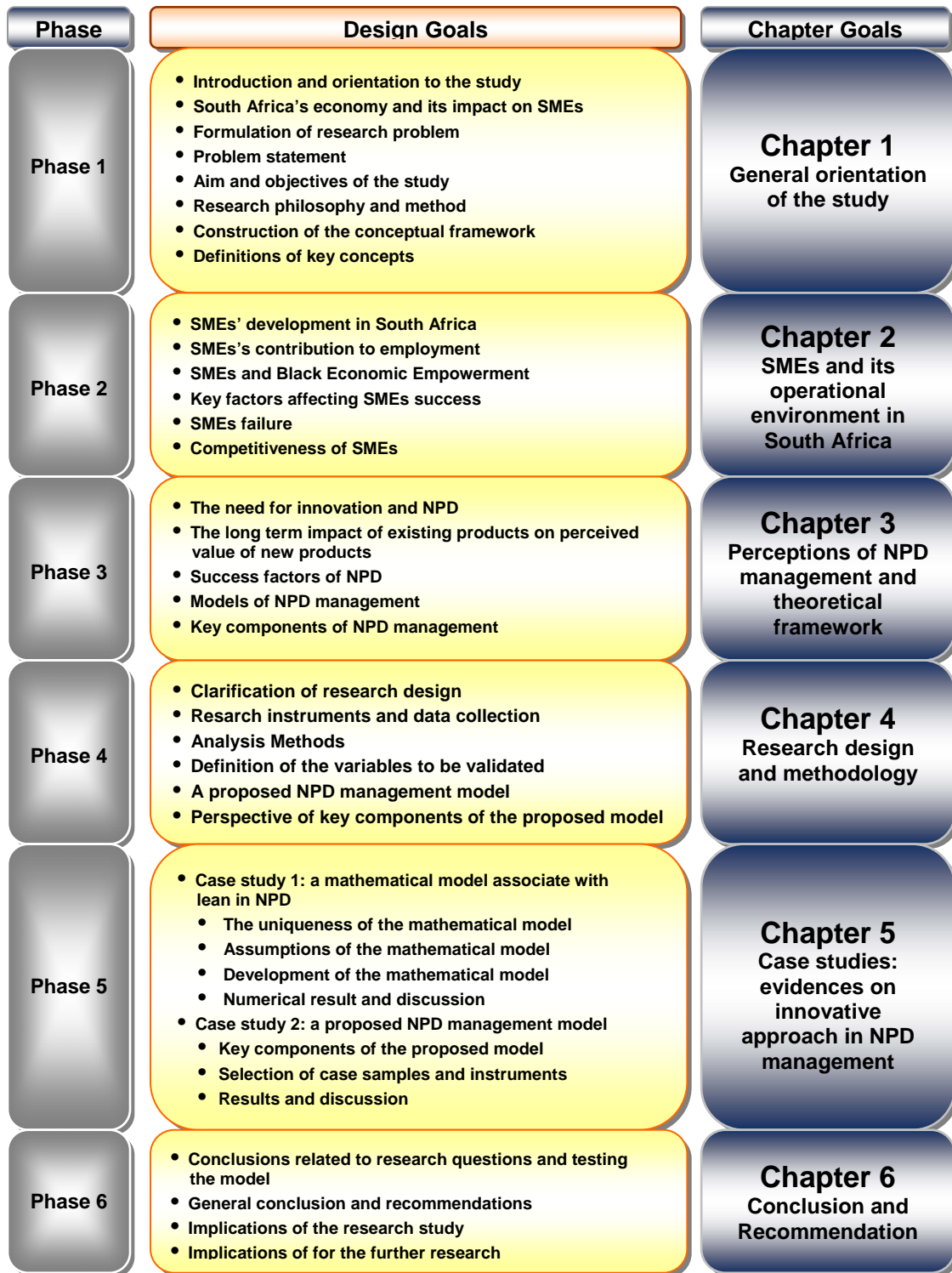


Figure 1. 6: Research Approach

1.11.2 Methodology

The method of this study includes a literature review, empirical studies, statistical analysis and report writing. The literature review explored the key

components of NPD management and how it impact on the success of SMEs. The review provided an insight and understanding into the research problems. The empirical study surveyed the importance correlations amongst these the key components to NPD management in SMEs within the Western Cape. These SMEs are perceived that NPD management is important to their business.

The instrument utilised a structured questionnaire and a number of personal interviews during the study period. The questions from the questionnaire were developed based on the findings of the literature review. The questionnaires used mainly close-ended questions; Yes / No type of questions were applied. The questionnaires were designed for both management and employees as showed in Appendices. Some questions were used to enable triangulation taking place in order to test the reliability of the study. An open-ended style questions were also utilized during the period of interview. The open-ended questions were used to collect the data where excluded in the questionnaire, which was considered.

Individual demographics such as gender, years of working experiences, educational background, position that held in the SMEs, and sectors clarification were included.

The statistical analysis includes descriptive statistics, frequencies, and the trend analysis through a developed mathematical model.

This study utilized a combination of both qualitative and quantitative approach. Qualitative data were collected through open-ended questions from a number of interviews. In addition, part of qualitative data regarding the information of SMEs was collected from white paper and governmental official website and industrial report.

1.12 ETHICAL ISSUES

Semi-structured interviews and questionnaires have been utilized to collect data during this work. In comparison to other methods, ethical issues arise because of the in-depth nature of the semi-structured interviews (Thompson *et al.*, 1989), where the sense of involvement felt by the researcher and the participant is much greater (Reisetter *et al.*, 2003) as compared to postal surveys.

Following strict ethical principles, the prospective participants are contacted only after obtaining permission from the top management of the company. Each interview starts when the participant has expressed satisfaction with the information provided and voluntarily agrees to participate by completing the questionnaires. Participants' identities are kept confidential by omitting the departments' name and the companies' entity. The information of the employees and SMEs will only be utilised for research purpose.

1.13 DEFINITIONS OF KEY CONCEPTS

This study has identified key concepts that listed in Figure 1.7 below. The detailed definitions of the key concepts are listed in Section 4.3, Chapter Four.

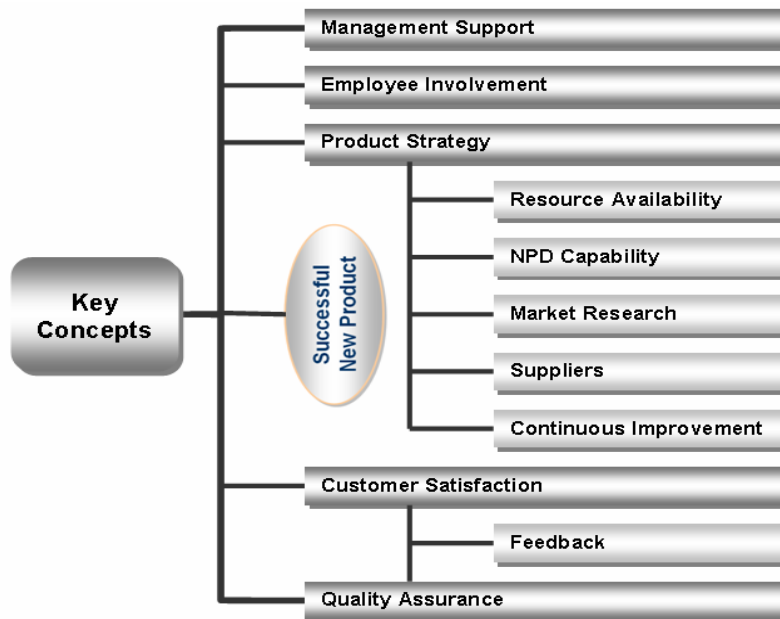


Figure 1. 7: Key concepts of NPD management

1.14 ORGANISATION OF CHAPTERS

This thesis is organised into seven chapters. Each chapter constructed in accordance to its nature and necessity.

Chapter One as an introductory chapter, which provides the background of the study, the purpose and scope of the research, problem statement and research questions, South Africa's economy and SMEs development in the country, characteristics of SMEs, aims and objectives of the study, significance of the research, the research propositions, formulation of the problem statement research philosophy, research design and methodology, and ethical considerations.

Chapter Two describes a holistic overview of SMEs current situation and its operational environment. It includes the contributions of SMEs to the national economy, main problems faced by SMEs, competitiveness of SMEs, and the key factors that affecting SMEs in South Africa. The main problems and the key factors affecting the development of SMEs were identified.

Chapter Three presents an extensive literature review on the important constructs related to the key components of managing the NPD processes which formed the backbone of the proposed NPD management model of the study. There are a number of definitions and key concepts of NPD that are listed in this chapter, essentially, the application of managing NPD will be discussed.

Chapter Four deals with the research design and method, specifically reflecting on the research instrument, sample of the study, procedure, and data analyses methods, where a combination of qualitative and quantitative methods were utilised. The semi-structured interviews were conducted using a questionnaire as the research instrument.

Chapter Five discussed two case studies regarding two models that were developed in this study: one was mathematical model, and another was a

NPD management model. A detailed discussion of the data analysis and findings were generated.

Chapter Six presents the conclusions and recommendations of the study. It provides a discussion of the results and conclusions regarding the research problems of the research; several recommendations were made based on the research findings. It also contains the implications of both current study and for further research. Finally the limitations of the study were addressed.

1.15 CONCLUSION

In conclusion, Chapter One has shown the current situation of SMEs, the development of SMEs in South Africa, national economic background, and significant contributions of SMEs towards the national economy. The importance of NPD in establishing the competitiveness of SMEs has been addressed. In essence, SMEs in the Western Cape Province need to adopt an effective way in their NPD process, so that they can be innovative and competitive. The way of managing NPD processes effectively for SMEs as a crucial strategy of maintaining SMEs' growth has been highlighted.

CHAPTER 2: SMES AND ITS OPERATIONAL ENVIRONMENT

2.1 INTRODUCTION

Since 1994, South Africa has been faced with the challenges of re-integration into world markets as a global economy, while at the same time positioning itself to realise the high expectations of its populace regarding a successful transition towards a more democratic order (Berry et al., 2002). To achieve the objectives of economic growth through competitiveness on the one hand, and employment generation and income redistribution as a result of this growth on the other, South Africa's small-, micro- and medium-sized enterprise (SMME) economy has been actively promoted since 1995 (Berry et al., 2002).

This chapter firstly presented the general development of Small and medium enterprises (SMEs) in the South Africa context. It provided an overview of SMEs sectors with its subsectors and how it impacts on the country's economy. It also consists of SMEs' contribution to country's GDP and employment, the impact of SMEs on Black Economic Empowerment as well as the status of SMEs and employment and BEE was addressed. Secondly, the main problems faced by SMEs were discussed. Thirdly, the key factors such as lack financial support, lack of business skills and knowledge, and poor general performance. A section followed by exploring the reasons for SMEs failure and the competitiveness of SMEs were explored from the current literature. Fourthly, the key factors that affect the success of SMEs were discussed. Finally, a conclusion of whole chapter was carried out.

2.2 SMES AND THE NATIONAL ECONOMY

SMEs are increasingly seen as playing a significant role in the world economies around many countries. In this section, SMEs' contributions to

South African national economy are commonly recognised as the following aspects which are: the contribution to the country's GDP, which help to drive economic growth; create employment which results in job creation and poverty alleviation; and SMEs are the sources of innovation and new ideas, this results in technology development moving forward and ultimately boosting the national economy.

2.2.1 SMEs' Contribution to GDP

SMEs have increasingly recognised as a crucial part of a country's economy. According to Berry et al. (2002), it is estimated that 91 per cent of the formal business entities are Small, Medium and Micro Enterprises (SMMEs) in South Africa. The SMMEs also contributes between 52 and 57 per cent to GDP and provide about 61 per cent of employment (Ntsika, 1999; Berry et al., 2002). Thus, SMEs play a vital role in boosting the country's economic growth, such as contributing to job creation and poverty alleviation.

As South Africa hosted the 2010 World Cup, the development of SMEs becomes more critical to South Africa. In essence, SMEs must provide more new products to meet the demands of both local and international customer needs thus contributing to the national economy.

Table 2. 1: South Africa: Provincial GDP Growth

Province	% contribution to GDP	Approximate no. of Respondents
Western Cape	14.47%	868
Eastern Cape	8.08%	485
Northern Cape	2.37%	142
Free State	5.52%	331
KwaZulu-Natal	16.52%	991
North West	6.51%	390
Gauteng	33.05%	1983
Mpumalanga	6.99%	419
Limpopo	6.50%	390
GDP	100.00%	6000

Source: *SME Survey, 2006*

According to the *SME survey 2006*, information regarding provincial contribution to GDP is showed in table 2.1. Gauteng stands at the top of GDP growth in the country. There were 1983 respondents which accounted for the 33.05 per cent of GDP growth. KwaZulu—Natal remains in second place of GDP growth with 991 respondents and 16.52 per cent of the GDP growth. Regarding the Western Cape Province, there were 868 respondents with 14.47 per cent contribution to GDP. Compared to other provinces, Western Cape Province is the third highest in South Africa and plays a significant role in the country's economic development. Based on the rate of the GDP growth, the other provinces are ranked as: Eastern Cape (8.08 per cent), Mpumalanga (6.99 per cent), Northwest (6.51 per cent), Limpopo (6.5 per cent), Free State (5.52 per cent) and Northern Cape (2.37 per cent).

Above all, the SME sector of the economy contributes significantly to the GDP of South Africa, but even more so to employment.

2.2.2 SMEs' Contribution to Employment

Over the last decade, the high rate of unemployment in South Africa has an effect on the number of informal SMMEs, as people are forced to make a living (Balkenhol and Evans-Clock, 2003), this was one the major reasons that caused the number of SMEs increased rapidly. According to Haasbroeck (1996), it is estimated that 91 percent of the formal business entities are small and medium sized enterprises (SMEs) in South Africa.

The Department of Trade and Industry indicates that in 1995 there were 793, 000 enterprises in the employment size-span from 1 to 200; of this number 500, 000 had between 1 to 4 employees (Havenga, 1996., cited from Ylinenpää and Havenga, 1997). These SMEs had an estimated employment of 6.1 million (Ylinenpää and Havenga, 1997). In addition, 1.26 million people were employed in the informal business sector (Havenga, 1996). The main portion of these SMEs are to be found in trade (245, 000), community and social sector (108, 000), construction (93, 000) and agriculture, forestry and

fishing (91, 000) (Ylinenpää and Havenga, 1997). In terms of the informal small business sector, the most common types of businesses include grocery and butcher shops, hairdressers, seamstresses and liquor establishments (Havenga, 1991).

In the twenty year period from 1985 – 2005, no more than ten percent of all new employment positions were produced by large established firms (Finscope, 2006).

In South Africa, more than 2-million small businesses represent 98 per cent of the country's total number of firms, employ 55 per cent of the labour force and contribute 42 per cent of the country's wage bill; yet 87 per cent of these enterprises are survivalist and operate outside the formal economy (Le Roux, 2006).

Table 2. 2: Formal and Informal Businesses in South Africa

	Formal Business	Informal Businesses	Population	Informal Business/ Total Businesses	Informal Businesses per Capita	Formal Businesses per Capita
Western Cape	78,000	111,000	4,760,000	58.7%	2.3%	1.6%
Eastern Cape	22,000	209,000	6,500,000	90.5%	3.2%	0.3%
Northern Cape	5,000	17,000	818,000	77.3%	2.1%	0.6%
Free State	13,000	126,000	2,740,000	90.6%	4.6%	0.5%
KZN	54,000	580,000	9,770,000	91.5%	5.9%	0.6%
North West	11,000	175,000	3,800,000	94.1%	4.6%	0.3%
Gauteng	199,000	616,000	9,450,000	75.6%	6.5%	2.1%
Mpumalanga	15,000	191,000	3,250,000	92.7%	5.9%	0.5%
Limpopo	10,000	266,000	5,410,000	96.4%	4.9%	0.2%
Total	407,000	2,291,000	46,498,000	84.9%	4.9%	0.9%

(Source: *FinScope Small Business Survey Gauteng, 2006:10. Cited from Michael et al., 2008*).

The majority of small and micro-enterprises in South Africa are informal; this means that the vast majority of businesses in South Africa are informal. Table

2.2 shows both formal and informal business of the SMMEs by their overall status and province. In 2001, small, medium, and microenterprises (both formal and informal) accounted for 54 percent of private-sector employment (including survivalists, such as street merchants barely subsisting). 10 Small and medium-sized firms accounted for 28.6 percent of all firms and 41.7 percent of all employment in the private sector (Michael et al., 2008).

In South Africa, SMEs are considered as important instruments for employment generation and economic empowerment of formerly disadvantaged groups. SMEs are commonly considered as one of the main players in job creation and are one of the key drivers of the country's economic growth.

The SME sector is widely regarded as the driving force in economic growth and job creation in both developed and developing countries (Sunter, 2000:23). According to Ntsika (2002), SMEs contribute 56 per cent of private sector employment and 36 per cent of the gross domestic product in South Africa. A report by National Treasury described the contribution of SMEs to GDP and employment to be as high as that of large enterprises and noted that SMEs are particularly important because of the negative growth in job creation by large enterprises and the government sector (Falkena et al., 2002).

This means that the SME sector is considered to be one of the most viable means to create employment and well-being in the South African economy. It is recognized that SMEs are an important driving force to keep national economies running; they are of great importance to the growth of employment. In order to hold this position a certain level of product innovativeness from these companies is necessary.

Unemployment can be the most severe problem that is challenging the South African government at present. The reality of huge unemployment has caused the problems of high crime, violence and poverty. The challenge facing the government is to provide a healthy environment that would facilitate job creation and hence a reduction in the unemployment rate. South Africa suffers

from high unemployment with an official estimate of approximately 24.5 per cent of the economically active population unemployed (Statistics South Africa, QLFS, 2009). One of the best ways to address unemployment is to leverage the employment creation potential of small businesses and to promote small business development (FinMark Trust, 2006).

The unemployment crisis is a global problem that is not only limited to South Africa. Kingdon and Knight (2001) have indicated that South Africa has “a remarkably high unemployment rate by international standards”. Based on their research and extrapolation of figures from Statistics South Africa (Stats SA), they put forward the unemployment rate of 36.2 per cent and 23.3 per cent for the broad and narrow definitions of unemployment respectively.

According to Kingdon and Knight (2005:9), “in South Africa, two different concepts of unemployment are used routinely: the strict (narrow) and the expanded (broad) definition. The narrow definition applies a job-search test but the broad definition accepts as unemployed those who did not search for work in a 4-week reference period but who report being available for work and say they would accept if a suitable job were offered; in 1998 the narrow concept was declared the ‘official’ definition of unemployment”.

In 2004, 41 per cent of working age people was unemployed according to the expanded definition of unemployment, and 26.2 per cent according to the narrow definition (Labour Force Survey, 2004). The chronic nature of unemployment in South Africa is illustrated by the fact that many unemployed people have never worked before. In addition, many people who are unemployed are still actively looking for work or have been looking for work in excess of 3 years.

2.3 SME AND BLACK ECONOMIC EMPOWERMENT (BEE)

Since 1994, Black Economic Empowerment (BEE) has been one of the primary issues on the South African government’s agenda. Before 1994, the

apartheid government which was in power in South Africa, African, Indian and Coloured people as “black people” who were systematically excluded from participating in the country's economy. An article titled “Black Economic Empowerment in South Africa” by the FW de Klerk Foundation (2005), gives a clear definition of BEE (below):

“BEE is an integrated and coherent socio-economic process that directly contributes to the economic transformation of South Africa and brings about significant increases in the number of black people that manage, own and control the country's economy, as well as significant decreases in income inequalities.

Broad-based black economic empowerment (BBBEE) means the economic empowerment of all black people including women, workers, youth, people with disabilities and people living in rural areas, through diverse but integrated socio-economic strategies, that include, but are not limited to:

- a. increasing the number of black people that manage, own and control enterprises and productive assets;
- b. facilitating ownership and management of enterprises and productive assets by communities, workers, co-operatives and other collective enterprises;
- c. human resource and skills development;
- d. achieving equitable representation in all occupational categories and levels in the workforce;
- e. preferential procurement; and
- f. investment in enterprises that are owned or managed by black people”.

BEE is clearly a crucial element on which government is expected to deliver. The main levers to promote black economic empowerment directly are where government has ownership rights (as in mining) and/or where government and parastatal's procurement is important for an industry. A third area is where charters are being negotiated with targets such as financial services and information and communication technology. These are generally national initiatives. At the provincial level it is important that they be monitored on the

ground, for example, in terms of steps taken by banking in providing access to banking services.

In the case of manufacturing industries, a dynamic and broad-based industry is perhaps the biggest contributor to black economic empowerment, through employment, skills upgrading, and the growth of SMEs owned and run by historically disadvantaged persons. Ensuring that the skills development framework remains effective is a crucial component. Where specific initiatives for improving firms' capabilities and building strong local clusters are adopted, black economic empowerment is an important dimension. There are various mechanisms to achieve this, including specific support for the entry and growth of new firms and/or through conditions attached to firm support such as the provision of finance.

2.4 MAIN PROBLEMS FACED BY SMES

Why and how do SMEs fail? This is not a new question but should always be considered by the SMEs and business developers. In a broad perspective, many businesses can fail due to lack of finance, poor management skills and improper marketing development. According to Ngubane (2002), South Africa is primarily seen as a productive capacity location and not as an R&D location; moreover, process development is more hampered by a lack of local demand for this requirement. This largely is a result of a lack of knowledge and management skills and resulting in commitment to continuous process improvement.

In terms of the failure rate of SMEs, it is estimated that the failure rate of SMEs is between 70 per cent and 80 per cent, millions of Rands are being lost on business ventures because of essentially avoidable mistakes and problems (Brink et al., 2003). Surveys of small business failure maintain that entrepreneurs often have good ideas and are competent but "they do not have a clue on how to run a business and have no underlying appreciation of business fundamentals" (Barron, 2000:1; Brink, 1997:364).

At an Annual General Meeting of the Committee of Technikon Principals (CTP) on 7 June 2002, Dr Ngubane, the then Minister of Arts, Culture, Science and Technology gave a speech regarding the problems that are faced by SMMEs:

“The South African SMME sector is, however, still not as productive and as competitive as we know it could be, to fulfill their role. This is mainly due to the fact that they still use outdated technologies and most of them have no access to facilities for the testing and promotion of innovative ideas. There is also very poor or no technology support for SMMEs. As a result, there are very low entry rates of SMMEs into the productive “value added” sectors and this leads to the high failure rate among start-up SMMEs.”

A common constraint to business development is the high failure rate of start-up SMMEs in South Africa (Balkenhol and Evans-Clock, 2003). Thus, it is necessary to argue the survival of SMMEs in both the formal and informal economy when it becomes a major concern. Burger (2004) claimed that business owners and employees in the informal economy are unskilled, placing these informal SMMEs in a very high risk category. However, to SMEs it self, this study looks into the three key reasons which include financial issues (Berry et al, 2002., Balkenhol and Evans-Clock, 2003., Lehohla, 2002), lack of management skills (Balkenhol and Evans-Clock, 2003), and poor general performance (Lehohla, 2002., Devey et al, 2006).

Table 2. 3: Problems faced by the SMMEs with solutions and side effects

Problem Symptom	Symptomatic Solution	Fundamental Solution	Side Effect(s)
Slow/declining revenue growth	Increased Marketing	New Products	Diverts resources away from R&D; increased reliance on marketing
Bank Failures	FDIC, FSLIC	Prudent Banking Practices	Responsibility for protecting deposits is shifted to government
Employee Performance Problem	Manager “Provides” Solution	Necessary Training for Employee	Growing dependence on manager; decreasing confidence of employee
Low Self-Esteem	Drug Use	Invest time in personal development	Drug Addiction; further debilitation of personal development

(Source: Ngubane, 2002)

Ngubane (2002) listed the main problem symptoms with its solutions and side effects that is showed in Table 2.3 shows the main problem symptoms, symptomatic and fundamental solutions, and side effects for the SMEs. The problem symptoms mainly include slow/decline revenue growth, bank failures, employee performance problem, and low self-esteem. All of these symptoms are generally related to lack of financial support, lack of business skills and knowledge, and ineffective performance of SMEs. These problems are generally impact on the overall performance of SMEs in South Africa. The main problems that faced by SMEs are discussed below.

2.4.1 Lack of Financial Support

Finances are critically important, especially for firms that show entrepreneurial talent and skills to grow (Berry et al, 2002). Financiers are unwilling to enter the informal SMME segment of the market due to the high risks associated with these businesses (Balkenhol and Evans-Clock, 2003). 60 per cent of non-VAT-registered business owners required additional money to start their businesses, but only 5.1 per cent of these informal SMMEs managed to obtain loans from commercial banks (Lehohla, 2002). South African SMMEs use their own funds as start up capital (Balkenhol and Evans-Clock, 2003). In an attempt to facilitate access to loan finance to SMMEs, the South African government established Khula Finance Ltd as a 'wholesale' institution to support financial intermediaries. It is believed, however, that this policy initiative has not lived up to its expectations (Berry et al, 2002).

2.4.2 Lack of business skills and Knowledge

It is argued that to respond to the challenge of competitiveness under conditions of globalisation, important elements of response both for countries and enterprises are effective "strategies to improve individuals' and enterprises' level of knowledge and skills" (King et al. 2002: 28). The role of training and skills development is thus seen as essential for SMME enterprises for them to 'learn to grow' (McGrath and King, 1999: 211) as well as to 'move up the value chain' (Kraak, 2005: 58). It is cautioned also that

“skills are not the only, nor even the main, answer to the challenge of small enterprise development” (McGrath, 2005: 5).

There are a number of studies have confirmed that a large segment of South Africa’s SMME entrepreneurs have very limited skills and correspondingly of the importance of training and the acquisition of skills for business development (Erasmus and Van Dyk 2003; Nieman et al. 2003; Perks 2004; Smith and Perks 2006).

Ngubane (2002) highlighted the need for adequate training for employees in SMEs. This means when SMEs have skilled and knowledgeable employees; value will be added to their manufacturing and innovative process. Balkenhol and Evans-Clock (2003) claimed that exposure to management experience further impacts on the management skills of entrepreneurs. They stated that years of restrictions and control of access to entrepreneurial opportunities created a mindset focused on wage and salaried work rather than the establishment of small businesses and entrepreneurs. This process has led to an increasing number of people who become economically active but cannot find employment and do not have the capacity to embark on self-employment or other income generating activities (Lehohla, 2002).

In essence, several studies showed a pattern that the most successful, adaptive and innovative SMMEs are those in which entrepreneurs (and often also the employees) have good to high levels of education, technical/managerial skills and training (Rogerson 2000; Chandra and Rajaratnam 2001; Ligthelm and Cant 2002; Skinner 2005). Perks (2004) and Smith and Perks (2006) differentiate four different categories of skill as necessary for start-up of a micro-enterprise, viz., personal skills, technical skills, business operation skills and management skills. In an investigation by Ligthelm and Cant (2002) concerning the ‘business success factors’ of SMMEs in Gauteng, they revealed that the lack of technical and managerial skills impacted in a highly negative fashion on business development.

The above mentioned studies appealed that lack of management skills and training is one of the most prevalent causes of general business failure amongst SMMEs in South Africa. In a survey conducted by Radipere and van Scheers (2005: 409) it was found that 90 per cent of a sample of 1000 entrepreneurs “believes that small businesses fail due to a lack of managerial skills”. Despite the significance of skills in determining the success or failure of SMMEs in South Africa, a consistent and remarkable finding in many studies is that entrepreneurs often “see little need for skills training” (McGrath, 2005: 5).

2.4.3 Poor General Performance

It is necessary to argue that being able to run a formal business assumes the presence of important infrastructural elements. Many of these SMMEs do not have access to general services such as a premise for the business, electricity, telephone, water and sanitation (Lehohla, 2002). This impacts on SMEs general operation negatively, and it leads to a poor productivity and an overall performance of SMEs.

In terms of the location of a business, Devey et al (2006) indicated that operating a business in a poor community is extremely difficult in so far that potential customers are also struggling to make a living and does not have money to spend. In addition, it is extremely difficult once SMEs without a permanent address or telephone for their businesses. It leads to ineffective and inefficient communications with customers and suppliers. Ultimately, it affects on the overall business performance.

While SMEs’ growth represents a positive contribution to the country’s economic development, entrepreneurs need to be aware that it is better to use more effective ideas for their business to succeed. An understanding of the reasons for failure can help SMEs to assess the overall success potential of a business. The business world is like a battleground. There is an old Chinese proverb from Sun Tzu (one of the famous strategists who summarized a practical war experience between 770-476BC [China] in “*The Art of War*”) that

says: “*Know yourself; know your opponent; one hundred battles, one hundred victories*”. In planning to prevent business failure, be honest and confident, know yourself and your limitations and be prepared to manage the business.

2.5 COMPETITIVENESS OF THE SME

What makes the South African SME competitive? One of the key findings of the *SME Survey (2004)* reveals that small and medium enterprises in South Africa are alive, well and highly competitive. Figure 2.1 indicates “a startling 86 per cent of the SMEs surveyed regard themselves as somewhat competitive or very competitive; a further 12 per cent regard themselves as neither competitive nor uncompetitive; this leaves a mere 2 per cent of SMEs who believe they are not competitive”.

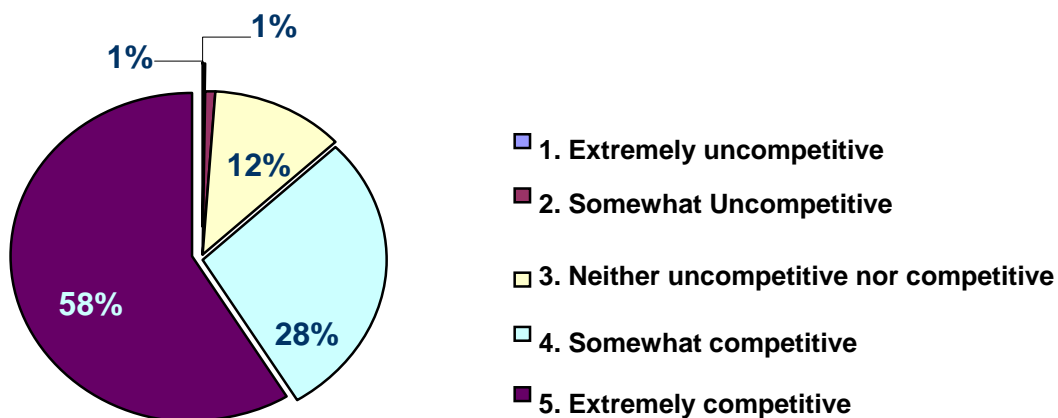


Figure 2. 1: South Africa: Competitiveness of the SME
(Source: *SME Survey, 2004*)

The latest news from *SME Survey 2007* states that technology makes the South African SME competitive. Arthur Goldstuck, principal researcher of the Survey says “Over the past four years, the Survey examined areas that cause SMEs to regard themselves as competitive. This year’s Survey differs because one of the primary intentions is to create something of a blueprint of what makes an SME highly competitive”.

Goldstuck also points out that the highest correlation between competitiveness and any one of the factors is 90 per cent. "This indicates that 10 per cent of competitive companies do not necessarily rely on advanced technology for their competitiveness; it is possible to run an effective company without these tools, but using them where appropriate definitely appears to support improved productivity and competitiveness," says Goldstuck.

In summary, factors of the competitiveness of the South African SMEs can be cost efficiency and productivity, which are the key to the country's economic growth. In order to be cost efficiently and productively in business, SMEs need to involve innovation and NPD so that they can maintain the competitiveness.

2.6 THE KEY FACTORS AFFECTING SMES SUCCESS

A number of researchers addressed the issue of factors that affecting SMEs success. These key factors are mainly focus on marketing orientation (Goetsch, 1993., Crainer, 1996., Brooksbank. 1996., Kunene, 2009), customer focus (Hong and Jeong, 2006., Hudson, 2001., Kunene, 2009), and resource availability (Lehohla, 2002., Singh et al, 2008., Pansiri and Temtime, 2008., Garengo *et al.*, 2005., Kunene, 2009).

Based on the current situation of South Africa's economy, competition is increasingly moved to high and the market is becoming tougher to SMEs. It is therefore marketing orientation is critical to the survival of SMEs. Customers always look for good quality of products/services; this pushes SMEs to provide a better quality of products/services in order to compete in the market. SMEs need to recognise the needs of their customers, so that they can provide the exact products/services to the customers.

In terms of resources availability, the lack of available financial resources, and skilled human resources caused many problems and difficulties to SMEs, although the government provided SMEs a number of economic accelerating programmes such as Accelerated and Shared Growth Initiative for South

Africa (AsgiSA), the Joint Initiative on Priority Skills Acquisition (Jipsa), Small Enterprise Development Agency (Seda), etc. Seda supports the growth of small business. People can go to Seda for help to start a business or, if they already have a business, to make it stronger and more profitable. However, the increasing numbers of SMEs, foreign entry investment and business add more pressure and competition to the local SMEs.

2.6.1 Marketing Orientation

Small and large businesses differ to each other in terms of its size, finance, market, etc. In comparing with large firms, for example, Sriram and Sapeinza (1991) also found differences between marketing orientation in small and large firms. Thus they suggested that the small and large firms should be studied separately. Blankson and Cheng (2005) also supported that market orientation in the behaviour of SMEs is different to large ones.

However, Becherer et al. (2001) compared the differences between market orientation in small and large firms. They reported that marketing orientation is weaker in small firms and increases with firm size. Hill (2001), on the other hand, identified that it may also be situation specific, varying with the levels of sophistication and effectiveness of the small firm management. Furthermore, other authors demonstrate that market orientation and the NPD process is a means to gain financial advantage for small firms (i.e. Enright, 2001), and market orientation is more significant in differentiated markets and in small industrial firms with low levels of formal planning and market research (i.e. Pelham, 1997).

From the viewpoint of environmental impact on the success of SMEs, for instance, with reference to the external environment, SMEs operate in highly competitive, turbulent and uncertain markets (Garengo et al., 2005). Usually they do not have control or influence over the market and thus they need to adopt a reactive approach and adapt to market changes (Hudson, 2001). Hogarth-Scott et al. (1996) explain that knowing the marketing environment

can reduce the risks for SMMEs and help them understand market needs better.

Goetsch (1993) describes successful SMMEs as those businesses that are marketing oriented and consumer focused and base their activities on an integrated marketing plan, and explains that an integrated marketing plan, and not a business plan, forms the basis of the activities of successful businesses. Crainer (1996:164) also concludes that all business activities must be marketing oriented. Brooksbank (1996) maintains that successful businesses will distinguish themselves through effective marketing plans, which will enable them to react and adapt to market needs immediately. McDonald (1995:22) stresses that a marketing plan is essential for management to identify competitive advantages.

Although marketing strategies may have to be implemented despite there being limited resources, and although many owner-managers of SMMEs regard marketing as an 'unnecessary luxury', the need for systematic planning and information increases as the enterprise grows (Hogarth-Scott et al., 1996). Once SMMEs conducted a sufficient market research, they will be able to identify more opportunities and establish a market driven business. This leads SMMEs to have strong focus on their customers.

However, marketing practices and problems differ from one SMME to another, as a result, for example, of inappropriate management techniques, decision making vested mostly in one person, or the fact that the owner-manager must attend to both strategic and operational management and is usually short of time (Hogarth-Scott et al., 1996).

2.6.2 Customer Focus

SMMEs cannot survive without customers. This requires SMMEs to have good understanding on customers' needs so that they will be able to design an effective marketing plan. Since SMEs rely on a limited customer base, they are usually closer to the customers and have the possibility to develop more

personal relationships with them (Hong and Jeong, 2006). However this sometimes forces the development of deferential relationships with their customers and SMEs are often subservient to their larger counterparts (Hudson, 2001).

In fact, SMEs' demand is made by stronger customers throughout the supply chain and this implies difficulties in leveraging payments of debts and consequently in coping with fluctuations in cash flow, causing a lack of control over the future (Hudson, 2001).

2.6.3 Resources Availability

In South Africa, many SMEs realise that it is difficult to survive firmly and make substantial contribution to the national economy. A major concern is the availability of resources (i.e. finances, training, management skills and general services) to support these SMMEs (Lehohla, 2002). Singh et al (2008) supported the viewpoint and emphasised that lack of available resources is one of the main problems and typical characteristic of SMEs. Indeed, SMEs resource is one the internal factors which is critical to the success of their business.

The term “resources” is considered both in terms of personnel, including also managerial time, and financial stability and security. In addition, to many SMEs skills are limited, not only among staff (Singh *et al.*, 2008), but also owner-managers often do not have enough managerial expertise or organizational capabilities and this implies poor strategic business planning and human resource management (Pansiri and Temtime, 2008).

Although small size represents a weakness in terms of available resources, on the other side, it favours a flat organizational structure with lack of bureaucracy and this has a positive impact on flexibility, adaptability and rapidity in responding to the changing environment (Garengo et al., 2005). Therefore, it also provides high potentials for SMEs to be innovative and seek ways to develop new products in order to satisfy customers' needs. For

example, a structure with few management layers favours face-to-face relations, simplifying communication processes and offering to the manager high visibility on the processes and the opportunity to directly influence employees (Singh et al., 2008).

Managers very often are also the owners of the company and the control in SMEs rests primarily with one or a few people with a high level of autonomy (Pansiri and Temtime, 2008). In many SMEs, decisions are mainly based on the top manager or business owner's personal skills and these SMEs possibly do not have a management team to analyse certain information before the final decision is made. The owner-manager usually adopts a highly personalized management style, tending to follow a “react and adapt” philosophy and fire-fighting strategies, focusing on short term horizons and not engaging actual strategic planning (Hudson et al., 2001). Thus, the success or failure in SMEs is critically affected by the managerial competencies and personal skills of the top manager or owner-manager.

Kunene (2009) identified key factors (external and internal) as crucial to SME success, in order to outline the importance of skills in entrepreneurship. According to Kunene (2009), the external factors include macro-economic factors, political-institutional factors, socio-cultural factors, and market opportunity factors. The internal factors include company demographics factors, human demographics factors, previous experience factors, and human capital factors. These external and internal factors are listed as below in table 2.4.

In terms of external factors, macro-economic factors include geographic area, regions, density, inflation, unemployment etc. In fact, it is easily understandable that SMME growth can be strongly affected by the macroeconomic context (Berry et al., 2002). Political-institutional factors such as policies, the business environment, public support etc. Socio-culture factors include access to public, access to available resources, crime, health, and culture. Market opportunity factors contain demand for supply, competition, access to markets, location and market uncertainty. These external factors

are generally affecting SMEs success. However, among these external factors, marketing related factors are more critical to the success of SMEs.

Table 2. 4: Factors affecting the performance of SMEs

Exogenous/external factors	Endogenous/internal factors
Macro Economic factors <ul style="list-style-type: none"> • Geographic area and region • Density • Inflation • Interest rates • Unemployment • Exchange rates 	Company demographics factors <ul style="list-style-type: none"> • Size of firm • Age of firm • Organizational structure • Community networks • Product/service differentiation
Political-Institutional factors <ul style="list-style-type: none"> • Macro-economic policies • The business environment • The judiciary • Bureaucracy • Public support 	Human demographics factors <ul style="list-style-type: none"> • Age • Gender • Family background • Exposure to role models
Socio-Cultural factors <ul style="list-style-type: none"> • Access to public infrastructure • Access to money/capital; technology; labour and other resources • Crime • Health • Culture • Role models 	Previous Experience factors <ul style="list-style-type: none"> • Education • Training • Work experience • Business ownership • Industry specific
Market Opportunity factors <ul style="list-style-type: none"> • Demand for supply • Competition • Access to markets • Location • Market uncertainty 	Human Capital factors <ul style="list-style-type: none"> • Personal characteristics • Capabilities, abilities and skills (this particular factor is the focus of this study)

Source: Kunene (2009)

Internal factors, company's size and ages of business, organisational structure, community networks, product / service differentiation. Human factors such as age, gender, family background, exposure of role model. Previous experience factors include the status of education, training, work experience, business ownership, and industrial specific. Human capital factors include personal characteristics, capabilities, abilities, and skills. Particularly in skills development, Kunene (2009) emphasised that the skills have crucial impact on SMEs success and failure.

Above all, the key factors that affect SMEs performance the most significantly can be marketing orientation, customer focus, and available resources. These resources include financial support, managerial competence, skills and employees involvement.

2.7 CONCLUSION

This chapter started with a discussion on SMEs development in South Africa. It explained the situation of formal and informal businesses in South Africa, the provincial contribution to GDP, followed by SMEs' contribution to employment and the impact of SMEs on BEE in the country. The competitiveness of SMEs is discussed. The main reasons of SMEs failure are highlighted. It includes lack of finance, poor management skills, improper marketing development, lack continuous improvement culture and innovation. Overall, lack of innovativeness is one of the key reasons account for the failure of SMEs in the current competitive environment. Finally the key factors that affecting SMEs success are identified through the current studies. It main includes marketing orientation, customer focus, and resources availability.

CHAPTER 3: PERCEPTIONS OF NPD MANAGEMENT AND THEORETICAL FRAMEWORK

3.1 INTRODUCTION

Due to the increased marketing competition and the recent recession of global economy, to remain competitive and innovative is becoming increasingly important to companies, especially those labelled as Small Medium Enterprises (SMEs). The relative advantages or disadvantages to a manufacturing company of focusing on single or tightly-related portfolio of products or, of diversifying have been addressed by a number of authors (Porter, 1980; Kanter, 1989). To SMEs, there is often little choice for diversity due to their limited capability, insufficient financial resources and lack of technological support. While large manufacturing companies can often invest in new technologies and equipment, providing world-class skills, training their workforce and winning new markets this is hardly the case for small companies (Laforet and Tann, 2006). This chapter provides an extensive literature in terms of the importance of innovation, new product development (NPD) with its key concepts, and about some relevant NPD management models.

3.2 THE NEED FOR INNOVATION AND NPD

A major issue for all SMEs is how to survive by maintaining or increasing market share through various innovations, such as NPD. Mosey (2005) suggested that manufacturing SMEs by repeatedly introducing innovative new products open up new market niches, which is essential to their survival. Laforet and Tann (2006) explored the characteristics of innovative SMMEs and addressed issues of innovation management in terms of NPD, process innovation (referring to investments in systems/technology and people), culture (or organisational values) and new ways of working.

However, NPD is often costly as it involves substantial expenses. Therefore, it is essential to manage NPD effectively and efficiently. In terms of managing NPD performance, Anderson (2008:553) stated that a company's overall new product performance depends on the five elements: the NPD process; the organisation of the NPD programme; the NPD strategy; culture and climate for innovation; and senior management commitment to NPD.

3.2.1 Innovation

Innovation is common to all organizations' technology development and management no matter how a large company is or a SME. Innovation is widely regarded as the most important competitive advantage that enables a company to thrive in today's dynamic business environment. Innovation drives prosperity for organizations and for nations. The definitions of innovation from literature are various:

Damanpour (1992) defined innovation as "the adoption of an idea or behaviour, whether a system, policy, program, device, process, product or service, that is new to the adopting organization".

Subrahmanya (2005:269) stated that innovation refers to the economic application of new ideas and technological innovation is described as a process which transforms ideas to commerce.

From a technological point of view, Cooper and Schendel (1976: 61) assert that technological innovation can create new industries and transform or destroy existing ones.

Cumming (1998) chronologically summarized the definitions of innovation as follows:

Marquis (1969) defined innovation as "a unit of technological change" and he quoted Schmookler's definition of technical change as "an enterprise producing goods or services or using a method or input that is new to it".

Kuhn (1985) suggested that “creativity forms something from nothing” and that innovation “shapes that something into products and services”.

Badawy (1988) wrote that “creativity brings something new into being” and that “innovation brings something new into use”.

Urabe (1988) added that “Innovation consists of the generation of a new idea and its implementation into a new product, process, or service, leading to the dynamic growth of the national economy and the increase of employment as well as the creation of pure profit for the innovative business enterprise”.

Udwadia (1990) defined innovation as “the successful creation, development and introduction of new products, processes or services”.

Twiss (1992) stated that “for an invention to become an innovation it must succeed in the marketplace”.

In 1996 the CBI/DTI Innovation Unit stated that innovation is “the process of taking new ideas effectively and profitably through to satisfied customers” (DTI, 1996).

Nevertheless, innovation should be something new, involving changes or transformation in an organization. Zhuang *et al.* (1999) describe an innovation as either an invention which may be considered completely new, an improvement of an existing product or system, or a diffusion of an existing innovation into a new application. They further indicated that innovation is seen as stretching from idea generation through to an “invention” or product/service for use.

McAdam and McClelland (2002) defined innovation as a process where ideas are generated and transformed into implementable business products and services. Sowrey (1989) and Parnes (1961) insisted that there is a strong relationship between the number of idea generation techniques and the number of successful products. Their suggestion indicates that the idea generation techniques are one of the critical success factors to NPD. This

means that the use of good idea generation technique in an organization will create a wide range of knowledge and a climate leading to successful NPD.

Majaro (1988) utilized four-stage definition in Figure 3.1 to show the concept of the innovation process. The process includes the key concepts of idea generation, screening, feasibility, and implementation.

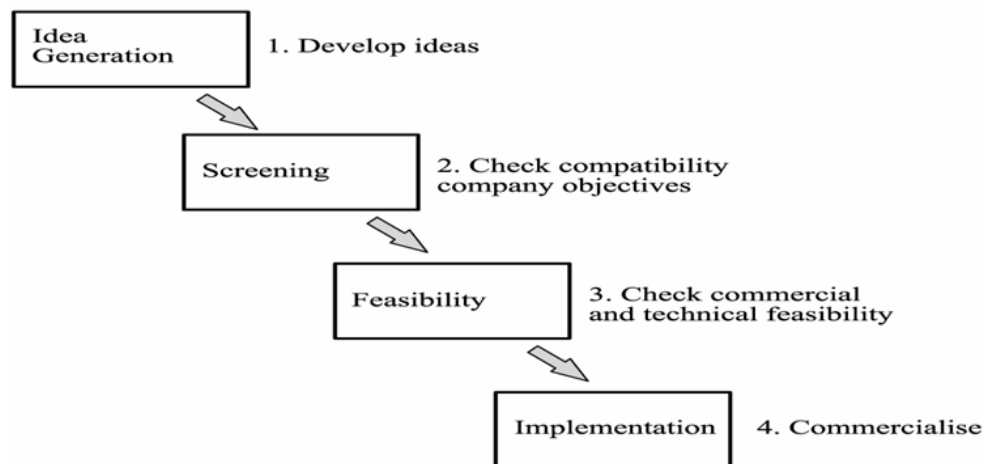


Figure 3. 1: The innovation process
(Source: Majaro, 1988)

Quinn (1985) described how those large firms such as Hewlett Packard, 3M and Raychem have used the customer-pull approach to knowledge creation and idea generation, introducing radically new products through small teams that worked with key customers or “lead users”. Indeed, customers are one of the most important sources for idea generation, various ideas and suggestions can be generated from customers’ requirements and the feedback of products.

Culture can be a set of norms, values, attitudes, and behavior to reflect the major characteristics of an organization. Culture is an important factor that can influence the effectiveness of companies. Culture plays a key role in determining the working climate, leadership style, strategy formulation, and organization behavior and processes of the firm (Saffold, 1988). Amabile (1998) and Blum (2000) perceived the need for organisations to have cultures which “reward and respect the free flow of ideas and enquiries”, where the

“social environment can influence both the level and the frequency of creative behaviour”.

When culture applied to NPD, the literature articulates it to the organizational innovative culture. Once a firm is focused on meeting customer's needs, the firm should create an atmosphere innovation at workplace, such as continuous improvement in NPD processes. High level of effectiveness can be achieved through innovative culture. During the initial phase of NPD process, companies rarely focused on customer's feedback rather pay more attention on searching on the latest technologies or develop their own unique products.

In the 1980's, global companies moved their manufacturing base to developing countries in an attempt to cut costs. Organizations have spent the last few years retrenching, cutting costs and restructuring their organizations in order to remain profitable. Organizations are realizing that in order to keep their customers, they need to offer more value, at lower prices, with more convenience and better quality than their competitors. The only way to do this is through innovation.

According to the UK Government's Innovation Report of 2003, innovation is defined as the successful exploitation of new ideas; it involves investments in new products, processes or services and in new ways of doing business (DTI UK, 2003:19).

DTI UK (2003:8) also highlighted the importance of innovation: for consumers, innovation means higher quality and better value goods, more efficient services (both private and public) and higher standards of living; for businesses, innovation means sustained or improved growth; for employees, innovation means new and more interesting work, improvement of skills and higher wages; for the economy as a whole, innovation is the key to higher productivity and greater prosperity for all.

The concept of innovation and its importance with NPD is discussed. In a common sense, it is vital to explore new ways to be innovative and

competitive. In today's business world, organizations have recognized that innovation is the most important criterion for success in the future. Indeed, innovation is what is needed today by companies who wish to remain leaders in their industry. In order to continuously improve / achieve advanced modern manufacturing in South Africa, the need to innovate is strong, creating new high-tech manufacturing industries such as biotechnology, steel and metal components, and textiles.

3.2.2 New Product Development (NPD)

Innovation being the key to long-term sustained growth of an organization must not be radical but incremental. The process of NPD is crucial within an organization, but it is a complicated and time-consuming process in which several different activities are involved. NPD is commonly defined by a number of researchers as the transformation of a market opportunity into a product as a result of the integrative coupling of market assumptions with technological possibilities (Krishnan and Ulrich, 2001., Griffm and Hauser, 1992, 1996). The Product Development and Management Association (PDMA) in 2006 defined NPD as an overall process of strategy, organization, concept generation, product and marketing plan creation and evaluation, and commercialization of a new product. This means that NPD is a process that begins with opportunity identification and ends with a set of information that adds value to customers and brings returns to an enterprise.

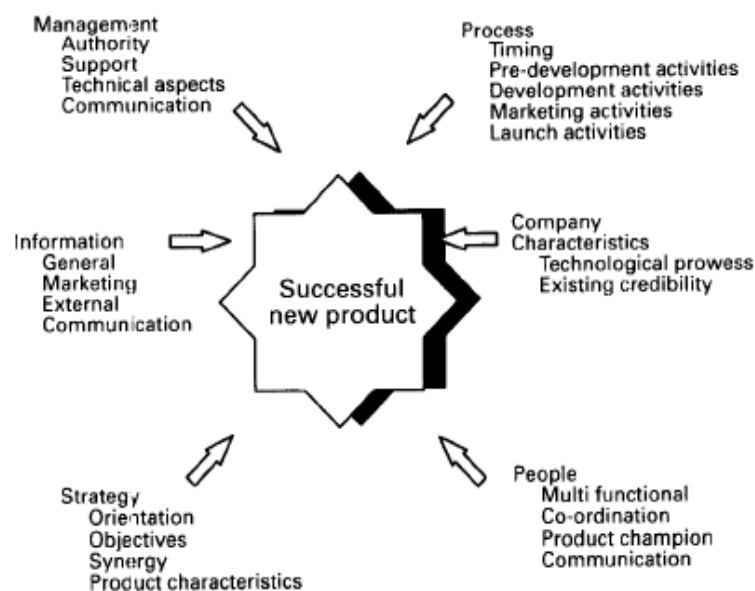
The following issues that relate to NPD could be identified:

- NPD process,
- Management of the NPD process,
- NPD success factors and
- External influences and areas of cooperation.

3.2.2.1 NPD Process

Based on the “generalist” studies in NPD, Craig and Hart (1992) identified the key themes of NPD research. These key themes include (Figure 3.2):

- NPD process
- Management
- Information
- Strategy
- People
- Company characteristics



**Figure 3. 2: Key Themes from the “Generalist” Literature
(Source: Craig and Hart, 1992)**

A number of NPD frameworks have been developed by many researchers in great detail and many processes to satisfy the needs of different organizations operating in different markets. The goal of NPD is to bring the new products to market on time, optimizing business results by eliminating waste and reducing cycle-times and costs, and managing the processes effectively to agreed business plans over the product’s life-cycle. The following NPD models have been developed by different researchers:

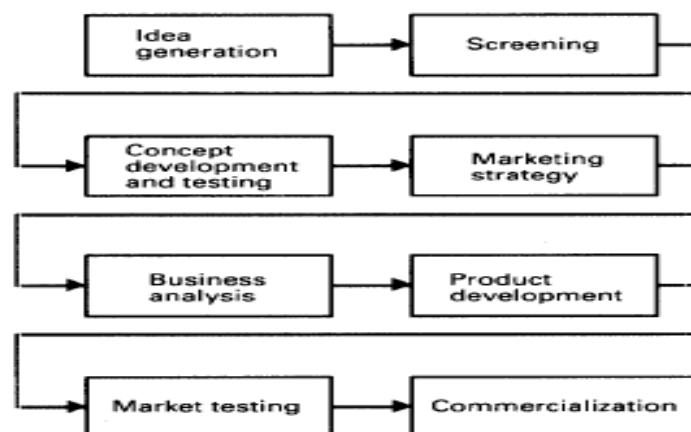
Shrivastava and Souder (1987) described the five basic steps in a NPD process:

- Idea definition.
- Concept definition.
- Product development.
- Pilot manufacturing.
- Marketing.

Thomas (1993) provided the following key steps for a NPD process:

- New product strategy development.
- Idea generation.
- Screening.
- Business analysis.
- Development.
- Testing.
- Commercialization.

Kotler (1980) as well as Craig and Hart (1992) have highlighted the following typical management strategy for NPD in Figure 3.3:



**Figure 3. 3: Typical management strategies for NPD
(Source: Kotler, 1980; cited from Crig and Hart,1992)**

Gerwin (1993) defined the seven subdivisions of the “simplified model of the process” as follows:

- Corporate strategy planning.

- New product conceptualization/formulation.
- Formal product concept.
- Technical specifications and design.
- Product testing and production.
- Marketing.
- Sales support.

Bowen et al. (1994) highlighted seven common critical elements for outstanding product development projects as:

- Core capabilities and core rigidities.
- Guiding visions.
- Pushing the envelope.
- Project leadership and organization.
- Ownership and commitment.
- Prototyping - rapid learning, and
- Early testing.

Stanton et al. (1994:101–125) identified the following six phases in the sequence of the NPD process as:

- idea generation
- screening of ideas
- business analysis
- prototype development
- test marketing, and
- commercialization

Ulrich and Eppinger (1995) shown a unidirectional process in Figure 3.4 is thrown into the next process:

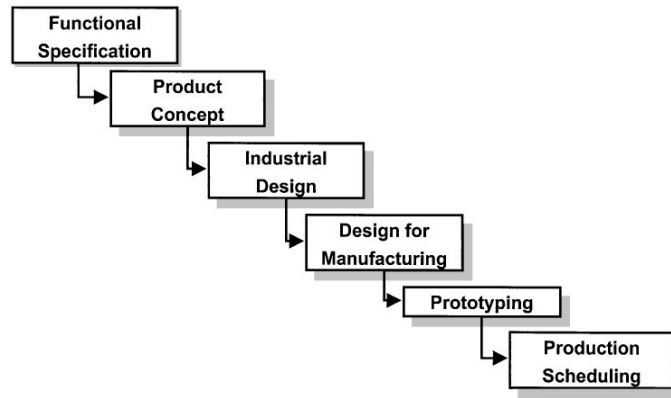


Figure 3. 4: Typical process of product development
 (Source: Ulrich and Eppinger, 1995)

Schilling and Hill (1998) considered a parallel process for NPD (Figure 3.5).

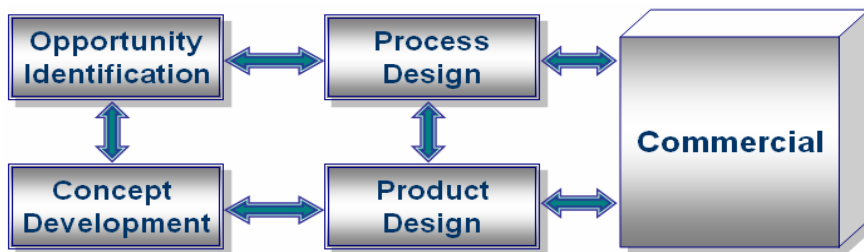


Figure 3. 5: The NPD parallel process
 (Source: Schilling Hill, 1998)

Rainey (2005:10-11) defined the six phases of a standardized NPD process (Figure 3.6).

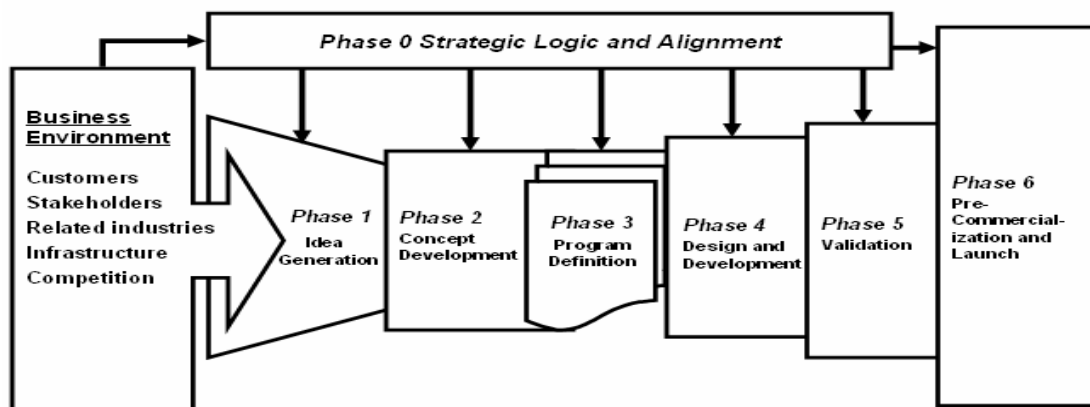


Figure 3. 6: The Standardized NPD Process
 (Source: Rainey, 2005)

Rainey (2005) explains each element of the standard NPD process and the linkage between these elements to form a cohesive new product strategy. Unlike many other texts where the people factor is taken for granted, Product Innovation gives due regard to selecting and managing the optimal mix of people responsible for ensuring that the process runs smoothly. Rainey sees integrated product development as providing organizations with the ability to improve market position in already served markets, as well as new ones, through innovative solutions to prevailing problems.

With the exception of “product life cycle management”, Deszca, Munro, and Noori (1999) introduced a deterministic stage model of the new product development process (Figure 3.7).

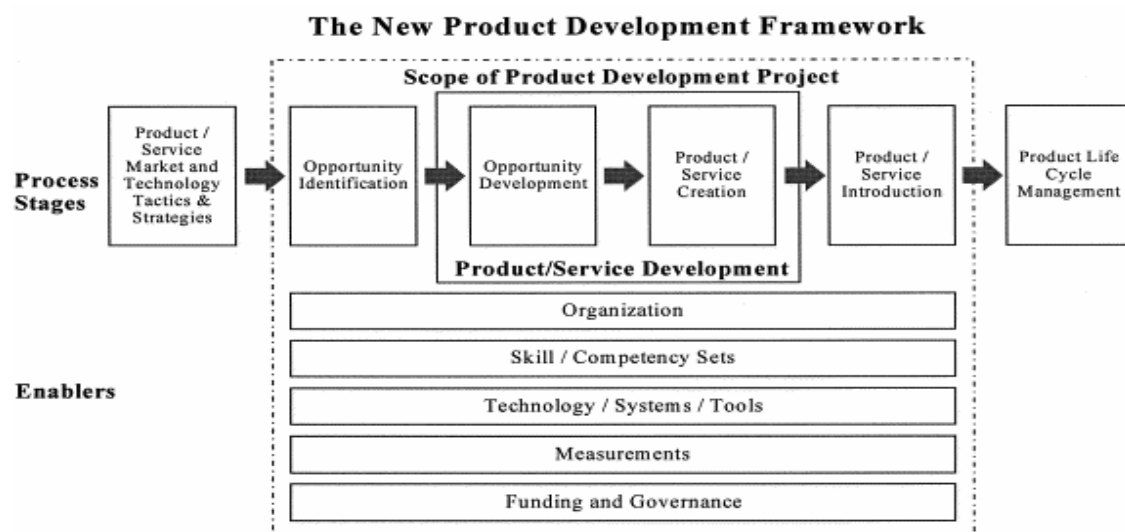


Figure 3. 7: The New Product Development Framework
 (Source: Deszca et al, 1999)

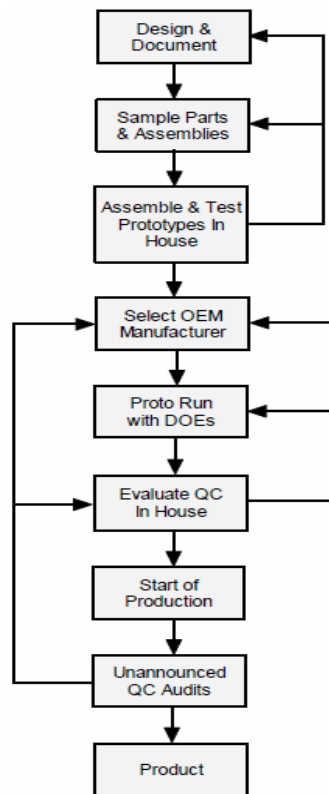


Figure 3. 8: Product Development Model with Feedback Controls
 (Source: Mowry, 2007)

According to Figure 3.8, Mowry (2007) presents the product development model which involves with feedback controls: select (Original Equipment Manufacturer) OEM, manufacturer proto run with (Design of Experiments) DOEs, and evaluate (Quality Control) QC, and QC in House (as an example).

The emergence of a new product in the market is a result of several activities spanning an appreciable length of time, depending on the product type. Some other authors (Kotler, 1991: 310–345; Booz, Allen and Hamilton, Inc., 1982) had earlier outlined eight phases, the additional phases being concept development and testing and development of marketing strategy.

Cooper’s Stage-Gate Model is a sequential process that tries to maximize the fit between customer requirements and product characteristics. A sequential process has no early warning system to indicate that the planned features are not manufacturable. As a result, it fails to reduce the cycle time as the new

product development iterates between product design and process design stages (Schilling and Hill, 1998).

The other NPD strategies typically make use of some kind of parallel process to reduce the cycle time while maximizing the fit between customer requirements and product characteristics. Concurrent engineering is a good example of parallel processing that decreases the product development time and achieves smooth transition from product design to production. It fulfills the two critical objectives of NPD strategy as suggested by Schilling and Hill (1998) by reducing cycle time and improving manufacturability. Improvement in manufacturability in turn results in maximizing the fit between customer requirements and product characteristics.

Cooper et al (2006) developed the Stage-Gate approach, which is a useful and powerful tool in product development. It splits progress into a series of “Stages” and “Gates” to give a well organised and structured flow to the project that is showed in figure 3.9 below.

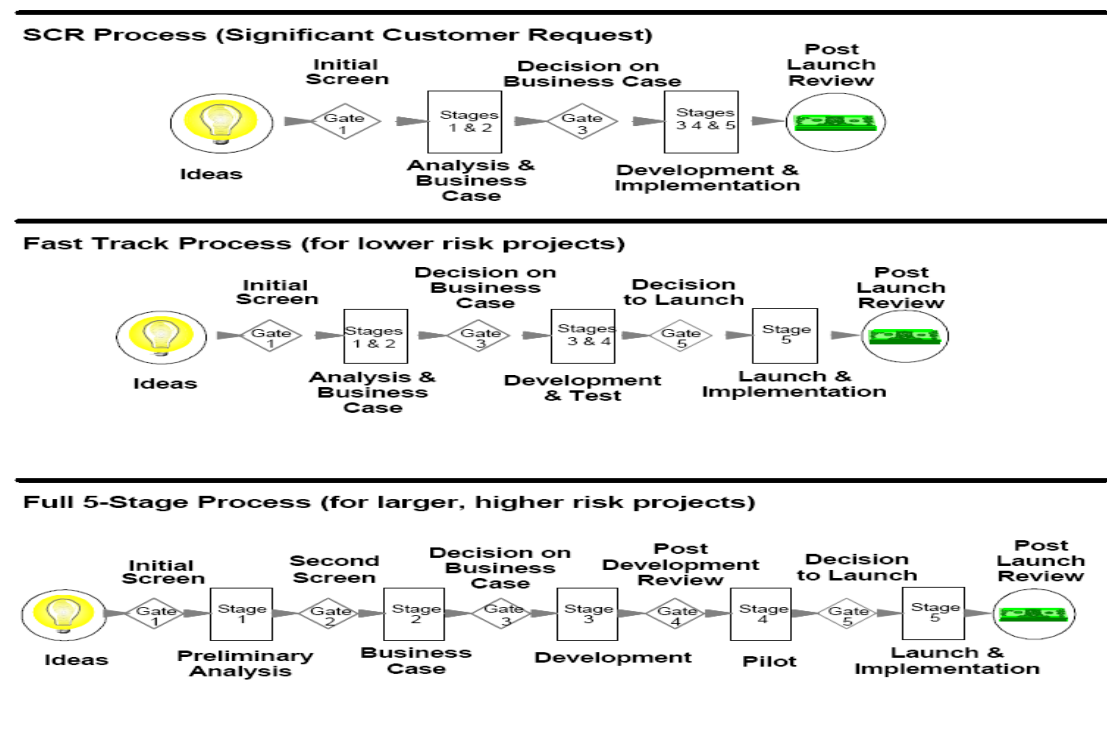


Figure 3. 9: The Stage-Gate approach
(Source: Cooper et al., 2006)

Craig and Hart (1992) provided a detailed explanation of each stage of the strategy, the discussion of which is briefly explained as follows:

Stage 1: Idea generation

Many new product development processes start with idea generation. Idea generation is a process in which creative thinking is used to produce large amount of ideas for new products. New product ideas have to come from somewhere. Where do companies collect their ideas for NPD? Some sources can be come through various channels such as employees, competitors, customers, distributors, supplies and others.

Stage 2: Idea Screening

Once the ideas are generated in stage 1, it is important to determine the ones which are feasible and workable as not all ideas can be useful for NPD. It is therefore, companies need to screen them in accordance with their development strategies.

Stage 3: Concept Development and Testing

After the stage of idea screening, the companies will be able to collect all the feasible and practical ideas. However, the idea needs to be taken to the target audience. These ideas will be used within the companies for the development of product concept and testing. The companies may take those ideas to the target audience for further determination of the product development.

Stage 4: Marketing Strategy and Development

How companies apply the ideas to develop a new product and launch it in the market? This can be determined by a proposed marketing strategy. The strategy will provide a blueprint of the market, such as marketing mix strategy of the product, the market segmentation, target market, market position, expected sales and profits of the product.

Stage 5: Business Analysis

Once companies established a feasible and clear marketing strategy, a set of analysis on financial feasibility and a long-run sustainability will become visible. At this stage, the information that is collected from the business analysis will enable the companies to make a vital decision for further product development.

Stage 6: Product Development

After all, a prototype at this stage will be produced. The prototype will evidently run through all the necessary tests. It will be presented to the target audience for critique, in order to identify any modifications that need to be made.

Stage 7: Test Marketing

During the stage of test marketing, the companies will test the product within a specific area. The purpose of test marketing is to see whether the product can be launched successful within a particular region, and modify the marketing mix strategy if there is a need before the product further launching to the national and international market.

Stage 8: Commercialisation

At the stage of commercialisation, there are certain factors that need to be taken into consideration before a product is launched formally. These factors such as time period, scope of the product launching, the way of the product will be launched, etc.

It is widely accepted that in order to move a new product idea through to production and final launch into the market, a number of activities need to be performed (Utterback, 1971). NPD process needs to be visible, so that the NPD process can be clearly and easy to control and monitor.

Through the exploration of the available literature, the most common elements of NPD process are found based on the frequencies of overlapped appearance from the literature. Only the frequency is greater than 14 were

chosen and listed in Appendix F. These common elements include ideas, marketing strategy, concept and design, prototyping and testing. Ideas include idea definition, idea generation and screening, and idea with philosophy. Marketing strategy is consists of market research versus technical feasibility analysis, market orientation, etc. In the concept and design phase, the concept of the product will be defined; and based on the product definition; the designation of the product will be carried out. In terms of prototyping and testing, it includes both the physical form and the quality of the product will be determined and examined.

The effectiveness of NPD is a key driver for the long term development of the business. When management are aware of the importance of the effectiveness of NPD, the management strategies will be enhanced.

3.2.2.2 NPD Success Factor

A number of researchers focused on the key factors that influence NPD process. Lynn *et al.* (1999) developed a model of the determinants of NPD success. The authors sent informants a series of cases and asked them to identify following key factors:

- Having a structured new product development process
- Having a clear and shared vision on the team
- Developing and launching a product within the proper time frame
- Refining a product after launch and having a long-term view
- Possessing the optimal team skills
- Understanding the market and its dynamics
- Securing top management support for the team and the team's vision
- Applying lessons learned from past projects
- Securing good team chemistry
- Retaining team members with relevant experience

Lester's (1998) identified a range of potential problems that can derail well-intentioned NPD efforts. By working through these problems, Lester discovered the following 15 critical success factors in NPD:

- Senior management commitment
- The culture of the organization
- Cross-functional teams
- Focus on adding value to the efforts of the venture team
- Provide strategy and fundamental guidelines
- Share a common understanding of the process
- Innovation requires expertise, skills, and motivation
- Generating good ideas
- Team formation events
- A detailed project tactical plan
- Clear goals and milestone measurements
- Shift to an external focus to run the new product venture
- Understanding in the venture team
- Communication to management
- The insight gained through reassessment efforts

Poolton and Barclay (1998) identified a set of six variables that have consistently been identified in the literature as being associated with successful NPD:

- Top management support for innovation
- Long-term strategy with innovation focus
- Long-term commitment to major projects
- Flexibility and responsiveness to change
- Top management acceptance of risk
- Support for an entrepreneurial culture

Cooper and Kleinschmidt (1995) studied a number of cases to reveal what makes the difference between winners and losers in the process of NPD. They extracted the following 12 common denominators of successful new product project:

- Solid up-front homework to define the product and justify the project
- Build in the voice of the customer
- Seek differentiated, superior product
- Sharp, stable, and early product definition
- A well-planned, adequately researched, and proficiently executed launch
- Build tough go/kill decision points into your process
- Dedicated, supported cross-functional teams with strong leaders
- An international orientation: international teams, global products
- Provide training on new product management
- Define standards of performance expected
- Cut back the number of projects underway
- Install a process manager

They argued that the success factors are invisible and why projects seem to go wrong or are otherwise not well executed.

The factors proposed by these authors are not exactly the same, and it is in fact difficult to generate a common set of critical success factors for NPD (Sun and Wing, 2005).

The central theme of the research by Craig and Hart (1992) was to identify factors that could distinguish new product success from failure. As mentioned above, NPD is broadly recognised as an important business activity in creating and maintaining a company's competitiveness. Its importance can be seen in a number of studies undertaken over the past three decades to identify the factors that are associated with successful new product performance. These studies have investigated new product performance from different perspectives, including new product success (Globe et al., 1973; Langrish et al., 1972), failure (Cooper, 1975; Crawford, 1979), or a comparison between success and failure (Cooper, 1979a; Link, 1987; Maidique and Zirger, 1984; SPRU, 1972).

According to Poolton and Barclay (1998), 'if companies can improve their effectiveness at launching new products, they can double their bottom line. It's one of the areas left with the greatest potential for improvement'. As a result, a large number of factors have been identified, including the NPD process itself, management systems and organisational characteristics, strategy and people (Craig and Hart, 1992).

The success of NPD is often linked to organizational strategy. Cooper (1997) believes that NPD and technology bear an integral relationship to a company's thinking by helping to define the range of that company's choice. The companies that are most likely to succeed in the development and launch of new products are those firms that implement a company-specific approach, driven by corporate objectives and strategy with a well-defined new product strategy at its core. Nonaka and Takeuchi (1995) suggest that 'a successful NPD process is more like the game of rugby than a relay race. Rugby is a team effort where its members continually interact until the game is over, whereas a relay race is more like the typical sign-off procedure followed in many companies whereby the job moves from one functional department to another'..

Innovation and NPD are crucial to the long term survival and profitability of SMEs. A number of researchers have highlighted the issue, inter alia:

NPD is essential for company survival and growth (Hart, 1996).

NPD is vital in determining the ongoing economic success of manufacturing companies (Jensen and Harmsen, 2001).

Companies must continuously develop new products to satisfy the (changing) needs of the market as well as to compete with other companies (Rahim and Baksh, 2003). Customers and market trends, push companies to be proactively developing new products to satisfy the needs of the consumer.

SMEs in the engineering industry are characterised by low overall volume growth, increasing consolidation and competition, efficient new product introductions which are an essential means of carving out a unique position in

the market. Establishing a direct link with the consumers, it can provide a market entry route for SMEs in an increasingly crowded marketplace. Although the above mentioned studies have had detailed discussions about the critical success factors to NPD, there are no linkages between the critical success factors and the way of managing NPD process within SMEs. Therefore, it is important to address the key components of managing NPD in order to assist SMEs to be successful in their NPD process.

3.2.2.3 NPD Challenges and Failure

Despite dealing with the critical success factors for NPD, SMEs also need to deal with a number of challenges in their NPD process. A number of researchers worked on the challenges and failures of NPD. Minot and Wood (2003) presented the following NPD Challenges:

- Appointing a project / engineering manager
- The utilisation and management of outside inputs
- Coordinating cross-functional teams
- Collaboration
- Managing resources
- Dealing with NPD staff
- Managing the completion of a product or its process
- Dealing with NPD failures

Among the above mentioned NPD challenges, companies must deal particularly with NPD failure as it is a serious problem to any company, since it can even ruin the business. There is no guarantee that a system will always be successful. System failures can be dramatic and sometimes can cause serious consequences for organizations. Realistically, not all NPD can be successful. Therefore, it is important to examine the reasons for new product failure in order to provide some new ideas, recommendations, and a model for the best practice of SMEs. The main reasons for failure can be attributed to a variety of factors including:

- Inadequate marketing (Calantone and Cooper, 1981; Calantone *et al.*, 1996).

- The ability to creatively and imaginatively make strategic decisions (Verona, 1999).
- Lack of communication with the customers
- Poor product performance
- High marketing costs, particularly for branded launches
- Inefficient management of NPD/innovation and/or lack of a structured NPD system

In addition to the above factors that cause NPD failure, Minot and Wood (2003) listed the following reasons for NPD failure:

- Poor project management
- Inadequate organisational infrastructure
- Underestimating the technical challenges, personal, and financial resources required
- Lack of clarity regarding objectives

Failure to understand the market can cause environmental uncertainty. Gerwin and Tarondeau (1982) defined environmental uncertainty as market changes, emerging technological developments, and the evolving competitive situation. Environmental uncertainties can cause confusion as to project targets and how trade-off decisions should be made. Gupta and Wilemon (1990) commented that uncertainty concerning customer requirements may result in a poor product definition.

Poor product definition can now cause poor understanding of customer needs (Rosenau, 1988). Khurana and Rosenthal (1997; 1998) also contend that unresolved technical uncertainties and inadequate customer needs assessment are responsible for the failure of many new product development projects. They believe that the main contributor to the NPD failure is environmental uncertainty. Clark and Fujimoto (1991) supported this statement by addressing that market, technological and competitive uncertainty can make it difficult for a project team to launch a product concept with internal as well as external integrity. This means that for a NPD to

succeed, organizations should put forward a strategy on how to deal with the identified environmental uncertainties.

A number of studies have found that timely and reliable knowledge about customer preferences and requirements is the single most important area of information necessary for product development (i.e. Henkel and von Hippel, 2005., Adams et al., 1998., Bacon, 1994., Teas, 1994). Misunderstanding customers' needs would cause confusion within the organization and make it difficult to know what strategy needs to be implemented and what resources are required. Afuah (2001) confirmed the problem with newly launched products suffering from notoriously high failure rates reaching 50 percent or more. Afuah (2001) further pointed out that the main culprit of this high failure rate was none other than failing to understand customer needs.

Many new products fail because manufacturers have limited understanding of the real needs of the customer and the opportunities in the market place when a new product is being conceived.

Successful manufacturers always establish a close relationship with their customers and keep up with ever changing demands. It sounds simple in theory; however in actual business terms, many companies that are engaging in NPD, are focusing on internal capability rather than market and consumer demand.

Although the above mentioned factors for NPD failure are known, SMEs are eager to be innovative and develop new products as it is critical for their growth and survival. Minot and Wood (2003) asserted that not all companies are suited for NPD because their capabilities can limit the ability to successfully support NPD. For example: limited skills, knowledge of employees, inadequate organisational structure, poor culture, scarce controls and communication.

For companies to be successful in NPD, it is important to have a suitable management strategy for their NPD. The author briefly summarized the failure

of NPD regarding the role of management as they are responsible in the daily operation of their organizations. SMEs should have proper strategies to manage their available resources to provide what their customers need. Most managers are failing to take their equitable positions because of lacking business and research skills, misunderstand the market, and lack of education and training.

3.3 FORCED CHANGES IN BRINGING INNOVATION TO NPD

In today's business environment, the market competition always pushes companies to develop new products. Therefore, NPD is essential for companies to survive firmly.

On the other hand, once individual or small groups of customers adopt new products, it will provide information to other individuals or large groups of customers to purchase the new products. During the period while the new product is pending for being accepted, recognized by customers and even after, those old products still participate in the market competition, and it impacts on the perceived value of new products.

3.3.1 Forced Changes

Companies routinely introduce new products, and these new products can be a brand new or either modified from the existing products. The new products usually have a better quality with lower cost in comparison with the existing products, and it should add more value to companies. In essence, once this value perceived by customers, it can increase company's sales and profits significantly. Therefore, it is necessary to make changes in products development.

Forced changes are often those changes which add very little or no value for the customer, but these need to be incorporated in the new design (Krishnan

and Ulrich, 2001; Ulrich, 1995). According to Yan and Makinde (2009), the new products can be developed through taking old components out and adding new components into the products development as shown in Figure 3.10. The reasons for change in new product development can be categorized as following: bringing innovation, continuous improvement, and forced change.

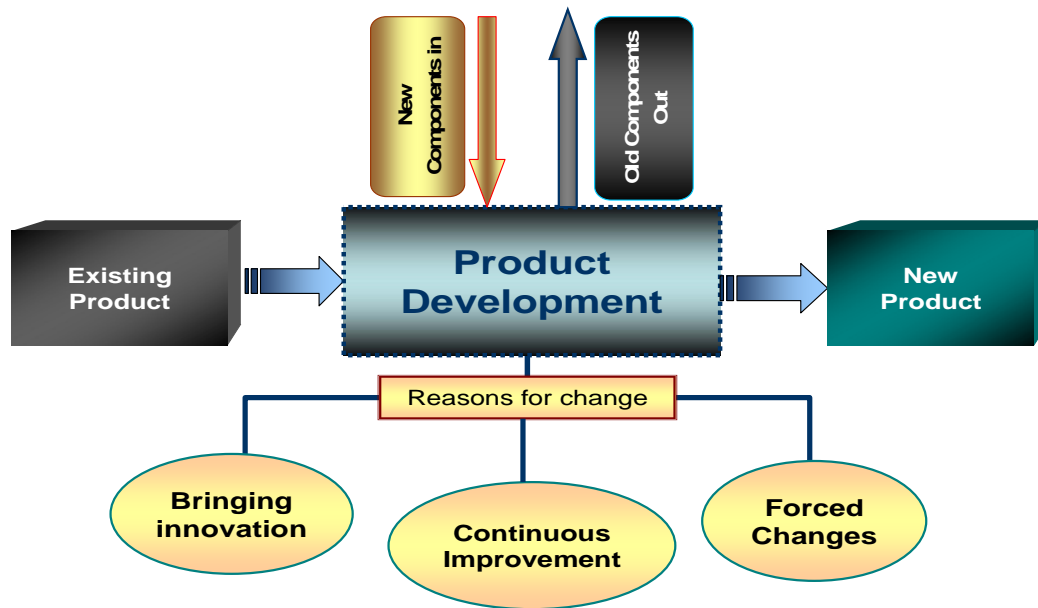


Figure 3. 10: Reasons for possible changes

Customers often prefer new products than those old products as they believe that the new product may have a better quality due to the ongoing advanced technology. On the other hand, innovation often brings new features/functions into the new products. Rainey (2005) stated that new features are the main source of keeping the customer excited about the product results in maintaining or increasing market share. Hence, a new product with the good quality will have a long product life cycle in the marketplace and adding customer's perceived value to the new product. In order to capture high proportion of market share, companies will have to keep themselves to be innovative. Therefore, companies need to accept change as a vital for innovation.

3.3.2 Bringing Innovation in NPD

A number of companies attempted to bring innovation to their NPD management process such as Toyota, Kodak, Motorola, etc. Those companies brought innovative practices such as Lean techniques and continuous improvement to improve their NPD management process. Lean techniques are regarded as one of the effective innovative strategies adopted to improve the existing products. Businesses worldwide have come to the realization that continuous improvement is vital to the ultimate success of a company. In order to be competitive and innovative, it is important for management team within an organization to apply Lean tools as an innovative strategy in their daily operations and product development process. Once lean is applied in product development process properly, it can assist companies have an effective NPD process and speed their new products to the market.

However, how to bring innovation and continuous improvement into NPD process, particularly, how to apply Lean tools in the product development process to launch a new product? Yan and Makinde (2009) proposed a Lean product development (LPD) model that shown in Figure 3.11. It includes several lean tools such as Stage-Gate, Kaizen, measuring time spent on NPD activities, and waste and cost reduction effort.

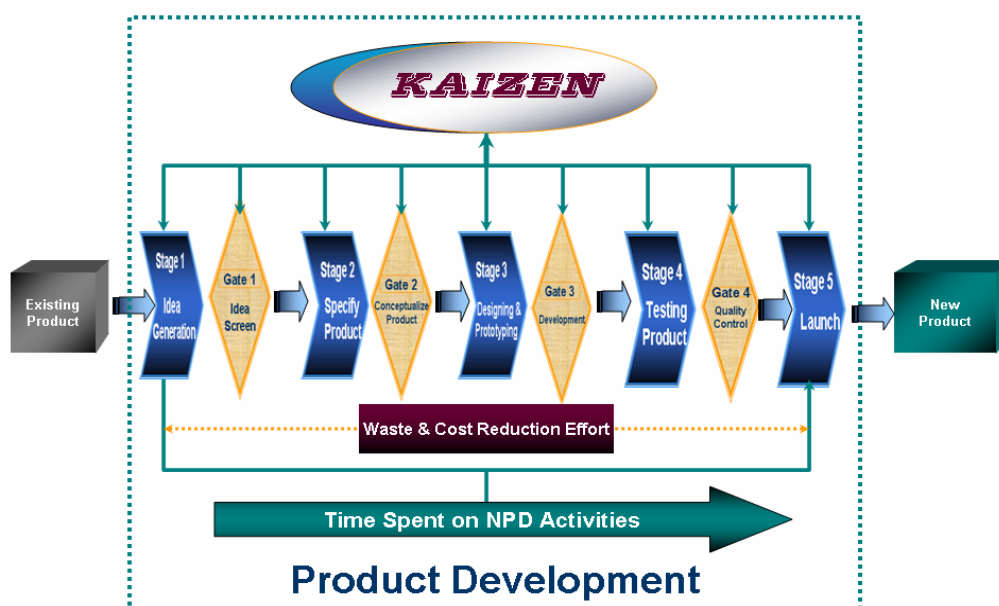


Figure 3. 11: Lean Product Development Model

Cooper's Stage-Gate Model is a sequential process that tries to maximize the fit between customer requirements and product characteristics. It is widely accepted that in order to move a new product idea through to production and final launch into the market. Kaizen as a philosophy of continuous improvement can be used in NPD process to encourage both management and shop floor employees participating in the NPD process in order to maximize the value of new product.

In terms of waste and cost reduction effort, it can be used throughout all the stages of the product process to measure the reduction of waste and cost. It is important to note that waste and cost reduction should be part of the entire process and should be a key element throughout all the stages in the NPD process. Time to market is critical factor of measuring the success of a NPD. The LPD model is designed to save the company time and costs that are caused by unnecessary wastes.

3.4 TYPICAL MODELS OF NPD MANAGEMENT

Companies are managing the NPD process to obtain a better understanding, or how to achieve the successful product development through well performed tasks in the process. In recent literature, a number of researchers have addressed the issue of NPD management in various ways (Anderson, 2008., March-Chorda et al. 2002., Petrick Echols, 2004., Song Noh, 2006., and Barclay, 1992).

3.4.1 Anderson's Simplified NPD Management Framework

Anderson (2008:554) developed a simplified NPD management framework for general understanding and acceptance across the organisation. These elements were bundled into three key components: *Doing the Right Things*, *Doing Things Right* and *Measuring the Results* (refer to Figure 3.12).

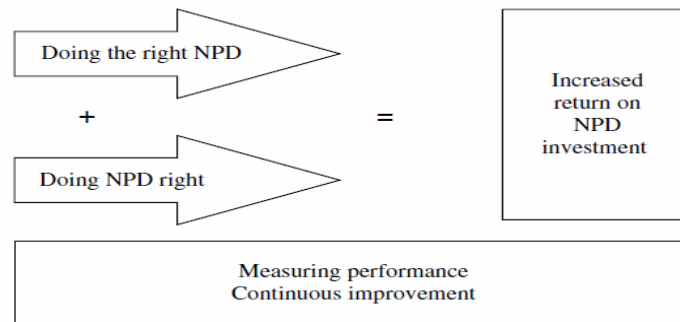


Figure 3. 12: A framework for improving NPD management

The use of these three terms as the basis for the framework of NPD management provided immediate understanding and meaning to all key stakeholders (Anderson, 2008:553). The basic principle, that maximisation of the return on a company's NPD investment through putting their efforts into the right projects and managing these projects in the best possible way, was a simple and compelling message to communicate across the organisation.

According to Anderson (2008:554), *Doing the Right Things* included the following elements related to selecting the most appropriate products to develop:

- Link and relevance to overall company strategy and direction
- Organisation of product development capability
- Product development portfolio practices
- Technology planning
- Decision-making practices and quality
- Culture, climate and values
- Senior management involvement

Doing Things Right included those elements related to achieving the best outcomes for specific product development projects (Anderson (2008:554) :

- The product development process
- Resource availability and allocation
- Link to market and key stakeholders
- Organisational design—project teams
- Project prioritisation

- Quality of execution—technical, marketing
- Product advantage and definition
- Culture, climate and values
- Senior management involvement

According to Anderson (2008:555), *Measuring the Results* had basically a two-fold aim:

- to demonstrate the return on investment in product development effort.
- results are measured as a way of determining overall performance and identifying specific areas for improvement.

3.4.2 March-Chorda *et al*'s Conceptual Model

March-Chorda *et al* (2002) proposed a conceptual model shown in Figure 3.13 for the critical success factors of product development planning and processing in SMEs. The model focused on top management support, product development planning, and the process of analysis of market requirements for the product development process.

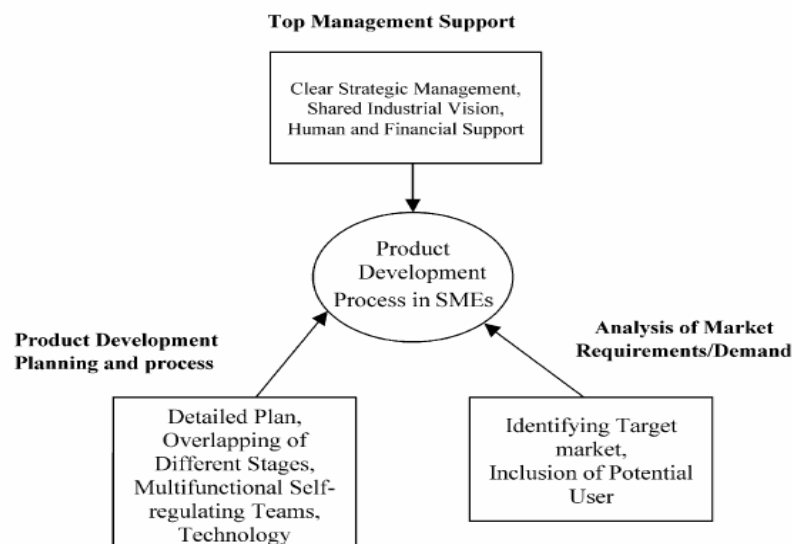


Figure 3. 13: A conceptual model for the critical success factors of product development planning and processing in SMEs
(Source: *March-Chorda et al., 2002*)

3.4.3 Petrick and Echols's Meta Roadmap Model

According to Petrick and Echols (2004:93), Motorola integrates supplier roadmap information directly into its internal roadmaps to plan technology and product evolution. Motorola begins this process by linking its divisional roadmaps into a "Meta Roadmap" that is used to communicate with customers and suppliers. Motorola's overall strategy to work with key suppliers is illustrated in Figure 3.14. This roadmap assists Motorola in identifying gaps in product offerings and unmet customer needs.

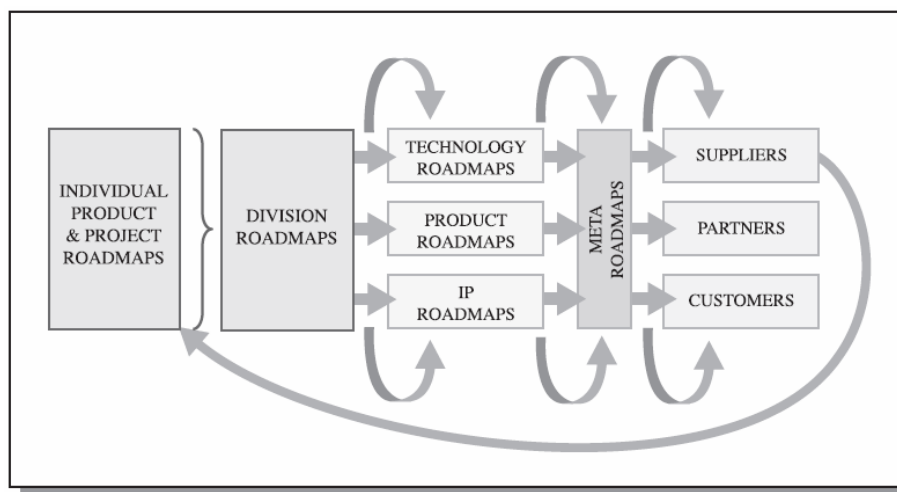


Figure 3. 14: Motorola integrates supplier roadmap information directly into its internal roadmaps to plan technology and product evolution
(Source: Petrick and Echols, 2004:93)

3.4.4 Barclay's Five Key Elements for NPD

Barclay (1992) summarized the following five key elements that required in achieving NPD success within any development framework:

- An open minded, supportive and professional management
- A good market knowledge and strategy
- A unique and superior product
- Good communications and coordination
- Proficiency in technological activities.

3.4.5 Song and Noh's conceptual framework for NPD Success

Song and Noh (2006:265) presented a theoretical framework (Figure 3.15), the model suggested that environment, skills, resources, leadership, strategic fit, proficiency of NPD process, and effective product positioning strategies are associated with project success.

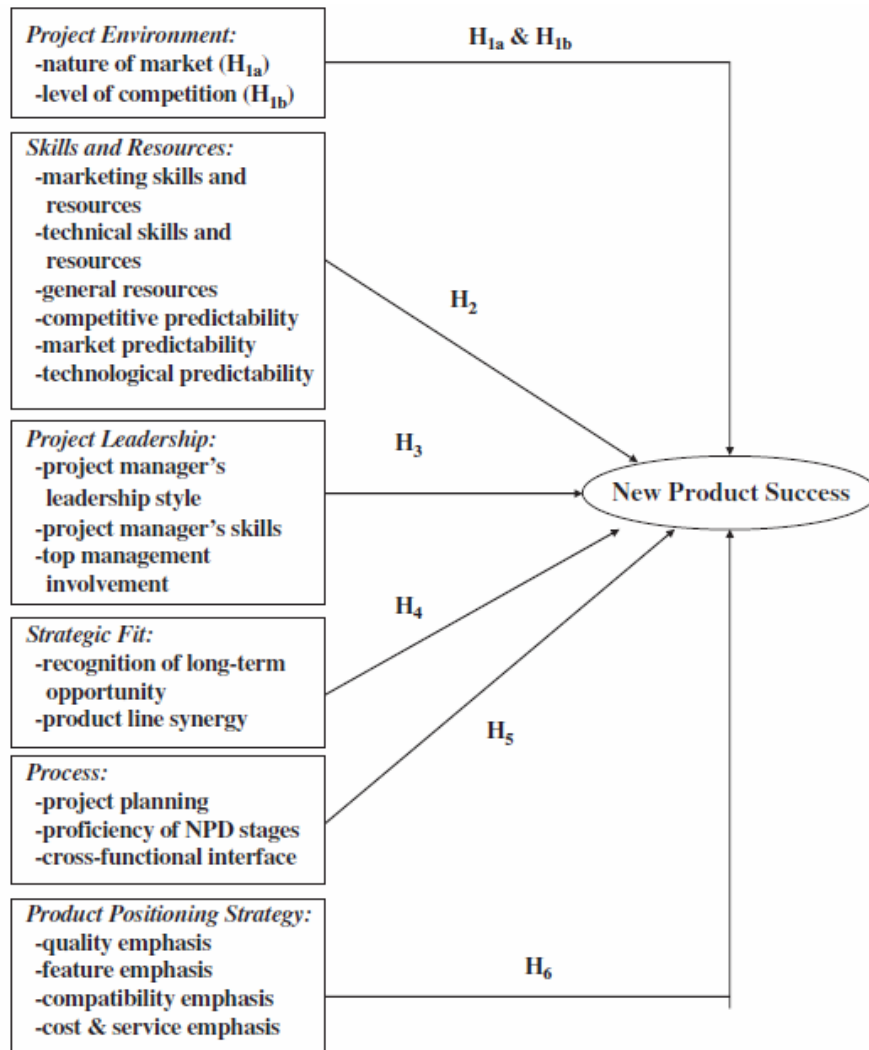


Figure 3. 15: A conceptual framework of new product success
(Source: Song and Noh, 2006:265)

3.4.6 Takeuchi *et al*'s Six Characteristical Model for NPD

Takeuchi *et al* (1986) observed six characteristics in the way (large successful) companies managed their new development projects:

- *Built-in instability:* Top management sets broad and challenging goals.

- *Self-organizing project teams*: This is similar to the process where a new company is formed.
- *Overlapping development phases*: Movement from one phase to the next is allowed although not all the requirements for the present phase are met. *Multi-learning*: All members of the team acquire a broad knowledge and wide range of skills.
- *Subtle control*: Little but enough control is exercised to prevent chaos.
- *Organizational transfer of learning*: Knowledge is transferred to outside the group, to new projects or to other divisions.

3.4.7 Other Models for NPD Management

There were some considerations of SMEs. An SME normally does not undertake massive projects, experiences stress amongst members and experiences long working hours during peak stages of a project. In a paper on the new age of new product development Scott (1998) described the new paradigm for new product development (as opposed to the old sequential “passing over the wall” approach). The recent NPD activity is focused on the entire NPD process or set of activities, rather than separately and sequentially in each step of the process.

Zirger *et al* (1990) studied the effect of acceleration techniques on product development time. Time to market has become a strategic crucial to firms. Zirger *et al* found that not all the factors considered were positively correlated with speeding up new product development. Four factors correlated with increased speed in development:

- Team structure and management variables (increased team functions, reduced number of projects, high priority on time) delivered the greatest impact.
- Overlapping development activities slashes time by cutting project review preparation, presentation and resulting engineering changes.

- Slightly increasing the number of major suppliers tended to lead to faster product development.
- Reduced levels of management support reduced product development time relative to other competitive counterparts.

Leonard-Barton (1992) presented a paradoxical view of core capabilities: in addition to enabling new product development, they can also serve to hinder and restrict thus becoming core rigidities. Core capabilities are a knowledge set that distinguishes and provides the competitive advantage. It includes four dimensions:

- Skill and knowledge.
- Technical systems.
- Management systems.
- Values.

Leonard-Barton argues that these core capabilities become less tangible as they move from technical to managerial systems and so become more difficult to change.

Meyer et al (1998) suggested three strategies for managing technology:

- Form a critical mass of skills around core technology.
- Develop a broad range of unrelated technologies without relying on one core technology.
- Purchase a broad range of technology.

Leonard-Barton (1992) stated that management rigidity can become an obstacle rather than a support mechanism when technical innovation progresses too far ahead without considering management innovation. In an SME where the same individuals perform technical and management duties it is easier to support change in both areas. Meyer *et al* (1998) suggested that a technology core having critical mass should be formed.

Obviously, management commitment plays a critical role in supporting NPD process which should not be ignored. Decent management commitment will encourage, and create an atmosphere of trust, coordination and control.

Companies need to make sure that their resources and necessary skills are available to develop new products. Complex activities in the NPD process such as design and prototype testing need to be undertaken in a systematic and professional manner. The link between R&D and marketing poses one of the most serious barriers in the process of successful NPD. In this regard, companies should be able to involve R&D facilitators if needed, in order to perform effectively and efficiently in the NPD process.

The quality of products is a key factor to NPD success, especially in the case of SMEs. Failure to meet customer requirements could cause serious damage to the relationship; this is commonly addressed by many academic researchers.

There is a strong body of evidence that indicates companies should look to the customer and the market for the majority of their new product ideas. Companies should have regular market research exercises where they should analyze and assess customer's preferences of their products.

3.5 KEY COMPONENTS OF MANAGING NPD PROCESS

Due to SMEs have limited resources and are different with large companies, thus, this study only choose the critical components from the above NPD management framework and models for SMEs. Management support and involvement is a key component for NPD management within SMEs. SMEs would not be able manage their NPD process effectively without involve employees, as employees can be the potential customers, which can generate valuable ideas for the NPD process. Product strategy provides a clear vision of the new product that will be developed and a right direction for SMEs to achieve the successful NPD.

These key components are shown in Chapter One Figure 1.5, which include management support, NPD strategy, NPD process, people involvement, company resources and continuous improvement.

3.5.1 Management Support and Commitment

It is normally assumed that new product projects are not initiated within small firms without the support of top management (Maidique, 1980), while the support of top management is frequently cited as a success factor in studies of large firms (Cooper, 1999).

Cooper (2005) suggested that top management support is a necessary ingredient for successful product innovation, since its main role is to set the stage for product innovation. In order to achieve the successful NPD, top management must have a clear vision on the new product that being developed. Once top management committed to NPD process, it can be a source of growth within the company. Thus, it is important to develop a clear vision, objectives, and strategy for NPD.

Top management has the responsibility to lead by example, and to create an organizational environment, which encourages employee participation, innovation and empowerment (Bounds et al., 1994). Indeed, a decent management commitment will promote a sound environment of innovative culture.

Heunks (1998) found successful SMEs associated with committed leaders with vision, enthusiasm, future-oriented exploit external opportunities for inward investment and information gathering. In addition, Motwani et al. (1999) prescribed that leaders must demonstrate active strategic commitment to research and technological change. In order to create an innovative culture, leadership should be able to listen to new ideas and encourage employees to become involved in the NPD process.

Maladzhi, Jacobs, Yan, and Makinde (2010) investigate the role of innovative leadership within SMEs. Their findings indicate that management support and

commitment is critical to the success of NPD process. Top management as facilitator - If top management controls decisions on market research, design specifications, prototyping, pre-production tooling etc-it leads to repressive behaviour in Product Development. It should rather assume the role of facilitator in encouraging employee participation (culture encourages empowerment), as delegation of authority from top management to cross functional team increases learning.

In a study by Laforet and Tann (2006:371) as it shown that more innovative companies had higher management commitment to innovation than in less innovative companies. They suggested that culture, NPD process, top management commitment to innovation contribute to innovative management and company strategic orientation.

Anderson (2008:560) summarized the key factors for the successful implementation of a framework for improving NPD regarding management:

- Commitment from senior management.
- Clear delegated authority to improve NPD management.
- Good cooperation and communication across the key internal stakeholders involved.
- A framework that was simple to apply and meaningful across the whole organization.

Thus, leaders must be outward looking in the nature of their business, particularly SMEs have less resource. Leaders must inspire employees; Leaders should be able to delegate authority in the company to facilitate NPD; actions of managers whether they are owners or not is important, it should provide resources and validity to NPD, lead and participate within all the processes; changes bring company innovativeness to the SME which must travel through the organization.

3.5.2 People Involvement

It is vital for employees to be involved in the NPD process. Bayo-Morines and Merino-Diaz de Cerio (2004) described that employees are one of the main

assets of a firm and one of the decisive factors in determining performance is one that leaves little room for argument. There is no doubt regarding the fact that employee's qualities, attitudes, and behaviors in the workplace to get a long way in determining a company's success. Employees must be at the heart of management values, in order to encourage employees to be involved in NPD process. Management must play a crucial role in motivating employees to be involved in any activities within the organization; this will enable employees to reach their full potential.

Moreover, management should communicate critical company issues with employees, their participative approach would generate higher employee involvement and better understanding of the companies strategies and vision, and if the employees understand the companies vision. Increasing employee motivation by making things happen, like an employee suggestion system that really works is extremely motivating for everybody. That is from employees to the management.

Companies can get tremendous business value through implementing good ideas and at the same time demonstrate to their employees that they and their ideas are highly respected. Involving employees in the company's initiatives motivates them and moreover, the number and type of ideas that are received are valuable indicators of the company's morale and employee's attitude.

Companies can improve their existing creative processes by involving employees in the NPD process so that they can get input from their employees, to get new perspectives from individuals who are often consumers of the company's products as well as employees. Typically, these would include brand naming, developing new products etc (Anon, 1994). By involving employees early in the NPD process can lead to good results. The processes can be continuously improved, that is by capturing ideas from employees across different parts of the company. All employees have ideas on how to make their companies processes more efficient, they just need to be given a chance and be listened to. The best ideas must be highlighted and shared, which facilitates their implementation across the whole organisation.

Employees are the ones who know exactly what is happening in the companies processes, meaning that since they are the ones who operate the machines each and every day, they are also the ones who know what can be changed in the processes in order to achieve top quality. So, listening to employees would benefit the companies greatly.

Employees involvement can be measured by the number of the following practices: planning and organising their tasks, involvement in designing their jobs, teamwork in the training of new workers, work teams, improvement groups, suggestion systems, attitude surveys, holding of open days and meetings to inform the workers (Bayo-Moriones and Merino-Diaz de Cerio, 2004).

Ahmed (1998) revealed that the climate of the organisation is contingent by its members through the organisation's practices; procedures and rewards systems deployed and are symptomatic of the way the business runs itself on a daily and routine basis. It has been proposed that a successful climate of innovation is founded on: nature of interpersonal relationships that exist between employees and senior management, and whether individuals feel supported and valued (Anderson, 2008:560).

3.5.3 Product Strategy

One of the key factors identified is the impact of the new product's launch strategy. A number of studies addressed the key factors as consistent correlates of new product success (e.g., Cooper and Kleinschmidt, 1987., Craig and Hart, 1992., Johne and Snelson, 1988., Lilien and Yoon, 1989., Montoya-Weiss, and Clantone, 1994). A new product strategy is needed to focus the product development effort and tie it to business unit or corporate strategy; and a new product strategy provides a way for management to influence this process (Moore and Pressmier, 1993:96). Its importance has been documented by both Cooper (1984a, b) and Booz-Allen (1982). Moore and Pressmier (1993:96) further claimed that the new product strategy should

contain new product objectives and specify the amount of required resources that is needed in the processes.

Cooper and Kleinschmidt (1995) found that a firm's new product performance depends mainly on its processes, resources, and strategies, which are the cornerstones of successful product development. Kahn *et al.* (2006) present their view of a best practices framework for NPD management based on the PDMA's six NPD management dimensions (strategy, portfolio management, process, market research, people and performance evaluation).

To many SMEs, their NPD strategy either lack focus or is very informal. Thus, it is important to draw attention to the management in having a structured product strategy. Product strategy in large companies can be structured and complicated process, however, the product strategy in SMEs should only focus on the key components and develop a basic model in order to achieve successful NPD. Due to the limited capabilities of SMEs, these key components include SMEs resources, R&D facilitators, market research, and suppliers as the minimum requirements that the management of SMEs should take into consideration. Once SMEs focus on those key components, they should be able to implement the product strategy effectively in managing their NPD process.

3.5.3.1 Resources Availability

Due to current competitive environment, the challenges for all businesses (including SMES) are not only to innovate in existing markets to survive and remain profitable, but also to innovate in new markets in order to stay in front of competitors. The NPD strategy provides a basis for consistent and rational decision making, and a focus for the company's limited development resources.

SMEs have the great responsibility to fend business for themselves and to provide services in a critical time. SMEs cannot afford to have many

employees due to its limited capability. Management in SMEs should always be aware of escalation prices of resources.

Company resource could range from a whole range of things dependant on the nature of the company business in industry. SMEs would need to buy some kind of material in order to produce products to be launched to the market. It is in management's interest to know where savings could be made. Buying expensive raw material and not meeting the sales demands, is a major loss to the organization. According to Harrison (2003:80), financial resources can be a source of advantage, although they rarely qualify as unique or difficult to imitate. Nevertheless, strong cash flow, low level of debt, a strong credit rating, access to low-interest capital, and a reputation for creditworthiness are powerful strengths.

Using outside resources and information could benefit the company, because the world is a big place outside. Mentorship is always advisable for SME's as information is known by outside references. Outsourced information will normally detail cost effective material suppliers and business opportunities. Skills for turning the raw material to products is also a resource that is of great importance to the company.

Skills to manufacture products should be the most important aspect within any SME, because the company exists of what it can produce. If the skills are not well looked after and not developed by the SME; quality products might lack as time goes by. To nature the skills again outside expertise should be acquired. Acquiring outside skills could be the most expensive but worth while move. Using outside expertise to train internal manufacturing bodies could very well benefit the organization in the future. Equipment is the most liable of all company resources, as these might not be operational for the bulk of the time and yet quite expensive.

Equipment plays a critical role in an SME. If a certain machine is not really needed by the company because it is almost non operational; costs might result to be high if that particular machine needs to be outsourced form

another company. Resources of the company must always be checked in the market for savings that could be made to the nearest cent so that needs to hire equipment could be eliminated. HR in any company should play a critical role in looking over company liabilities and assets. HR includes human based activities such as recruiting, hiring, training, and compensation.

Organizational resources and capabilities can be measured by measuring how much do the processes and activities of an organization bring value to the products and services. Michael Porter developed a framework, called the value chain, which is useful tool in identifying potential sources of competitive advantage. The Value chain divides organizational processes into distinct activities that create value for the customer. These main activities are consist of inbound logistics, operations, outbound logistics, marketing and sales, and service (Harrison, 2003:82).

SMEs are facing a financial risk when they experiencing the NPD launch. SMEs are less likely to implement more formal risk minimization strategies for new product development (NPD) such as stage-gate often have reasons of resource constrains. Check the illustration below for the stage-gate model. The stage-gate model is the driving force behind the successful NPD process. New incremental products are the result of the company's overall strategic planning process. It can also be the resultant of an employee idea suggestion programme. The following, a screening process takes place to determine the strategic fit, market attractiveness, technical feasibility and the identification of any killer variables. Gate keepers are technical and marketing people.

Resources, people and money are assigned to the project to perform an initial market and clinical assessment. The purpose of this stage is to determine if the idea can pass through Gate 2. The detailed business case is developed once the project passes through Gate 2. This business case incorporates market definition and segmentation, product positioning, a product win statement, product specifications, market entry strategy, technology and operational strategies and a financial analysis. A full assessment in terms of

competition and intellectual property evaluations are conducted to ascertain the degree of freedom to operate and ability to gain a competitive advantage.

In Gate 3 the business case is evaluated by senior management. At this stage it is determined whether the project continues into product development. Decisions on incremental projects are based on the financial attractiveness of a project. At this stage the gate committee empowers a multifunctional team taking the project into product development based on the specifications detailed in the Stage 2 (Kahn 2005).

3.5.3.2 R&D Facilitators

Raymond and St-Pierre (2004) noted customer dependency would leave a company very vulnerable indeed due to a higher level of business risk; they also reported that R&D activities would counter the influence of SMMEs' major customers and reduce their vulnerability.

Hence, it is important for SMEs to be aware of the importance of networking as the literature above highlighted, which might lead to an increase in company innovative performance.

3.5.3.3 Marketing Research

The sole purpose of market research is to help companies make better business decisions about the development and marketing of new products. Market research represents the voice of the consumer in a company. A company must conduct market research so that management can be provided with relevant, accurate, reliable, valid and current information. Market research helps the marketing manager link the marketing variables with the environment and the consumers. It also helps remove some of the uncertainty by providing relevant information about the market variables, environment and consumers. Without relevant information of customers, companies cannot predict market reliably and accurately.

Wind and Mahajan (1997) addressed the importance of relatively poor of successful NPD due to the poor utilization of appropriate marketing research and models. They determined that the marketing research and modelling approaches could improve the chances of successful NPD.

Undoubtedly, the marketing literature takes a market-driven view, which has extensive market research as its key driver (Booz, Allen and Hamilton, 1982). The benefits of this approach to the new product development process have been widely articulated and are commonly understood (Cooper, 1990). In practice, new products are likely more successful if they are designed to satisfy a perceived need rather than if they are designed simply to take advantage of a new technology (Ortt and Schoormans, 1993).

The approach taken by many companies with regard to market research is that if sufficient research is undertaken the chances of failure are reduced (Barrett, 1996). Indeed, the danger that many companies wish to avoid is the development of products without any consideration of the market. Furthermore, once a product has been carried through the early stages of development it is sometimes painful to raise questions about it once money has been spent. The problem then spirals out of control, taking the company with it.

3.5.3.4 Supplier involvement

Supplier focus is an important dimension of quality management since materials and purchased components frequently are the source of suboptimal quality (Leonard and Sasser, 1982).

Suppliers are most likely to be involved in the NPD process. In the past, suppliers were not involved early in the process, they were only involved nearly the end of the process. NPD has become increasingly important in developing or maintaining a strong position in an increasingly competitive business. Because of the increasing global competition as well as specialised skills and knowledge, suppliers have given more and more importance to

NPD. Suppliers must be involved in the NPD process because they possess the potential to generate new ideas and to provide means for their insight.

An effective supplier involvement can decrease the difficulty of the development processes and enables the prevention of problems that may arise due to ignoring suppliers technological and manufacturing constraints. The involvement of the supplier depends on the communication, trust, and commitment of the supplier.

The supplier must be closely interactive with the customer, because such a relationship is vitally important for the close interaction and it increases the new products efficiency. It is realised by many companies that supplier involvement in NPD can be beneficial with regard to costs and quality of the new products. Suppliers have a huge and direct impact on the cost, quality, technology, speed and time-to-market of new products.

Effective and efficient integration of suppliers in the value based supply chain will be a key factor for designers and manufacturers in achieving the improvements and innovations necessary to remain competitive. Companies must be aware that involving suppliers in NPD efforts has the potential significant results, the involvement and participation in NPD may help decrease cost, reduce time-to-market, improve quality and communication and provide innovative technologies that can help capture market share and return on investment (Vayvay and Cobanoglu, 2006).

3.5.3.5 Continuous Improvement (CI)

Continuous Improvement (CI) in Japanese term as kaizen, it has been adopted by many companies in worldwide. The concept of CI was originally brought to Japan from the US after the World War II to assist in the reconstruction of the Japanese industry (Schroeder and Robinson, 1991). CI can be defined as “a company wide process of focused and continuous incremental innovation” (Bessant et al; 1994).

CI is one of the core values of quality management (QM), which is a people-focused system that aims at continual increase of performance by stressing learning and adaptation as keys to the success of an organization (Evans Lindsay, 2001). Beside the key role of CI in quality management, CI has significant impact on productivity (Reid, 2006), and is considered vital in today's competitive environment (Dean and Robinson, 1991; Singh et al; 2008). The CI concept indicates a continuous effort involving everyone in an organization.

Over the last decade, CI has been evaluated in the context of New Product Development (NPD) processes (Caffyn, 1997; Nilsson-Witell, 2005). However, there is little understanding of the practical issues surrounding adoption of CI in NPD processes, and in particular, of the contingent company-specific variables that affect the implementation of 'CI enablers' (Bessant and Caffyn, 1997). CI is viewed as a particular set of routines that can help an organization to improve performance (Bessant et al; 2001). Caffyn and Grantham (2003) investigated ways of fostering continuous improvement within NPD processes to enhance company's NPD management. Based on the discussion of above literature, the main success factors are identified.

3.5.4 Customer Satisfaction in NPD

Hultink et al., (2003) identified four important factors for short-term and long-term success: customer satisfaction, customer acceptance, meeting quality guidelines, and product performance level. Customer satisfaction was found to be the most important measure, regardless of a company's time perspective. Customer plays a critical role in the NPD process (Nambisan, 2002). For example, customers as a resource in the ideation phase; a cocreator during design and development phase; and as user in product testing and support phase (table 3.1).

Table 3. 1: Customer roles in NPD

Customer Role	NPD Phase	Key Issues/Managerial Challenges
Customer as resource	Ideation	<ul style="list-style-type: none"> • Appropriateness of customer as a source of innovation • Selection of customer innovator • Need for varied customer incentives • Infrastructure for capturing customer knowledge • Differential role of existing (current) and potential (future) customers
Customer as cocreator	Design and development	<ul style="list-style-type: none"> • Involvement in a wide range of design and development tasks • Nature of the NPD context: industrial/consumer products • Tighter coupling with internal NPD teams • Managing the attendant project uncertainty • Enhancing customers' product/technology knowledge
Customer as user	<ul style="list-style-type: none"> • Product testing • Product support 	<ul style="list-style-type: none"> • Time-bound activity • Ensuring customer diversity • Ongoing activity • Infrastructure to support customer-customer interactions

(Source: Nambisan, 2002)

Customer satisfaction involves keeping customers happy both in day-to-day interactions (Hunt, 1977; Johnson and Fornell, 1991). Competitive pressures mandate that firms identify customer requirements and develop strategies that allow them to meet or beat the service levels provided by competitors (Verwijmeren et al., 1996). It is widely recognized that collaborating with suppliers (Bessant, 2003) and customers (von Hippel, 1986) makes a significant contribution to the innovation process.

3.5.5 Quality Assurance

In reviewing the literature, new product quality can be affected by the factors such as NPD speed, Bureaucratic structure, formal and informal quality control procedure.

New product quality is one of the critical factors to determine the new product life cycle. What can be done to ensure superior quality when a new product launch on the market in the first day? It is not easy to determine the new product quality. A primary reason is that product-quality research rarely distinguishes between new products and established products. According to the product quality literature, one factor stands out as particularly relevant for the quality of a newly developed product is NPD speed.

Obviously, the speed with which new products are developed is likely to affect product quality. One view is that quality takes time; doing things quickly can compromise product quality (Crawford, 1992; Meyer, 1993). This perspective is supported by the notion that NPD speed is associated with time pressure (Sethi, 2000) and, when accelerated, might even encourage development shortcuts (Wind and Mahajan, 1997).

Karau and Kelly (1992) and Sethi (2000) claimed that due to time pressure, NPD teams, for instance, may be forced to consider a narrow range of decision alternatives and may not have time to explore ways to build superiority into the product.

Smith and Reinertsen (1991) and Stalk and Hout (1990) provide examples where in order to cut developments short, it is often tempting to simply trim performance specifications and reduce technological content, which typically undermines quality. However, taking time for quality could have unintended consequences. Once NPD processes slow down, organizational slack increases (Nohria and Gulati, 1996). As slack accumulates, commitment among employees to work more efficiently and, therefore, to do things right the first time may erode (Meyer, 1993; Patterson and Lightman, 1993).

Bureaucratic structure is likely to influence new product quality (Clark and Fujimoto, 1991; Deming, 1982; Juran, 1974; Wheelwright and Clark, 1992). Bureaucratic structure is determined by the extent of formalization and centralization (Aiken and Hage, 1968; Hall et al., 1967). Formalization is the degree to which rules, codes, and instructions define roles, authority relations, and procedures in an organization (Hall et al., 1967). Centralization is the extent to which decision-making authority and responsibilities are delegated among employees (Aiken and Hage, 1968). Both aspects of bureaucratic structure can be observed simultaneously in a business unit (Aiken and Hage, 1968; Hall *et al.*, 1967).

Numerous studies show that formalized and centralized organizational structures can limit market information generation and dissemination

(Jaworski and Kohli, 1993; Kohli and Jaworski, 1990; Zaltman *et al.*, 1973). Market intelligence is critical for a successful NPD program (Moorman and Miner, 1997; Olson *et al.*, 1995) and essential to making higher quality products that meet customer and supplier requirements (Menon *et al.*, 1997; Li and Calantone, 1998; Sethi, 2000). It is well documented that formal and informal controls can increase the amount of discipline and care exercised during the development of new products (Jaworski, 1988; Jaworski *et al.*, 1993) by providing a frame of reference for selecting and properly sequencing adequate quality control procedures (Wheelwright and Clark, 1992).

Gruner and Homburg (2000) assessed the performance impact of the intensity of customer interaction in different stages of the new product development process and the characteristics of the involved customers. They also emphasized that one of the important measurements was the relationship between customer satisfaction and new product quality.

Quality assurance is very essential, especially for an efficient support of all developing and manufacturing processes and activities with the forefront objective to reach robust processes with a high throughput of parts meeting their functional requirements. Developing new concepts or adjusting widely applied quality assurance methods in order to support and continuously improve the development of processes is essential. There are quality assurance methods which are in place that can and are used by companies. Quality assurance comprises of methods and approaches which are either preventive or production accompanying (Fleischer, Lanza, Schlipf and Behrens, 2006).

3.5.6 Feedback

There is scant literature regarding the impact of feedback on NPD management process. In fact, feedback in both internal and external of SMEs is vital for continuous improvement to take place. Internal feedback in the NPD process includes prototyping, total quality testing, and pilot use of the product before its commercial launching to the market. External feedback

such as the evaluations from customers, competitors' opinions and the ideas from suppliers will contribute to the quality improvement of the product.

Feedbacks indicate a need for repetition, information crossovers indicate an opportunity for a loss of coordination information, and length of feedback cycles indicates a large amount of required rework.

Indeed, feedback can be one the main contributors to enable continuous improvement take place within the companies. Thus it is necessary for SMEs to take consideration of gaining feedback from both internal and external channels for product continuous improvement.

3.6 CONCLUSION

This chapter presented the key concepts of innovation and NPD and addressed the important factors for the success of NPD. In essence, the relevant literature of NPD management has been explored. To SMEs, the basic requirements of managing its NPD process can be simplified as management commitment, employee involvement, product strategy, quality assurance, customer satisfaction, and the feedback of the new product. This means that these key components need to be in place within SMEs' NPD management process. What can be done to make the NPD process effectively and organized? The next chapter will deal with the research design and methodology.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

Methodology is the application of various methods, techniques and principles in order to create scientifically based knowledge by means of objective methods and procedures within a particular discipline (Welman and Kruger, 1999). Tull and Hawkins (1993) described research design as a specific procedure, which is adopted in the collection and analysis of data necessary to address a problem. This study utilized the combination of quantitative and qualitative research approach, and case study research methods have been carried out. This chapter discusses the aspects of the research methodology including research design, the summary of the key components of proposed NPD model to be validated, data collection and analysis methods can be utilized to answer the research questions, and the development of the New Product Development (NPD) model for SMEs.

This study approached the following three phases (Figure 4.1), which were explore the theoretical NPD models, investigate the key elements of NPD process, and develop the NPD management model. In Phase 1, the theoretical NPD model from the preliminary literature review which has been done in the Chapter 2; in phase 2, 40 SMEs were interviewed in the Western Cape Province to investigate the key elements of NPD through current practical NPD process.

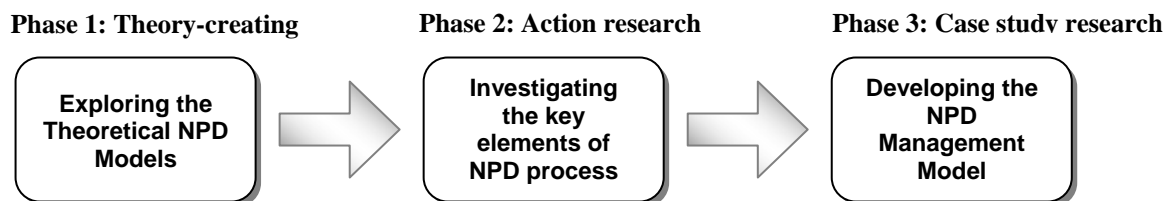


Figure 4. 1: Three Research Phases to Develop the NPD Management Model

Data were collected from Phase 2, Phase 3 focused on the development of the NPD management model for SMEs.

The research problem of this study is described in Chapter One as: ineffective and inefficient NPD process within SMEs culminating in establishing costs and timeframes to market for new products. The aim of this study is to develop a basic NPD management model. Based on the above three phases, the study has adopted the research process that outlined by Cooper and Schindler (2008:82) as showed in Figure 4.2.

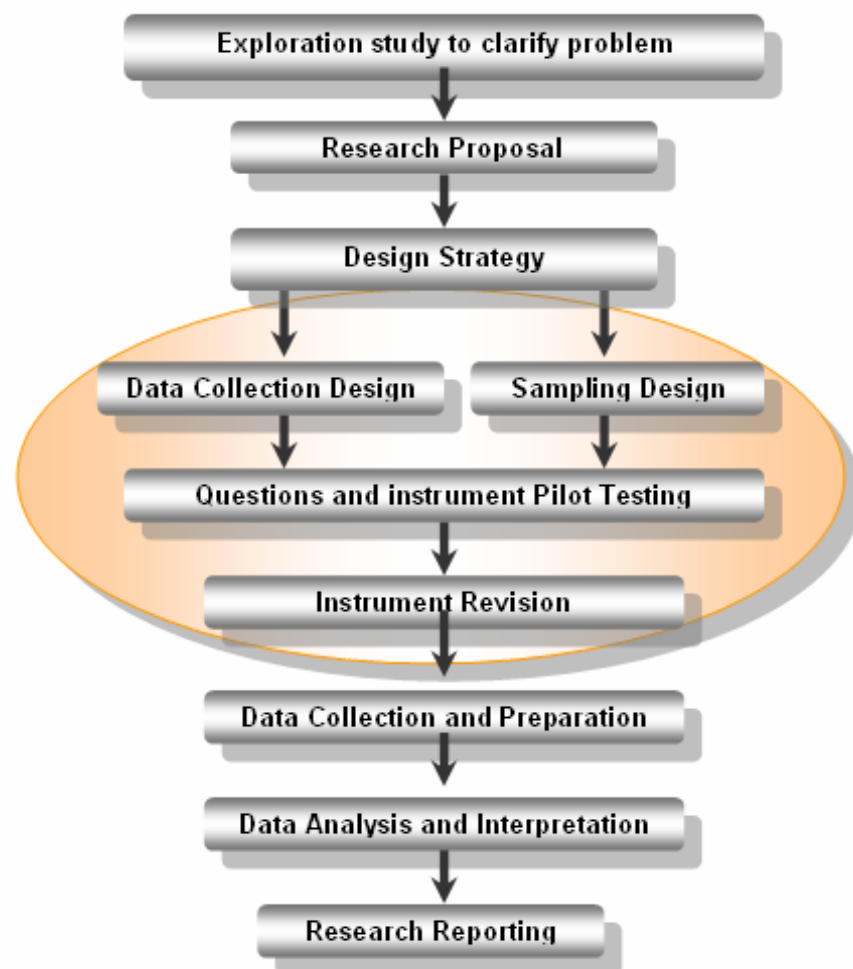


Figure 4. 2: The research process
(Source: Adopted from Cooper and Schindler, 2008)

4.2 RESEARCH DESIGN

4.2.1 Classification of research design

Case study method has conducted in this research. Cunningham (1997) proposes that the case study method can be divided into three different classes: intensive, comparative, and action research.

This study utilises an action research approach. According to Kemmis and McTaggart (1988:5), action research is a form of collective, self-reflective inquiry that participants in social situations undertake to improve:

- the rationality and justice of their own social or educational practices;
- the participants' understanding of these practices and the situations in which they carry out these practices.

Reason and Bradbury (2001) defined action research as an interactive inquiry process that balances problem solving actions implemented in a collaborative context with data-driven collaborative analysis or research to understand underlying causes enabling future predictions about personal and organizational change. In Dick (2002)'s opinion, action research as a flexible spiral process which allows action and research as a natural way of acting and researching at the same time; an iterative process of acting-reviewing-acting-reviewing.

In an action research, groups of participants can be teachers, students, parents, workplace colleagues, social activists or any other community members– that is, any group with a shared concern and the motivation and will to address their shared concern. This study involves top managers, senior managers, administrative staff, supervisors, and shop floor employees.

4.2.2 Sampling

The procedure for drawing a sample was adapted from Churchill and Iacobucci (2002) as showed in Figure 4.3. The main purpose of sampling is to

achieve representativeness; Gilbert (1993) and Jennings (2001) stated that the sample should be assembled in such a way as to be representative of the population from which it is taken. To achieve this, the sampling units were randomly selected from the Western Cape, South Africa.

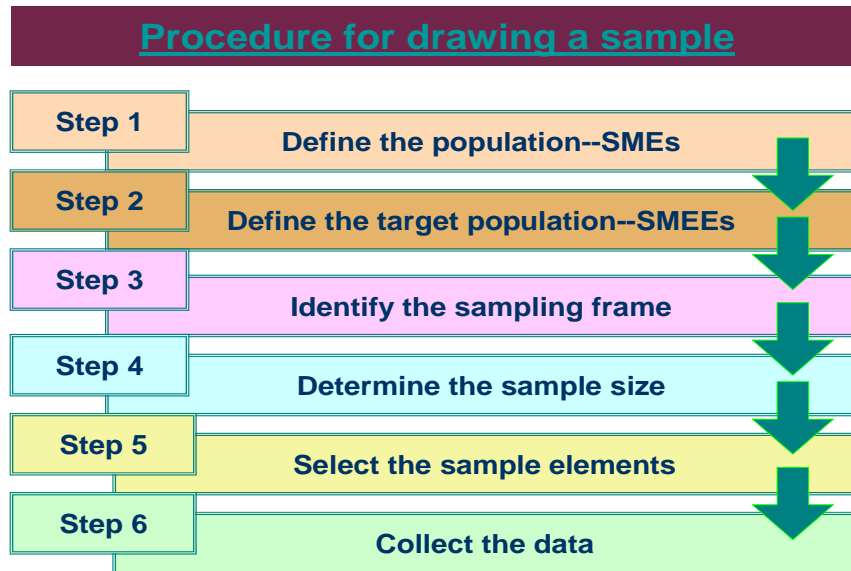


Figure 4. 3: Procedure for drawing a sample
 (Source: Adapted from Churchill and Iacobucci, 2002)

This case study covers 45 companies in the Western Cape, South Africa. These 45 companies are categorised as SMEs in accordance to its number of employees. According to the Department of Economic Development and Tourism (2004), small business employ less than 50 people and medium business employ from 50 to 249 people. In South Africa, the National Small Business Act provides a detailed definition of SMMEs (Small, Micro and Medium sized Enterprises) as shown in Table 4.1.

Table 4. 1: Definitions of SMMEs given in the National Small Business Act

Enterprise Size	Number of employees	Annual turnover	Gross assets, excluding fixed property
Medium	Fewer than 100 to 200, depending on industry	Less than R4 million to R50 million, depending upon industry	Less than R2 million to R18 million, depending on industry
Small	Fewer than 50	Less than R2 million to R25 million, depending on industry	Less than R2 million to R4,5 million, depending on industry
Very small	Fewer than 10 to 20, depending on industry	Less than R200 000 to R500 000, depending on industry	Less than R150 000 to R500 000, depending on industry
Micro	Fewer than 5	Less than R150 000	Less than R100 000

(Source: Falkena et al., 2002)

Table 4.2 showed that there are 55 management members include top, senior, and junior managers. 305 employees which include 48 administrative staff, 40 foremen/supervisors, and 217 production line workers from the 45 SMEs are participated in this study.

Table 4. 2: Categories and number of respondents

Category	Position	Numbers
Management (MAN)	Top management	38
	Senior manager	7
	Junior manager	10
	Sub-total	55
Employee (EMP)	Office staff	48
	Foremen/Supervisor	40
	Production line workers	217
	Sub-total	305

Figure 4.4 showed the numbers of SMEs in different sectors from the Western Cape. There are 62 per cent of SMES embark on manufacturing activities, where 22 per cent are doing repair and maintenance services, 4 per cent are from construction, 2 per cent is in communication. The others (9 per cent) involve small retails, restaurant and logistics business.

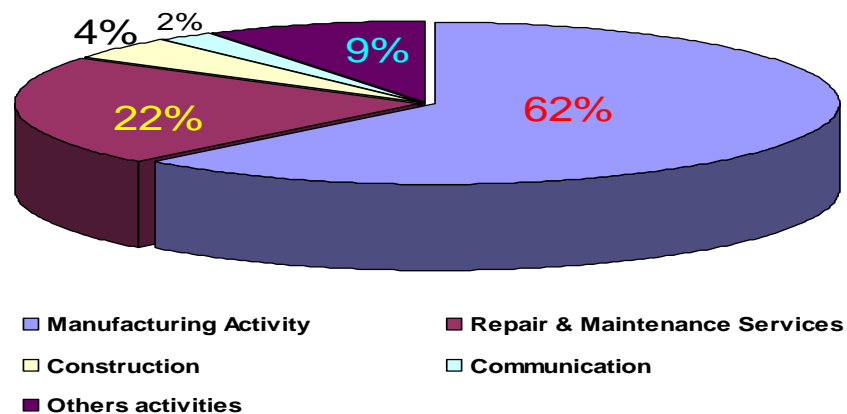


Figure 4. 4: Numbers of SMEs in different sectors

4.2.3 Research Instruments and Data Collection

Data were collected through a semi-structured questionnaire a number of personal interviews where it was considered necessary. The original

questionnaire for both management and employees are showed in Appendix B and Appendix D respectively. Several statements such as delegation of authorities, open-door policy, the way of management communicates with employees, the willingness of idea contribution, and R&D activities were designed purposefully. Data were collected from both management and employees through exploratory interviews and observations, comparing with the relevant literature enabled triangulation to take place. Triangulation is commonly applied in qualitative research. Madey (1982) discussed using exploratory interviews and/or observations in improving the sampling framework. The use of triangle method is also for the purpose of testing reliability of several key components of the NPD management model.

A number of visits and interviews were conducted to get the feeling and in-depth perspectives from the management of the 45 SMEs regarding key components of the NPD management model. The detailed questions of the interview are showed in Appendix C. An open-ended questionnaire (Appendix E) was utilised to gather the opinions from employees. The responses from both management and employees were compared to identify the importance of the key components of the NPD management model.

Due to the working shifts in some SMEs, part of the questionnaires was completed through focus-group.

4.2.4 Analysis Methods

The questionnaire consists of the key components from the NPD management model. These components were underpinned in the statements that are showed in tables below. In order to obtain accurate data, both management (coded as MAN) (Table 4.3) and partial employees (coded as EMP) (Table 4) were chosen.

Table 4. 3: Statements for data collection: Management (MAN)

No	Statements
MAN1	Management delegates authority easily in the company.
MAN2	Management takes personal responsibility to specify the job / process requirements.
MAN3	Management often accepts employees' ideas and suggestions on processes / products.
MAN4	Your company provides training opportunities to develop individuals.
MAN5	Communication channels between management and employees operate regularly within your company.
MAN6	Management team has a clear vision of the final product during NPD process.
MAN7	Your company assesses the capability for a new product to be developed.
MAN8	Your company seeks any ideas from customers in order to have continuous improvement for NPD.
MAN9	Your company has a management team to support continuous improvement for NPD.
MAN10	Management concerns the cost of carrying a continuous improvement project(s).
MAN11	Your company seeks ideas for continuous improvement from relevant industry.
MAN12	Your company embarks on market research actively for continuous improvement.
MAN13	The results of market research contribute to decision making for continuous improvement.
MAN14	Customers are generally satisfied with the quality of the product(s) that you delivered to them.
MAN15	Customer satisfaction stimulates your company to maintain the high quality of the product(s).
MAN16	Customer satisfaction motivates your company to preserve continuous improvement culture.
MAN17	Your company has a good working relationship with suppliers.
MAN18	Suppliers often contribute valuable ideas for continuous improvement in NPD.
MAN19	Your company discusses with customers with what improvements need to be made.

Table 4. 4: Statements for data collection: Employees (EMP)

No.	Questions
EMP1	Management delegates duties to you easily in the company.
EMP2	Management is competent and knowledgeable in continuous improvement.
EMP3	Management takes personal responsibility to specify the job.
EMP4	Management supports decisions for continuous improvement on the NPD process.
EMP5	You have contributed ideas for product continuous improvement.
EMP6	Management makes available specialized equipment and materials for continuous improvement.
EMP7	The company has offered you a training opportunity since you joined the company.
EMP8	You have feelings about the company equivalent to your own family.
EMP9	You can communicate with management easily.
EMP10	Management keeps you informed of the progress of continuous improvement project that you involved.
EMP11	Management employs outside experts for continuous improvement when necessary.
EMP12	Management insists in continuous improvement for the company's products.

The relevant information of both individuals and companies were collected, which include: position hold at the company, number of total employees, years of working experience, and turnover. In a few cases, some Managing Directors were also responsible for the production function. The data were analysed by using percentages, bar charts and scatter charts.

The quantitative data were coded into numerical representations after the data collection, a series of statistical analyses were performed using the software package—SPSS, version 17. The data analysis through SPSS will generate the results of descriptive statistics such as frequency, mean, standard deviation, etc. These distributions will show the frequencies of these 45 SMEs' responses and percentages for each of the items in the questionnaire regarding the key components of NPD management.

4.3 DEFINITION OF THE VARIABLES TO BE VALIDATED

The key components of NPD management were utilised as variables to determine the validity of a proposed NPD management model in this study. These key components include management support and commitment, people involvement, product strategy (resource availability, market research, suppliers, and continuous improvement), quality assurance, and customer satisfaction. All the key components that will be validated in this study are derived from the literature.

4.3.1 Management Support and Commitment

Management support and commitment in NPD process is typically conceived of an individual's psychological bond to NPD. This individual is part of a management team (include top, senior, and junior managers) within an organization.

According to Cooper (2005), top management support is a necessary ingredient for successful product innovation, since its main role is to set the stage for product innovation. Thus decent management commitment can result in a great promotion to the environment of innovative culture.

4.3.2 People Involvement

During the 1980s, there was a change in direction and emphasis and the term "employee involvement" was adopted in place of "employee participation". The Institute of Personnel Management (1990:2) defined employee involvement as a "range of processes designed to engage the support, understanding and optimum contribution of all employees in an organization and their commitment to it". Salamon (1992:342) makes a subtle, but important distinction between employee involvement and participation.

People involvement in NPD process can be defined as both management and employees contributing their ideas and suggestions for the improvement of products. The term people involvement in this study only focuses on employee involvement since management support and commitment is regarded as one of the key components of the study.

4.3.3 Product Strategy

The product strategy was discussed extensively from the literature from various perspectives.

Cooper (1983a, b) proposed a NPD procedure which includes various activities such as creation, creation dissemination, preliminary product development, economic analysis, product prototype test, pilot run, product mass production and entry to market. Cooper (1984a, b) also described the following four variables concerning a NPD strategy.

- (1) Orientating the enterprise to a new product: This includes creating a new product, developing a better product for meeting the customer's demand than that of competitors, and product concentration and differentiation.
- (2) Market characteristic adopted by the new product:
This includes the characteristics for a new market, customers, competitors and new sales channels.
- (3) The enterprise's technological orientation and commitment:
This includes the percentage of R&D expense to sales amount, company's R&D orientation, etc.
- (4) Technological characteristic adopted by the new product: This contains more advanced and complicated technologies, closely matched with the company's R&D resources, technical maturity and concentration.

Barczak (1995) divided new product development strategy into three categories based on Ansoff and Stewart's classification: first to market, fast follower and delayed entrant.

Firth and Narayanan (1996) defined a new product development strategy which includes three features: (1) new embodied technology; (2) new market applications; (3) innovation in the market.

Song and Montoya-Weiss (1998) utilized Ansoff's product market matrix model considering the growing for the market and technology strategy.

Veryzer (1998) utilised new models with two important aspects: technological capability and product capability. Technological capability means that a product must be made using a technology beyond the current company technology level; product capability represents the benefit of a product recognized or experienced by customers.

In summary, the main theme of the above studies are emphasized that company's capability, market research, technology and innovation are the key factors of NPD strategy. In lighting of the above key factors of NPD strategy, product strategy in this study is consists of resources availability, market research, suppliers, and continuous improvement.

4.3.4 Resources Availability

In terms of product development, a resource can be implicitly defined as any physical or virtual entity that can add value to a product or service, such as available funds, materials, tools, labour, intellectual properties, etc. All of these resources have limited availability and can be consumed to gain a benefit from it. Anything that can be used to satisfy a human need is a resource. Utility or usability is what makes an object a resource.

Late introduction of new products to market and high costs of NPD can ruin the business of a company. It is vital to determine the availability of resources at the early stage of NPD process.

When a firm pay more attention on the common barriers to NPD and overcome any possible difficulties, such as lack of key resources for the new product, there is a theatrical and constructive impact on the firm's business and its NPD process. In the current study, due to the nature and characteristics of SMEs, resources can often be the major problems that facing SMEs. Thus, it is crucial to determine the resources availability for SMEs' NPD process.

4.3.5 Marketing Research

The AMA (2005) defined Marketing research as: the function which links the consumer, customer, and public to the marketer through information—information used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve our understanding of marketing as a process.

Marketing research is a way of formal communication between companies and the environment. It is the means by which the firm generates, transmits, and interprets information from the environment about or relating to the success of the firms marketing plans (Churchill, 1999).

The goal of marketing research is to identify and assess how changing elements of the marketing mix impacts customer behavior. The term is commonly interchanged with market research; however, expert practitioners may wish to draw a distinction, in that market research is concerned specifically with markets, while marketing research is concerned specifically about marketing processes (McDonald, 2007).

To many SMEs, the most important factors in marketing research can be: (1) analyze Macro and Micro Economic data such as GDP, price change in materials, supply chain and demand, economic growth, sales by industries, interest rate, number of investment, etc. (2) analyze the trends, growth, size, share of market, particular market competition. (3) Determine market

segment, market target, market forecast and market position; (4) Formulating market strategy and identifying potential partnership for possible collaboration.

4.3.6 Supplier involvement

According to Business Dictionary, supplier also called vendor refers to external entity that supplies relatively common, off the shelf, or standard goods or services, as opposed to a contractor or subcontractor who commonly adds specialized input to deliverables.

4.3.7 Continuous Improvement

Continuous Improvement (CI) in Japanese term as kaizen, it has been adopted by many companies in worldwide. The concept of CI was originally brought to Japan from the US after the World War II to assist in the reconstruction of the Japanese industry (Schroeder and Robinson, 1991). CI can be defined as “a company wide process of focused and continuous incremental innovation” (Bessant et al; 1994). CI is one of the core values of quality management (QM), which is a people-focused system that aims at continual increase of performance by stressing learning and adaptation as keys to the success of an organization (Evans and Lindsay, 2001).

4.3.8 Quality Assurance

Quality assurance refers to a program for the systematic monitoring and evaluation of the various aspects of a project, service, or facility to ensure that standards of quality are being met.

According to Penman et al. (2000), Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation / development process. They further pointed out that, reviews, preferably by independent third parties, should be

performed upon a finalised inventory following the implementation of Quality Control (QC) procedures; reviews verify that data quality objectives were met, ensure that the inventory represents the best possible estimates of emissions and sinks given the current state of scientific knowledge and data available, and support the effectiveness of the QC programme.

During the NPD process, quality assurance as a systematic process that examines and ensures whether the new product is being developed is meeting customer's specified requirements. It is therefore many companies established a team or a separate department dedicated to quality assurance.

4.3.9 Customer Involvement

According to Wikipedia (2010), customer satisfaction is a business term, which measures the level of products and services supplied by a company meet or surpass customer expectation. It is seen as a key performance indicator within business and is part of the four of a Balanced Scorecard. Organizations need to retain existing customers while targeting non-customers (Joby, 2003). In a competitive marketplace where businesses compete for customers, customer satisfaction is seen as a key differentiator and increasingly has become a key element of business strategy (Gitman and McDaniel, 2005).

4.3.10 Feedback

Feedback is information given to a person to evaluate behaviors. Feedback can be either positive or negative. Senge (1990) pointed out that positive feedback tends to increase the event that caused it, such as in a nuclear chain-reaction (i.e. self-reinforcing loop), while negative feedback tends to reduce the input signal that caused (it is also known as a self-correcting or balancing loop).

In the phases of NPD, a number of web-based tools exist that enable customers to articulate and contribute their ideas, to interact with the product development team and other customers during product development, and facilitates the visualization of virtual prototypes in order to gain customers' feedback (Prandelli et al., 2006).

4.4 A PROPOSED NPD MANAGEMENT MODEL

The principle and a detailed description of the model are carried out in this section.

4.4.1 The Description of the NPD Management Model

Companies manage the NPD process to obtain a better understanding, or how to achieve the successful product development through well performed tasks in the process. After carefully filtering the elements of NPD management from the key factors, the following components have been chosen as the critical components especially for SMEs' NPD management:

- Management support and commitment
- Employee involvement
- Product strategy:
 - Resource availability
 - NPD capability
 - Market research
 - Suppliers
 - Continuous improvement
- Quality assurance
- Customer satisfaction
- Feedback from new product launching

Based on the key management components of successful NPD, a proposed NPD management model is introduced as shown in Figure 4.5 below.

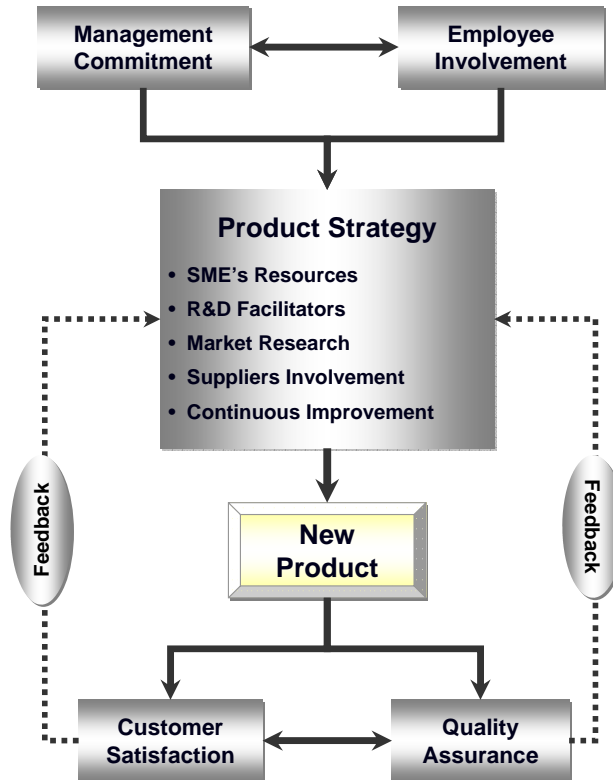


Figure 4. 5: The Proposed NPD management model

Competitive pressures mandate that firms identify customer requirements and develop strategies that allow them to meet or beat the service levels provided by competitors (Verwijmeren et al; 1996). It is widely recognized that collaborating with suppliers (Bessant 2003) and customers (von Hippel, 1986) makes a significant contribution to the innovation process.

Speed to the market is often regarded as one of the key measurements of quality of NPD management (Sun, 2009). In common sense, the speed with which new products are developed is likely to affect product quality. One view is that quality takes time; doing things quickly can compromise product quality (Crawford, 1992; Meyer, 1993). This perspective is supported by the notion that NPD speed is associated with time pressure (Sethi, 2000) and, when accelerated, might even encourage development shortcuts (Wind and Mahajan, 1997).

Karau and Kelly (1992), and Sethi (2000) claimed that due to time pressure, NPD teams, for instance, may be forced to consider a narrow range of decision alternatives and may not have time to explore ways to build superiority into the product. Thus quality assurance is critical for the success of a new product's launch.

Gruner and Homburg (2000) assessed the performance impact of the intensity of customer interaction in different stages of the new product development process and the characteristics of the involved customers. They also emphasized that one of the important measurements was the relationship between customer satisfaction and new product quality.

Customers are one of the key idea contributors to the NPD process, not only in the ideation phase; but also as cocreators during design and development phase; and as user in product testing and support phase. Johnson and Fornell (1991) described that customer satisfaction involves keeping customers happy both in day-to-day interactions. Hultink et al; (2003) identified both customer satisfaction and quality assurance as two of the four important factors for short-term and long-term NPD success.

Beside these key elements, companies need to embrace continuous improvement (CI) culture into their NPD management process to ensure the success of their NPD. Due to the limited understanding of the practical issues surrounding adoption of CI in NPD processes, this study emphasizes on linking feedback from both customers and quality assurance process to identify necessary areas for CI for SMEs.

In the proposed model, feedback from both internal and external of a company is necessary for the NPD management process. The process provides feedback both during and after the new product launching to the market. Internal feedback through quality check can identify the potential shortcomings of the product. External feedback from customers can greatly contribute valuable ideas for the new product. Thus, companies can enable CI

of the product through both quality checking (internal) and customers (external) feedback.

4.5 PERSPECTIVES OF THE KEY COMPONENTS OF THE NPD MODLE

4.5.1 Management Support and Commitment

A number of studies have addressed that top management commitment as one of the best practices in NPD practice (Cooper, 2005., Bounds, Yorks, Adams, and Ranney, 1994., Heunks, 1998., and Motwani et al., 1999). Management must be involved in the NPD project as early as possible that is from the early stages of the project. Involving top management early and often in NPD is an effective practice in rapidly changing markets. Assessing, developing, and supporting ideas for new products may be more urgent. It is very important for the management to be committed because its commitment leads to higher speed to market and success rate.

In a NPD project, it is likely for employees to get interested in the project and to take ownership. The management also like to take risks which are why it is so important for management to be involved so as to bring clarity of the vision and also to help in resolving conflict. This also helps keeping the project on track. It was proven that greater management involvement in NPD is associated with faster speed to market and also a higher success rate. According to Reilly, Chen and Lynn (2003), there are several other forms which can be taken by management. They can act as executives for the project, they can help the team to overcome obstacles, they can provide encouragement to the team, and also they can provide adequate money and human resources for new products.

4.5.2 People Involvement

The importance of employee involvement has been highlighted by many researchers. One of research described employees as one of the main resources, which contributing ideas to NPD, Bayo-Morines and Merino-Diaz de Cerio (2004) described that employees are one of the main assets of a firm and one of the decisive factors in determining performance is one that leaves little room for argument.

Others claims that employees are one the key factors in NPD management (Kahn et al., 2006). Ahmed (1998) has shown that the climate of the organisation is inferred by its members through the organisation's practices, procedures and rewards systems deployed and is indicative of the way the business runs itself on a daily and routine basis. Hence, it is vital for employees to be involved in the NPD process.

4.5.3 Product Strategy

NPD strategy is commonly regarded as one of the key factors that have significant impact on NPD process. Kahn et al. (2006) present their view of a best practices framework for NPD management based on the PDMA's six NPD management dimensions: strategy, portfolio management, process, market research, people and performance evaluation. A new product strategy is needed to focus the product development effort and tie it to business unit or corporate strategy; and a new product strategy provides a way for management to influence this process (Moore and Pressmier, 1993:96). Lynn et al. (1999) identified one of the key determinants of NPD success is to have a structured NPD process.

4.5.4 Resource Availability

Resources are critical to the success of NPD process. Sethi et al (2001) claimed that resource availability to a company can be an important influence

on product innovativeness. Cooper and Kleinschmidt (1997) stated that resource availability is one of the key success factors in NPD process.

4.5.5 Market Research

A number of studies emphasised the importance of market research and orientation in NPD process. Market research is one of the cornerstones to determine the success of a firm's new product performance (Ahmed, 1998., and Kahn et al. 2006). In order to minimize the risk of product failure, market orientation helps a business develop an understanding of its target market and their needs (Day and Wensley, 1988). Market orientation or market focus has been found as one of the key factors for firm level success (e.g. Kohli and Jaworski, 1990; Piercy, 1997) as well as new product innovation (e.g. Atuaheme-Gima, 1995).

Key elements of market orientation are described as decisions on market definition, market segmentation and potential bases of product differentiation; development of marketing mix policies; and information concerning the entire market for strategy design and execution (Piercy, 1992). Recent stream of NPD research has shown that market orientation has a positive impact on new product performance (e.g. Griffin, 1997; Song and Parry, 1996, Atuaheme-Gima, 1995; Salomo et al., 2003; Ramaseshan et al., 2002).

The orientation of the NPD process to the needs of the market (Atuaheme-Gima, 1995; Souder et al. 1997), this refers to the quality of market research with reference to the understanding and evaluation of customer needs (e.g. Parry and Song, 1994; Schmalen and Wiedemann, 1999), the accurate prognosis of the market potential (Balbontin et al. 1999), the observation of the competition (e.g. Mishra et al. 1996), the execution of test markets (Dwyer and Mellor, 1991), etc.

4.5.6 Supplier involvement

A number of studies addressed the importance of supplier involvement in NPD project. Kleinschmidt (1995) found that resources are one of the cornerstones, which determine the success of product development. Congruent with the need to integrate multiple linked processes in the supply chain, theoretical research advocates that early and extensive supplier involvement results in a faster development process (Dyer and Singh, 1998, Handfield et al., 1999, Monczka et al., 1998., and Petersen et al., 2003).

Purchased materials and components from suppliers heavily influence the quality, competitiveness, product design, cost dependency, lead times, development cycles, development risks and market availability of manufacturer's products (Hult and Swan, 2003., O'Neal, 1993., Burt and Soukup, 1994; Asmus and Griffin, 1993). Bonaccorsi and Lipparini (1994) highlight the benefits of early supplier involvement in NPD, including reduced development costs, higher quality with fewer defects, reduced time to market and supplier-originated innovation.

Some researchers characterized the execution processes for integrating suppliers into NPD projects as a "black box" (Handfield et al., 1999 and Monczka et al., 2000).

Petersen et al. (2005) investigate the issue of what managerial practices affect new product development team effectiveness when suppliers are to be involved. Their findings indicate that suppliers play a significant role in NPD project.

NPD project are important issues around which no common understanding has formed. For instance, some research on early supplier integration maintains that earlier supplier involvement is always better (Griffin and Hauser, 1992 and Handfield et al., 1999).

4.5.7 Continuous Improvement (CI)

Employee is one the main idea contributors in NPD processes. Kaizen as a well-known concept related to CI, which means continuous change for the better by involving all employees (Imai, 1986). During the NPD process, companies often try to make necessary changes for a better design of a new product; it will involve numerous changes in the process. According to Barclay (1992), 87 per cent of the surveyed organizations stated that the product development process needs ongoing improvements. Some perspectives related to CI as a distinctive capability, knowledge transfer, and a dynamic process (Nilsson, 2002).

In essence, CI is viewed as a particular set of approach that can assist an organization to improve performance (Bessant et al; 2001). Caffyn and Grantham (2003) investigated ways of fostering continuous improvement within NPD processes to enhance company's NPD management.

Caffyn and Grantham (2003) investigated theoretical perspectives on continuous improvement applied in product development. They found that research adopting a quality perspective (CI) is not common on NPD (e.g. Caffyn, 1997; Sterman et al; 1997). Gautam and Singh (2008) presented the concepts and a systematic methodology by involving CI for maximizing the benefits of the change in terms of the customer perceived value within the given set of constraints.

Sun and Zhao (2010) reported a study that aims to investigate the influence of quality management tools such as CI on improving the speed of NPD. They suggested that companies which have implemented TQM and other quality tools such as CI will have a better basis for implementing new NPD approaches.

4.5.8 Quality Assurance

Quality assurance is critical to NPD success. One factor that stands out as particularly relevant for the quality of a newly developed product is NPD speed. Due to time pressure, NPD teams, for instance, may need to consider a narrow range of decision alternatives and may not have time to explore ways to build superiority into the product (Karau and Kelly, 1992).

Garvin (1983) found that manufacturing organizations that purchased components on the basis of quality as opposed to lowest price generally produced higher quality products.

Organizations that are committed to the pursuit of quality tend to focus on a long-term interdependent or close relationship with a significantly reduced number of more dependable suppliers (Flynn, Schroeder, and Sakakibara 1994; Saraph, Benson, and Schroeder 1989).

Speed to the market is often regarded as one of the key measurements of quality of NPD management (Sun, 2009). In common sense, the speed with which new products are developed is likely to affect product quality. One view is that quality takes time; doing things quickly can compromise product quality (Crawford, 1992; Meyer, 1993). This perspective is supported by the notion that NPD speed is associated with time pressure (Sethi, 2000) and, when accelerated, might even encourage development shortcuts (Wind and Mahajan, 1997).

Karau and Kelly (1992), and Sethi (2000) claimed that due to time pressure, NPD teams, for instance, may be forced to consider a narrow range of decision alternatives and may not have time to explore ways to build superiority into the product. Thus quality assurance is critical for the success of a new product's launch.

4.5.9 Customer Satisfaction

A number of studies showed that customer satisfaction adding on company's market value, such as customer's willingness to pay premium prices (Homburg et al., 2005), companies with satisfied customers tend to enjoy greater customer loyalty (Bolton and Drew, 1991., Oliver, 1980), positive word of mouth (Szymanski and Henard, 2001), etc. All of these can raise a company's market value. Moreover, numerous studies discovered that companies with superior customer satisfaction can attain higher levels of cash flows (Gruca and Rego, 2005., Mittal et al. 2005), customers that are satisfied are generally loyal and provide a basis for sustainable cash (Matzler et al., 1996), and less volatility of future cash flows, thus leading to superior market value (Anderson et al., 2004., Fornell et al., 2006).

Competitive pressures mandate that firms identify customer requirements and develop strategies that allow them to meet or beat the service levels provided by competitors (Verwijmeren et al; 1996). It is widely recognized that collaborating with suppliers (Bessant 2003) and customers (von Hippel, 1986) makes a significant contribution to the innovation process.

Linking customer's satisfaction to NPD, Gruner and Homburg (1999) claimed that customers who have participated in successful NPD projects set themselves apart in the following three ways:

- a high commercial attractiveness,
- the characteristics of a 'Lead User', and
- maintained a close business relationship with the manufacturer.

These findings make it clear that no sweeping statement about the effect of customer integration in the NPD process can be made (Hauschildt 1993).

4.5.10 Feedback

Di Benedetto (1999) reviewed the literature on product launch to identify the key strategic, tactical, and information-gathering activities that influence the

success of a new product launch. Through these activities some feedback can be gained from both during and after launch. Companies can use the feedback to improve the new product through these feedbacks.

4.6 CONCLUSIONS

In summary, this chapter provided a description of research design and method applied.

SMEs need to bring products to market rapidly and efficiently to achieve high profit and the potential of their innovations. This requires SMEs to adopt innovative approach and techniques working together to develop a new product. In order to meet customers requirements and needs, SMEs should look at both technically and commercially of their new products, so that the new products can be unique and have long life cycle.

Innovative approaches such as Lean principles already used to streamline manufacturing operations and the supply chain, are now being applied to product development in the hopes of increasing product profitability.

CHAPTER 5: CASE STUDIES ON INNOVATIVE APPROACH IN NPD MANAGEMENT

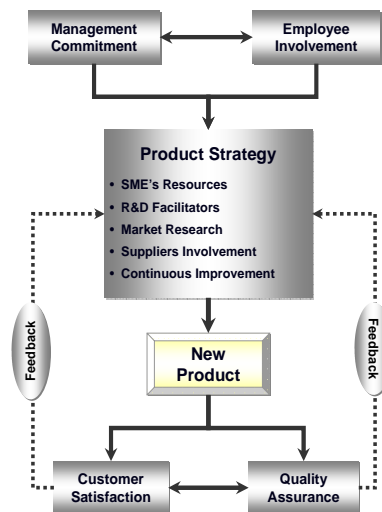
5.1 INTRODUCTION

This chapter presents two case studies discussing the application of innovative approaches to NPD process. The object of this study is to develop a NPD management model for SMEs. The common NPD processes were identified through a literature survey in Chapter 3. The key components of NPD management were identified through literature survey. It is therefore case study one conducted a survey covers 45 SMEs in the Western Cape to determine the validity of the key components for the proposed NPD management model. These key components are derived from a number of studies which addressed most frequently as consistent correlates of new product success (e.g; Cooper, 2005; Bayo-Morines and Merino-Diaz de Cerio, 2004; Kahn et al; 2006; Cooper and Kleinschmidt, 1995; O'Dwyer and Ledwith, 2009; Moore and Pressmier, 1993; Bessant, 2003). These key components include top management support and commitment, people involvement, product strategy (resource availability, NPD capabilities, marketing research, suppliers, and continuous improvement), customer satisfaction, quality assurance, and the feedback from new product launch.

Once innovative approach applied in the NPD process, it is necessary to assess the impact of existing product on the new product perceived value. Thus case study two will utilise a mathematical model to analyse the long term impact of existing products on perceived value of new products. The model by Yan and Makinde (2009) is discussed in Chapter 3, section 2.3. According to Yan and Makinde (2009), the NPD model includes several lean tools such as Stage-Gate, Kaizen (Continuous Improvement), measuring time spent on NPD activities, and waste and cost reduction effort. The mathematical model provides a detailed analysis in this chapter.

5.2 CASE STUDY 1: AN INNOVATIVE NPD MANAGEMENT MODEL

This section introduced an innovative NPD management model by Yan and Makinde (2010) for SMEs. The model contains six main elements, which is shown in Figure 4.5 in Chapter Four.



The innovative NPD management model

According to the proposed model, Yan and Makinde (2010) highlighted the following key components of NPD management especially for SMEs:

- Management commitment
- Employee involvement
- Product strategy:
 - Resource availability
 - NPD capability
 - Market research
 - Suppliers
 - Continuous improvement
- Quality assurance
- Customer satisfaction
- Feedback from new product launching

5.2.1 Case Sampling and Instruments

In total, 45 companies in the Western Cape were chosen as the samples in the study. The employee's size of all of these companies is less than 250, which met the range of SMEs regarding the criteria of the National Small Business Act. On the other hand, the turnover of these 45 companies are categorised as SMEs in accordance to its size and turnover regarding These SMEs were mainly from manufacturing sector, which covers 62 per cent of the total samples. Others were from engineering designs, construction, communication and small retails.

A semi-structured questionnaire and several personal interviews were utilised for data collection. Due to the large numbers of SMEs, it took more than six months to collect all the questionnaire and complete interviews. Due to the working shifts in some SMEs, part of the questionnaires was completed through focus-group. The questionnaire consists of the key components from the NPD management model.

This section followed the order of data collection design, it includes demographical data, responses from both management and employees include the data collect through close-ended questionnaires and open-ended questions from a number of interviews. Demographical data include gender, position held in company, years of working experience, number of employees in the company, education level, and the categories from different industrial sectors. The general data of the 45 SMEs is showed in Appendix I.

5.2.2 Demographical data

5.2.2.1 Gender

Based on the results of the data analysis, the samples were chosen from both interviews and questionnaires include 86 per cent male, and 14 per cent female from both management and employees within the 45 SMEs as shown in Figure 5.1.

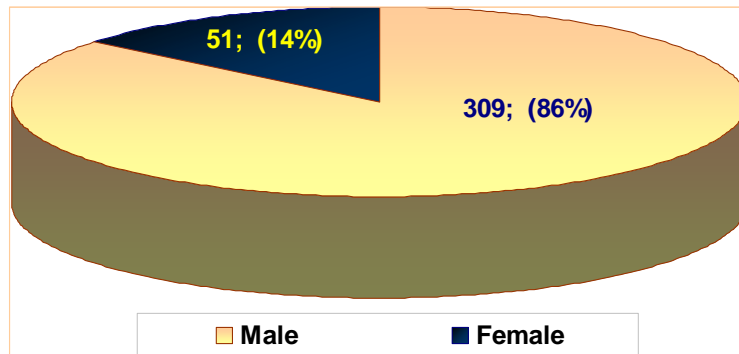


Figure 5. 1: Gender

5.2.2.2 Positions held in the company

55 management members include 38 top managers, 7 senior manager, and 10 junior managers. 305 employees include 48 administrative staff, 40 foremen/supervisors, and 217 production line workers from the 45 SMEs.

5.2.2.3 Year of working experience

Figure 5.2 showed the year of working experience of all the participants. This is enable the study to uncover whether the working experience impact on NPD management within SMEs. It indicates that 33 per cent of the total 360 participants (include both management and employees) have 2 to 5 years working experience; 26 per cent have less than 2 years working experience; 22 pen cent are between 6 to 10 years; and 19 per cent are between 11 to 15, and more than 15 years.

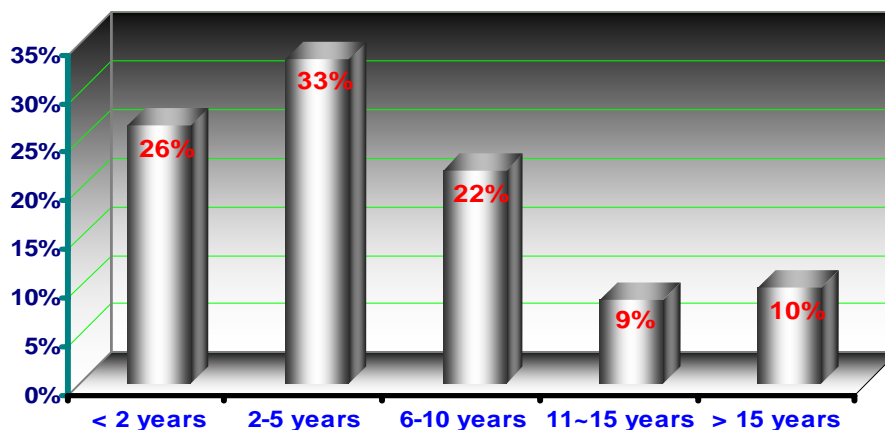


Figure 5. 2: Years of working experience

5.2.2.4 Employees size regarding SMEs' category

Based on the results that showed in Figure 5.3, 20 SMEs out of 44 per cent of the total sample have less than 50 employees in the company; 12 SMEs (out of 27 per cent) are under the category of 50 to 100 employees; 7 (16 per cent) are under the category of 101 to 150 employees, only 4 (9 per cent) and 2 (4 per cent) SMEs are in the group of 150 to 200 employees, and 201 to 250 employees categories respectively.

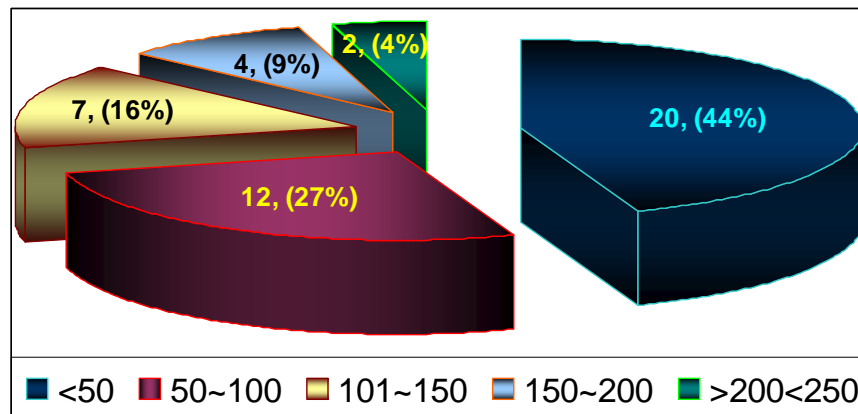


Figure 5. 3: Number of employees in SMEs' category

5.2.2.5 Education

Figure 5.4 shows the educational level of all the participants from the 45 SMEs. 6 per cent participants have completed education in secondary school; 36 per cent completed high school which is the highest group amongst others; 22 per cent participants have college certificate where 19 per cent achieved national diploma; 10 per cent participants have Bachelors degree where 2 per cent were Masters degree; only 0.3 per cent (on participant) has a Doctoral degree; 5 per cent of others include professional certificate such as professional engineers, qualified quality inspectors, etc.

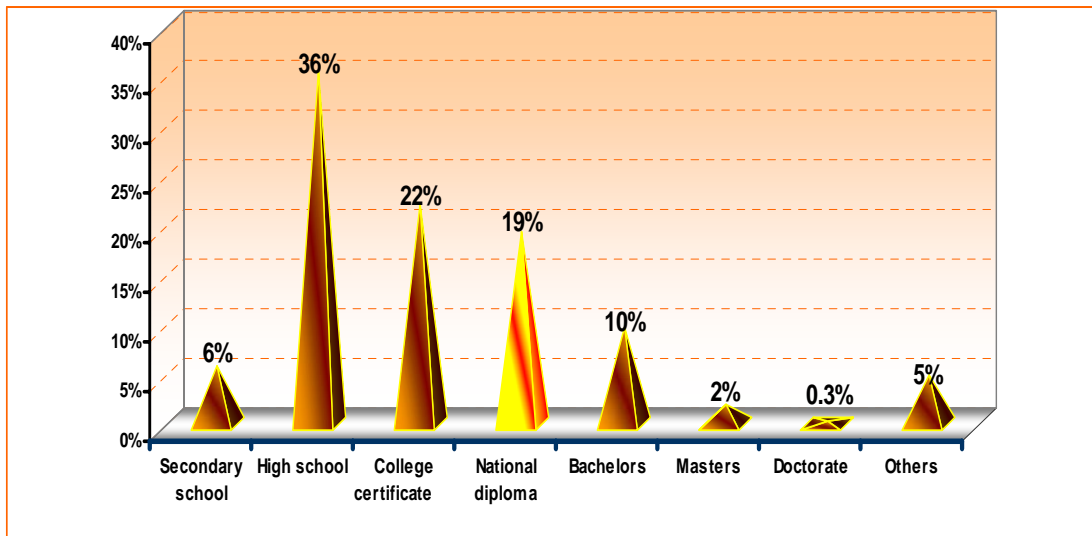


Figure 5. 4: Educational level

5.2.3 Results and discussions on the response of management

The close-ended questionnaire collected the responses regarding their opinions on the key components of the NPD management model.

The interview questions covered those data that could not be collected through the questionnaires, which is necessary supplementary information to support the argument of the study. these data such as the number of new products that SMEs developed over the last five year, the company's turnover (by the end of 2009), open policy for NPD, communication channels, resistance to changes, decisions made and by whom on the company's NPD processes / products, and the way of how to accommodate ideas and conduct marketing research for the new products.

5.2.3.1 Results and discussions on Close-ended questionnaire

The responses from the 55 managers (including top, senior and junior managers) are shown in table 5.1. Figure 5.5 provides a clear direction on which the weak area of NPD management regarding the management responses.

Table 5. 1: Responses from Management

No.	Yes		No	
MAN1	53	96%	2	4%
MAN2	12	22%	43	78%
MAN3	50	91%	3	5%
MAN4	55	100%	0	0%
MAN5	32	58%	23	42%
MAN6	53	96%	2	4%
MAN7	40	73%	15	27%
MAN8	33	60%	22	40%
MAN9	29	53%	26	47%
MAN10	30	55%	25	45%
MAN11	27	49%	28	51%
MAN12	34	62%	21	38%
MAN13	42	76%	13	24%
MAN14	52	95%	3	5%
MAN15	51	93%	4	7%
MAN16	53	96%	2	4%
MAN17	54	98%	1	2%
MAN18	43	78%	12	22%
MAN19	48	87%	7	13%

The results indicate that MAN1, MAN3, MAN4, MAN6, and MAN14~MAN19 have higher positive responses in comparing other items, all these items are more than 90 per cent. This means that management is willing and providing actual support to CI and NPD process. For example, management delegates authority easily, ideas acceptance, and all the 55 managers within the SMEs gave fully support in providing training opportunities to employees (MAN4). On the other hand, the results also show in MAN2 that 78 per cent managers disagree with the statement, which means they do not take personal responsibility to specify the job / process requirements. This indicates that management easy to delegate authorities within the companies.

In terms of product strategy, the result shows that management team has a clear vision of the final product during NPD process (MAN6). Companies

generally have a good working relationship with suppliers (MAN17). Suppliers often contribute valuable ideas for continuous improvement in NPD (MAN18). All of these would contribute to an effective product strategy and maintain continuous improvement culture within these SMEs.

Quality assurance is the main theme of continuous improvement. The results showed that customers are generally satisfied with the quality of the product(s) that these SMEs delivered to them (MAN14), and the customer satisfaction stimulates companies to maintain the high quality of the product(s) (MAN15). Customer satisfaction motivates SMEs to preserve continuous improvement culture (MAN16). These SMEs also discuss with customers with what improvements need to be made (MAN19) to enable continuous improvement to take place.

Beside the above high positive responses from management, there were also some responses that were not strong and active, such as MAN5, MAN8–MAN12. 42 per cent of managers believe that communication channels between management and employees were not operating regularly within their companies (MAN5). 40 per cent of managers were not seeking ideas from customers actively (MAN8).

Nearly half of the SMEs did not have a management team to support continuous improvement for NPD (MAN9). More than half of the SMEs did not seek ideas for continuous improvement from relevant industry (MAN11). This was due to management's concern about the cost of carrying a continuous improvement project(s) (MAN10). This was also confirmed by personal interviews during a number of visits at these SMEs. 62 per cent of the managers believe that the company embarks on market research actively for continuous improvement (MAN12), 72 per cent of managers agree that the results of market research contribute to decision making for continuous improvement.

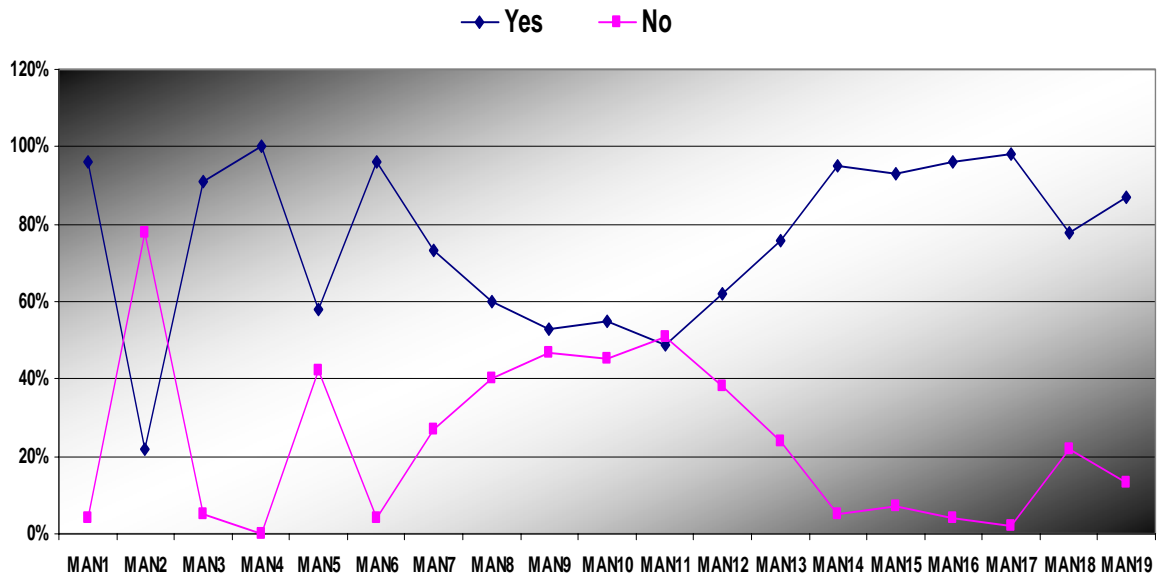


Figure 5. 5: Responses from management

5.2.3.2 Results and discussion of Interviews questions

Number of new products that developed during the last five years

The number of new products that developed during the last five years is displayed in Appendix H. The top ten SMEs who developed the most new products are shown in Figure 5.6. These SMEs include C2, C7, C8, C10, C11, C12, C20, C26, C39, and C44.

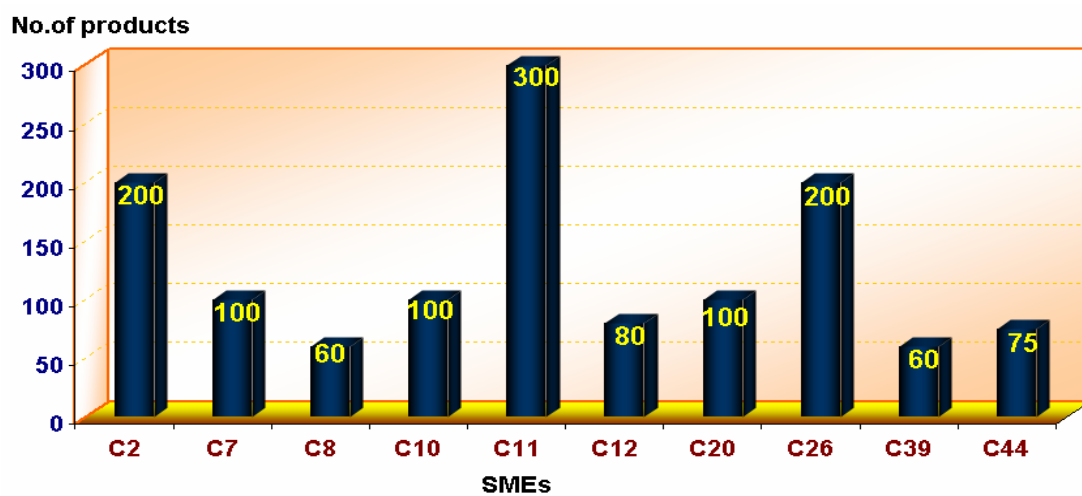


Figure 5. 6: Top ten SMEs regarding the number new products

C11 is an engineering design company in the Western Cape. The company develop various new products such as metal mould, automobile components, weapon parts, agricultural appliances, etc. During the last five years, based on the interview results, the company has developed more than 300 new products, which stands on the top position among all other SMEs.

Both C2 and C26 embark on manufacturing activities, the two companies develop new products regularly based on the orders from their customers. In addition, they also develop new products based on the improvement of the existing products.

C7, C10, and C20 are on the same scope of numbers of new products (approximately 100) that developed, two of them were from manufacturing activities, and the rest was from engineering design.

C8 and C39 both embark on manufacturing activities; they stand on the same level which 60 new products were developed. C12 and C44 developed 80 and 75 products respectively.

Annual Turnover (by the end of 2009)

A detailed annual turnover of the 45 SMEs is showed in Appendix G. This section only discusses the top ten SMEs regarding the amount of annual turnover.

Based on the results, the detailed results of annual turnover of the 45 SMEs is showed in Appendix G. Although the employee size of these SMEs are under 250, however, the annul turnover of the top ten SMEs are higher than 50 million Rand, which does not meet the criteria of SMEs in accordance to National Small Business Act. This also means that the growth of SMEs is significant in terms of production and sales in the comparison with ten years ago. Table 5.2 shows the number and percentage of SMEs' annual turnover in different range.

Table 5. 2: SMEs' annual turnover in different range group

Range of annual turnover	SMEs	No.
<5m	C2, C17, C20, C28, C29, C33, C42, C45	8
>5m≤10m	C6, C22, C31, C34, C38, C40	6
<10m≤20m	C5, C12, C19, C21, C26, C27, C32, C41, C43	9
<20m≤30m	C3, C10, C11, C35, C37	5
<30m≤40m	C9, C13, C16, C24, C25, C36	6
<40m≤50m	C4, C7, C18, C23, C44	5
<50m≤60m	C15, C39	2
<60m≤80m	C1, C8, C14, C30	4
Total		45

According to Figure 5.7, the 45 SMEs were separated as different groups regarding the amount of their annual turnover. 8 SMEs which count 18 per cent out of the 45 SMEs have less than 5 million Rand annual turnover, these 8 SMEs including C2, C17, C20, C28, C29, C33, C42, and C45. 6 SMEs count 13 per cent of the 45 SMEs which including C6, C22, C31, C34, C38, and C40, they were from 5 to 10 million rand. 9 SMEs include C5, C12, C19, C21, C26, C27, C32, C41, and C43, are from 10 to 20 million rand, which count 20 per cent of the total number of SMEs.

The group of 20 to 30 million (include C3, C10, C11, C35, and C37) and 40 to 50 million rand (C4, C7, C18, C23, and C44) groups, owned the same percentage (11 per cent) respectively. The group of 40 to 50 million stands for 13 per cent which contains C4, C7, C18, C23, and C44. Only 4 per cent SMEs had the annual turnover from 50 to 60 million rand, which include C15 and C39; and 9 per cent of SMEs (C1, C8, C14, and C30) had the turnover from 60 to 80 million rand.

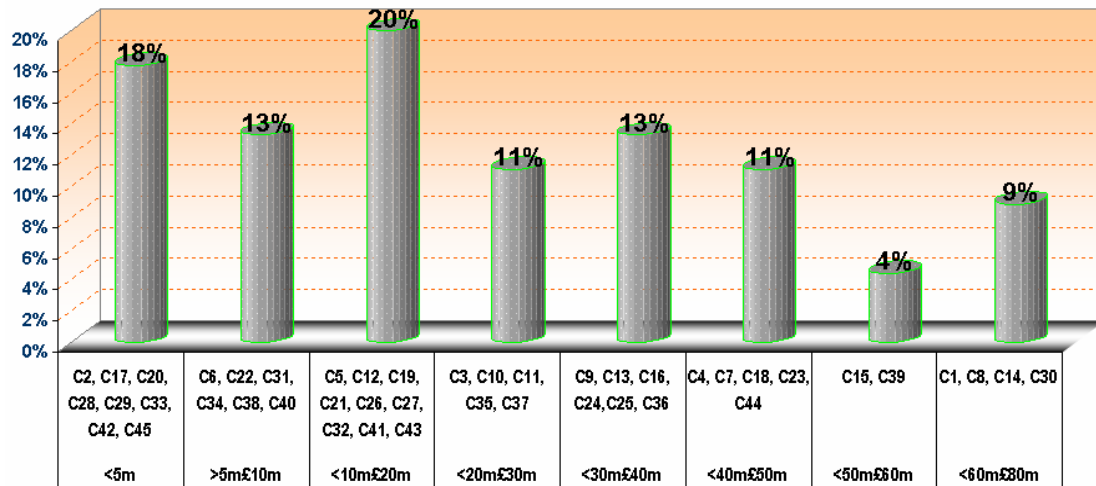


Figure 5. 7: Percentage of annual turnover in different groups

The main theme of the responses from the open questions are summarised as the following:

How do you communicate with your employees?

There were various ways of communicating with employees from the 45 SMEs, generally described as follows:

The way of communicating with employees includes face-to-face, written and verbal reports, emails, notice-board, and meetings. For example, “most of the time, I communicate through supervisors; these supervisors will send my message to the shop floor employees. However, to those important issue such as product improvement, I will call all employees for a meeting, I will explain it clearly to the employees” one top manager mentioned.

Another top manager from SMEs explained the way of how he communicates with his employees: “I always make efforts to build a good relationship with my employees. I usually try to make them feel the company is just like their home, we are a family. I believe that this is important to enhance employees’ confidence to contribute ideas to products, so that we can always make improvements to our products”.

Meetings include weekly, quarterly or monthly meetings with employees. In addition, informal meetings through appointments, emails, etc were utilised. A top manager said: "Through the normal delegating channels and via every quarterly shop stewards meeting".

Some SMEs involved import and export business, they communicate to employees through network communication tools such as MSN, Skype, facebook, etc.

Do you have an "open-door" policy for your employees?

The responses the management within the 45 SMEs regarding the open-door policy for employees are summarised as below:

Many managers claimed that they implemented an open-door policy within their companies. E.g. "Everybody can come to me if is there a specific problem in products, my door is always open" one of the top managers said. "If my employees want to talk to me, they can come to me without appointments, I am generally available and willing to listen" another top manager claimed. Another top manager said, "I am always very glad to have my employees who come to give me ideas regarding product design and improvements".

Several top managers have the similar answer regarding the open-door policy. They said: "Yes, employees can come to my office any given day. There were nearly 12 employees came to my office and discussed different issues. According to their problems, I usually give my opinion and advices. Workers sometimes go to the managers or to me directly, as they feel it is difficult to talk to their supervisors. The supervisors may not listen to them and accept their ideas. When things happened like this, I normally will find out the problem and provide a solution".

"Yes, exactly what it says: 'open-door'. Any employee can come and discuss any issue with me, as long as he/she is willing to contribute to the company.

Through the policy, I also can know what employees' thinking." A senior manager said.

Another top manager mentioned: "we do have an open-door policy. The employees are allowed to contribute ideas for production and provide any suggestions for product improvements. However, it is not strictly followed and implemented. For example, some employees contributed ideas to their supervisors or managers, the supervisors and managers took a long time to respond to the suggestions, and sometimes they even did not give any feedbacks to employees. This discourages employees for idea contributions. Thus, I think that now it is the time for me to make decision for changes, and we need to have a transformation regarding the NPD issue at the company".

How do you accommodate ideas that are contributed by your employees?

In terms of accommodating ideas; management is active and willing to listen to the employees. Some SMEs, for example, make use of suggestion box, APQP (Advanced Product Quality Planning) meetings, establishing award incentive system to award employees with prize to encourage them for the idea contribution to NPD. All the ideas are encouraged to contribute towards the improvement of new products.

Some top managers from different SMEs have the similar response, they claimed: "we have a R&D meeting every week, the product designers, sample makers, shopfloor supervisors are part of the meeting. They collect various ideas from employees and bring these ideas to the meeting, and we will evaluate and discuss it".

"Yes, definitely, I will always support those who are willing to contribute ideas. It is very important to get ideas and suggestions from shop floor workers, as they are the ones who know the product and the potential problems to enable

continuous improvement for the products” another top manager from one of SMEs addressed.

Managers are willing to listen to employees for their ideas for product development. Some top and senior managers provide a similar answer, such as: “I’ll listen to them, if their ideas are viable and workable, I’ll address the issue to the management meeting and try to implement it”; “Every employee has a right to come with ideas for products and we will assess and try these ideas see if it contributes profits to the company”; “We have a weekly R&D meeting to discuss the issue of new product. For example, we discussed about the sample making last week, and we identified several problems about the new product”.

“During the conceptual phase of a product, we take into account the views of all employees, and see what their opinions. Some suggestions were really valuable. This enables us to make right decision for the product.” One of the top managers said.

Based on the above results, management is positive to accommodate employee’s ideas and suggestion towards product development.

How do you overcome “the resistance to changes”?

The most approaches that the 45 SMEs overcome the resistance to changes are similar, these approaches mainly include: firstly, explain to the necessity and benefits of the change to employees; enable to get the support from the majority of employees. Secondly, call the resisters and talk to them individually, identify the main problem. Thirdly, provide an alternative solution.

The general responses from the 45 SMEs are summarised as below:

“Some changes are tough to implement” said by a top manager, he further started: “we try to make our employees to get used to it, and gradually, the change will be becoming usual. For example, we tried to create a continuous

improvement culture within the company; it requires all employees to be involved in the process to contribute any ideas to improve our management system, manufacturing process, and product development. However, some employees complained that they are administrative staff and do not understand the manufacturing process, how can they be involved. It was a common complain, after a period of time, since they were involved, they started to learn, and understand”.

“It is very difficult to deal with the resistance, sometimes, we have explained the key concepts and repeat again and again about the advantages of the changes” one of the top managers said.

“In a given group, a wide selection of early adopters; these adopters recognise the benefits of the changes, and continuously maintain those changes. Although some resistors do not want to adopt the changes, however, our changes will carry on. The early adopters want to change things, and they do not about last group of resistors. While time goes, the resistors have to follow”.

Some SMEs did not experience such problems in change. “There is not much resistance to change since our solutions were reasonable and necessary. Our employees have a good understanding about the company. On the other hand, we are always careful when we make changes.”

The above results indicate that change is a tough task and is quite challenge to many SMEs. This requires management to provide necessary trainings to employees in order to assist employees to have a good understanding about the change, so that they can easily follow the process and make the change successfully.

How do you do your market research?

There were various responses regarding the way of conducting market research. The ways of conducting market research such as advertisement

through TV, newspaper, journal, magazines, website, conduct a market survey, sending team to investigate the market, etc.

Some SMEs go through the advertisement process based on the nature of their products. For example, one of the SMEs advertises its products on a technical journal, using website searching engine such as web-surfing, Google, etc.

A number of top managers from different SMEs described that they often interview a group of people and make demonstrations in how to use the product and write down their feelings about the products.

One top manager from another SME emphasised that they usually build a team and conduct market surveys to identify the market needs. The results of the survey will be discussed in internal R&D meetings within the company. "I am very serious with the marketing research, as it can determine whether our products can still survive in the market. Thus we need to always keep our information be updated. We have a team in dealing marketing research." One of the top managers claimed.

However, some SMEs are not sensitive with the market research as they have regular customers. "I am not worried too much about market research, my customers will check the market, they will know what they need, and they will inform me with all the specification of the new products. I will just make it for them." Several senior managers mentioned in a similar way. "We compare the products based on what is proven technology and this is mainly driven by customer's requirements." One of the top managers supported.

How are decisions made and by whom on the company's NPD processes / products?

The decisions are made generally by the top management in most of the SMEs. However, some SMEs have senior managers that are particular dealing with R&D and NPD design can also make decisions, and the decisions will be

reported to the top management. In addition, some SMEs also involve customers in decision making process.

“This is driven by the marketing strategy, which gets cascaded into the technical manufacturing functional strategies. These strategies are then converted into goals. All the information will finally go to the top management and the top manager will make the decision.” A senior manager stated.

“Customers know what the best is for them. We propose different solutions to our customers, and the customers will give us ideas. We will make the final decision based on these ideas”. Several top managers gave the similar opinion. “We usually make decisions based on our customer’s requirements.” Another top manager emphasized.

Some SMEs have a R&D team for the decision making, the team use marketing analytical tools such as SWOT (Strength, Weakness, Opportunity, and Threat) to analyse the situation of market and company itself, and make decisions for product development.

Above all, some SMEs make decisions based on their customers’ requirements; the senior manager will evaluate the necessary improvements of the products, and then make a decision. In addition, some SMEs make decisions based on the information from market research and a discussion in internal R&D meetings.

5.2.4 Results and discussions on the responses from employees

The results from employees include the data gained from close-ended questionnaire and open-ended questions. Due to the working time shift, some results were gained through focused group.

5.2.4.1 Results and discussion on close-ended questionnaire

In order to verify some of the results that generated from management, this study compared the responses from employees to management. The responses from employees are shown in Table 5.3 and Figure 5.8.

Table 5. 3: Responses from employees

No.	Yes		No	
EMP1	260	85%	45	15%
EMP2	188	62%	117	38%
EMP3	167	55%	138	45%
EMP4	262	86%	43	14%
EMP5	195	64%	110	36%
EMP6	248	81%	57	19%
EMP7	228	75%	77	25%
EMP8	141	46%	164	54%
EMP9	204	67%	101	33%
EMP10	202	66%	103	34%
EMP11	150	49%	155	51%
EMP12	272	89%	33	11%

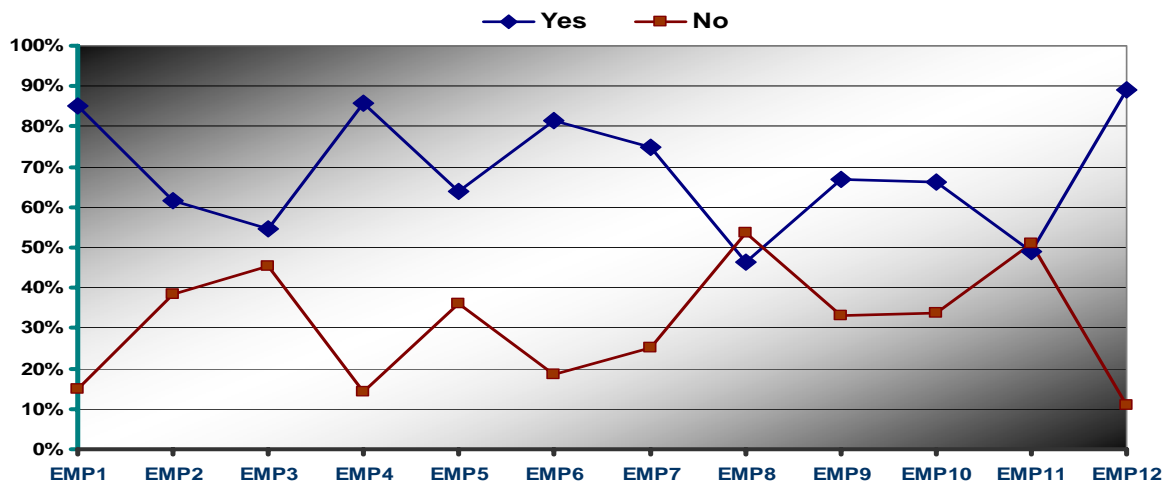


Figure 5. 8: Responses from employees

There were 12 questions were asked in the questionnaire. These questions are designed to collect the opinions from employees on the key components of the NPD management model. Based on the results, Table 5.3 indicates that the responses from employees are positive (EMP1, EMP4, EMP6, EMP7, and

EMP12) although some of the items are not strong (EMP2, EMP3, EMP5, EMP9, EMP10, and EMP11), and EMP8 has more than half of the employees have the negative response.

85 per cent employees have the positive response on the delegation of duties from the management (EMP1), it has confirmed through the response from management (MAN1). 86 per cent of employees agree that management supports decisions for continuous improvement on the NPD process (EMP4). Management also makes available specialized equipment and materials for continuous improvement (EMP6). 75 per cent employees agree that the company has offered them at least one training opportunity since they joined the company (EMP7). All of these items (EMP1, EMP4, EMP6, and EMP7) indicate that management support is truly exiting in the majority of SMEs.

However, management competency and knowledge in continuous improvement is not strongly recognized by employees (EMP2). Nearly half employees do not agree that management takes personal responsibility to specify the job, which is relevant to MAN2. 64 per cent employees have contributed ideas for product continuous improvement (EMP5). 67 per cent employees feel that they can communicate with management easily (EMP9).

66 per cent employees agree that management keeps them informed of the progress of continuous improvement project (EMP10). More than half of employees believe that management do not employ outside experts for continuous improvement when necessary (EMP11), which is reflect to MAN11.

5.2.4.2 Results and discussion on open-ended questionnaire

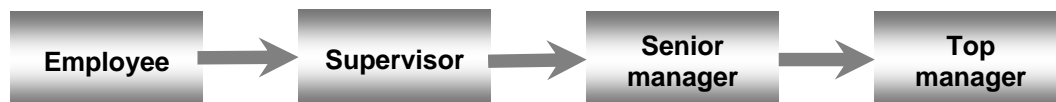
The open-ended questions from the questionnaire include the way of communicating with management, an “open-door” policy for employees, the way of management accommodate ideas that are contributed by employees, how management deal with “the resistance to changes” in your company, the morale of co-workers.

Some of the questions are to enable triangulation to take place in identifying the response from the management, such as open-door policy, the way of management accommodate ideas, and the issue of resistance to changes in SMEs.

How do you communicate with management?

Many employees give positive answers, such as: “yes, it is very easy to communicate with managers at the company; I do not have problems in communicating with managers; I have regular communication with my manager; my boss is willing to listen to me regarding the improvements of products”.

However, there is a clear hieratical barrier that determined through the research. For example, some employees from several SMEs explained: “we cannot just go to the top manager directly. We have certain procedures for communicating with all level of management which we need to follow. The procedure that our company is generally as:



Some employees agree that there is an “open-door” policy. However, even though most employees do not take this advantage to raise their voices to top management. They rather wait until there is a meeting, which might take time for them to pass an important message. This also result in miss the period of improvements of the product and loose in the market competition.

Through the results that generated from employees, the heretical structure exists within many SMEs. This can be one of the main barriers to impact on the idea generation to NPD process.

Does your company have an “open-door” policy for employees to communicate with management? Give an example.

Some employees provided positive responses on the open-door policy. For example, one employee said that he feels easy to report the product

improvement issue to the top manager. He received few times awards of contributing ideas to product development. Another employee from the same company also claimed that the management takes ideas from employees and will inform the employees whether be accepted.

Beside the positive response, some opinions were not positive regarding the open-door policy. For example, one of the employees complained: “the open-door policy is not always there as we are scared of the top manger. Some us could go to the top manager because of my co-worker is informed to go to the top manager. Otherwise, I do not think that it is easy for us just go and talk to the top manager”.

Based on the results, management needs to encourage employees to contribute ideas and suggestions to product development by establish a flat organizational structure. This will enable employee’s access to their doors easily for ideas contribution.

How does management accommodate ideas that are contributed by employees?

Some employees described: “our ideas will be only considered by special occasions since the top manager is always very busy. We often use the opportunity when we sit in the monthly meeting. However, some of the good ideas may be late for the improvement as our competitors always tried to compete with us”.

“In our company, managers prepared a suggestion box in corner of the administration hall; everybody can give ideas and suggestions to product development”.

“Management will consider the feasibility of the ideas that we contributed as it may add costs to the company. This also depends on the resource availability of the company”.

Base on the results from employees, management are active to accommodate employees ideas for product development. To those highly innovative SMEs,

the way of management dealing with employee's idea contribution is significant to their NPD success.

How does management deal with “the resistance to changes” in your company?

The responses from employees regarding the ways of management deal with the resistance to changes are as follows:

“Management often provide training when there is a change. Through the training, management tries to make us understand the change, and motivate us to follow the changes” said by an employee.

“We are always informed by the management when there is a change. The changes within the company are often considered seriously by management. We also realise that some changes are really important and reasonable to the company. Thus we try to follow the change that management required us”.

“Sometimes, it becomes stressful when a change takes place in the company, we felt under high pressure and uncomfortable to the change. Same changes made everybody feel difficult to work as the changes may require us to go for a training to get understanding of the system, so that we can work easily”.

Based on the results, employees try to follow the changes that the management made, however, employees need to be informed and trained, so that they will be able to work effective. This requires management of some SMEs to make more efforts in dealing with the changes, in order to make employees embrace the change and achieve successful product development.

Can you comment on the morale of your co-workers?

The general responses from the employees regarding the morale of co-workers are highlighted as follows:

“My co-workers have confidence enthusiastic in dealing their work. Our

morale and enthusiasm is motivated by customer satisfaction”.

“We have a very good relationship with each other; we understand each other and try to assist each when there is a need. Our good working relationship enables us to work effectively in the company”

“My co-workers are working very hard, and dedicated and committed to the job description. Our managers give us necessary support to enable us to do the good work. The spirit from my co-workers encourages and motivates me to work hard to achieve our goals for the company.”

Based on the above responses, comments on the morale of co-workers are positive. This indicates that employees have good spirit and enthusiasm towards their work. They are responsible to their work as they are concerning their customers. The employees have a good working relationship with each other.

5.2.5 Summary

Both management and employees play a critical role in NPD management process. From the viewpoint of internal environment of SMEs, the quality of the NPD process closely relies on management support and commitment, managers’ competencies and management skills for decision making, employee involvement, and creating a continuous improvement culture. Employee’s morale and enthusiasm towards work also pushes NPD management within SMEs.

On the other hand, the external environment of SMEs, marketing orientation, effective suppliers’ collaboration is critical to the success of NPD management.

5.3 CASE STUDY 2: A MATHEMATICAL APPROACH IN NPD

Once new products are introduced to the market, those old products still exist and influence the market until they are completely out of the market and the new products replace them. Most customers may not purchase a new product during the introduction stage as they are not sure of the quality and effectiveness. Thus, early sales of a new product could be depressed or time-to-takeoff could be longer than seems justified by the potential utility of the new product (Golder and Tellis 1997; Tellis et al. 2003).

After World War II Japanese manufacturing industry were faced with enormous shortages of material, financial, and human resources. These conditions resulted in the birth of the “lean” manufacturing concept (Womack et al., 1990). Early Japanese industrial leaders such as Toyoda, Shigeo Shingo, and Taiichi Ohno responded by devising a new, disciplined, process-oriented system, which is known today as the “Toyota Production System,” or “Lean Manufacturing.” The system focused on reducing the major sources of waste, the main tools of the system such as JIT (Just-In-Time), production smoothing, setup reduction, and others to eliminate the waste and improve quality such as Kaizen (Continuous Improvement) and TQM (Total Quality Management).

Lean techniques have been adopted by many companies in their manufacturing process due to its distinct benefits (e.g. Detty and Yingling, 2000., Melton, 2005., Yan and Jacobs, 2009). This section develops a mathematical model assessing the long term impact of existing products on perceived value of new products. A two compartmental deterministic mathematical model is formulated and analyzed qualitatively. Numerical simulations support our analytical conclusions and illustrate possible behaviour scenarios of the model. Lean product development technique is the key of minimizing waste and maximizing profits for any company.

5.3.1 The Uniqueness of the Mathematical Model

The long term impact of existing products on perceived value of new products is a necessary component that companies should consider in order to maintain desired margin of profitability. Whether introducing new products / services or upgrades of existing products/services, better profit can be achieved by applying Lean product development technique and evaluating the long term impact of existing products on perceived value of new products will contribute in maintaining the desired profit margin. Innovation, continuous improvement, and changes forced by economics factors and marketing conditions are essential elements for bringing new products successfully in the marketplace; however, market competition with the existing products may have long term impact on the perceived value of the new products.

Customers are impressed by new products as it generally provides better quality and similar price to the old products. Companies usually endeavour to increase their sales and profits through new product development. Product improvement by incremental development is the heart of any sustained business venture (Morgan et al., 2001, Gilvan et al., 2004). However, in most cases, the old products impact the market of the new products due to the economic factors and uncertain marketing conditions. Once economic factors and marketing conditions change, what can companies do? How do companies optimise the perceived value of the new products and make more profits? Therefore, companies need to continuously develop new strategies to attract customers in order to sustain the perceived value of the new products.

Most of the earlier studies and models have considered the profitability of both the existing and new products on independent level, ignoring the impact of market competition or possible interaction between the existing and new products in a competitive market scenario (Tam, 2004; Lin et al. 2008). For instance, a generic model for net purchase value of a product for its product life cycle was proposed by Burke (1992) but he did not take it further for downstream analysis of the market impact of existing product on the perceived value of new product.

5.3.2 Assumptions of the Mathematical Model

Yan and Makinde (2009) developed a mathematical model to investigate theoretically the long term impact of market competition with existing products on the perceived value of the new product. The model was made based on the following assumptions:

- At any given time for a product, it is assumed that the higher is the customer perceived value; the higher is the level of customer satisfaction. The increased level of customer satisfaction from the improved product can be translated into increased sells and profit by increasing the net purchase value of the product.
- Lean product development technique is employed in producing the new product – through incorporation of new innovations, technology, cost reduction and quality improvement.
- Both existing and new products are subjected to market competition there is time-dependent degradation in product's attractiveness and customer perceived value.
- It is assumed that competitors are launching their products at regular interval in uniformly distributed time horizon. This results in a time-dependent decay in the existing product perceived value.

5.3.3 Development of the Mathematical Model

Suppose the existing product was launched at time $t < 0$ and at time $t = 0$ a new product is launched such that, for $t \geq 0$, both the new and the existing products are subjected to market competition. The proposed model equations for the rate of change in operational profits of both new and existing products is given as;

$$\frac{dS_1}{dt} = a_1(S_1 - \frac{S_1^2}{k_1}) - b_1 S_1 S_2, \quad (1)$$

$$\frac{dS_2}{dt} = a_2(S_2 - \frac{S_2^2}{k_2}) + b_2 S_1 S_2, \quad (2)$$

with peak operational profit $S_2(0) > S_1(0)$, where

S_1 = operational profit for existing product

S_2 = operational profit for new product

a_1 = operational profit generation rate for existing product

a_2 = operational profit generation rate for new product

k_1 = residual sales parameter for existing product

k_2 = residual sales parameter for new product

b_1 = impact rate of new product on existing product profitability, which is function of market competition and amount of innovation and technology obsolescence.

b_2 = impact rate of existing product on new product profitability which is function of market competition and amount of innovation and technology improvement.

Increase in operational profit is attributed to increase in sales, which can be credited to the increase in product perceived value H given by

$$H = S_2 - S_1. \quad (3)$$

Since a product in a market, where ground is flat for the competition, any new product from a competitor is going to reduce the existing product's perceived value. Therefore, product's relative perceived value is based on its competitive position in the market. The long term operational profit of both existing and new products based on the above model can be easily obtained as follows (Arrowsmith and Place, 1982).

$$(S_1^*, S_2^*) = (0,0), (k_1,0), (0,k_2), \left(\frac{k_1 a_2 (a_1 - b_1 k_2)}{a_1 a_2 + b_1 b_2 k_1 k_2}, \frac{k_2 a_1 (a_2 + b_2 k_1)}{a_1 a_2 + b_1 b_2 k_1 k_2} \right). \quad (4)$$

The first result $(S_1^*, S_2^*) = (0,0)$ in Eq. (4) predicts zero long term operational profit for both new and existing product. The second result $(S_1^*, S_2^*) = (k_1,0)$

reveals zero operational profit for the new product only. This can be attributed to new product failure and other market factors.

However, many company's will prefer to maintain high perceived value of the new product at any given time at the expense of the existing product, hence, this makes the long term operational profit in the third result $(S_1^*, S_2^*) = (0, k_2)$ of Eq. (4) most desirable by allowing the existing product operational profit to wane with time (since the existing product gradually disappear from the market) while the new product operational profit is still maintained.

Mathematically speaking, this third long term operational profit can only be achieved provided $k_2 > \frac{a_1}{b_1}$. The fourth result shows the possibility of co-existence of long term operational profit for both new and existing products.

$$(S_1^*, S_2^*) = \left(\frac{k_1 a_2 (a_1 - b_1 k_2)}{a_1 a_2 + b_1 b_2 k_1 k_2}, \frac{k_2 a_1 (a_2 + b_2 k_1)}{a_1 a_2 + b_1 b_2 k_1 k_2} \right). \quad (5)$$

In an industrial setup, this scenario can only be viable, provided the perceived value of the new product is still higher than the existing product. Otherwise, new product failure may result.

5.3.4 Numerical Result and Discussion

In this section, the study monitors the dynamical effect of market competition on the new product perceived value as described by the model in Eqs. (1)-(2). Runge–Kutta integration scheme implemented on *MAPLE* is employed to the model equations numerically.

For illustration purposes, this study adopts parameter values that satisfy the condition $k_2 > \frac{a_1}{b_1}$ such that the most desirable long term operational profits i.e. $(S_1^*, S_2^*) = (0, k_2)$ are achieved.

Figure 5.9 shows a time evolution of the operational profit for the existing product and new product when market competition impact is ignored i.e. under the condition of $b_1=b_2=0$. It is noteworthy that the operational profits of both new and existing products decrease gradually with time to their respective constant residual value. This is in agreement with the results reported in Burke (1992), Gautam and Singh (2008). However, this scenario is detrimental to business growth since it impacted negatively on the perceived value of the new product as illustrated in figure 5.11, where the perceived value wane with time under the same parameter condition.

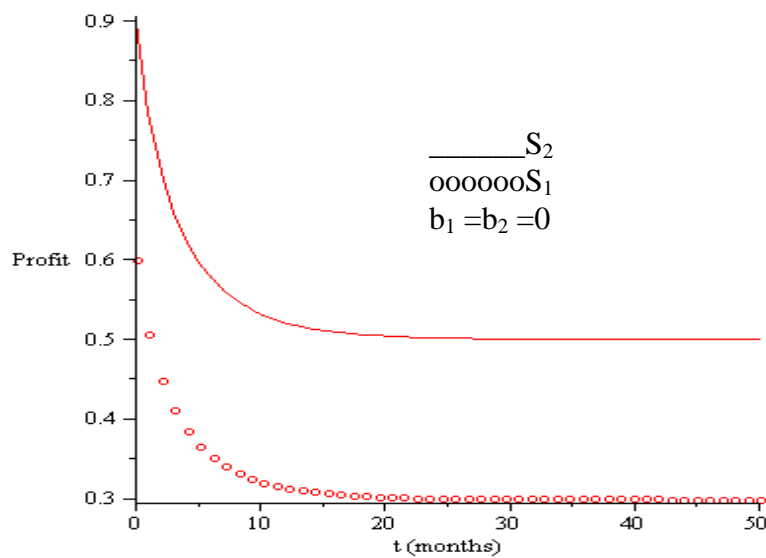


Figure 5. 9: Variation in the profit margin with time

In figure 5.10, the time evolution of the operational profits for the existing and new products in the presence of favourable market competition i.e. the condition $b_1= 0.5, b_2=0.2, k_2 > \frac{a_1}{b_1}$ such that the most desirable long term operational profits $(S_1^*, S_2^*) = (0, k_2)$ are achieved. The operational profits of the new product decrease gradually to its residual value while the existing product gradually goes into extinction. This scenario produced a positive increase in the perceived value of the new product as illustrated in figure 5.11. Hence adopting this strategy by companies will surely result into high profitability and growth.

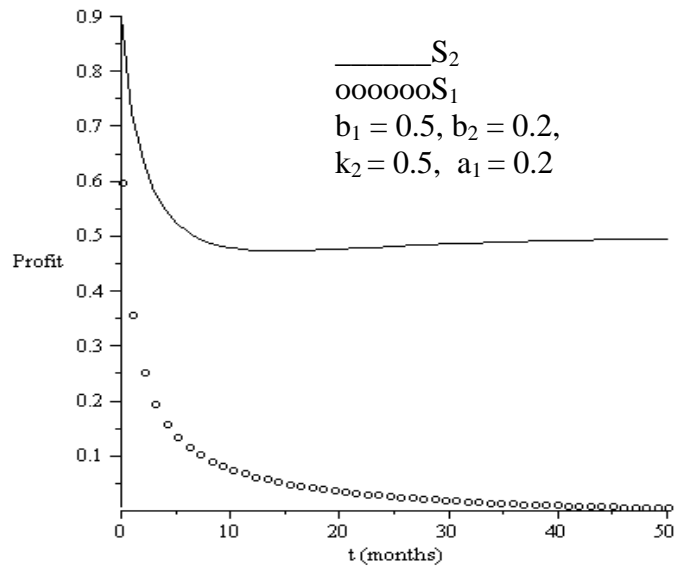


Figure 5. 10: Variation in the profit margin with time

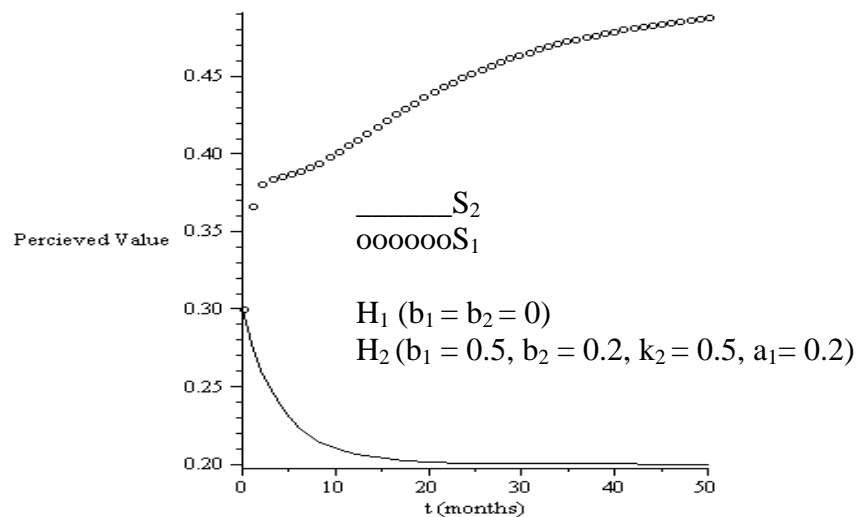


Figure 5. 11: Variation in perceived value with time

5.3.5 Summary

Innovation, continuous improvement, and changes forced by economics factors and marketing conditions are essential elements for bringing new products successfully in the marketplace. However, due to the significant effect of the existing product on perceived value of the new product in marketplace, the companies should consider adopting an effective strategy in

order to maintain a desired profit margin for the new products. In essence, Lean product development technique can be the key of minimizing waste and maximizing profits for any company, however, evaluating the long term impact of existing products on perceived value of new products will contribute immensely in achieving the desired profit margin.

5.4 CONCLUSION

In conclusion, this chapter demonstrated the significance of the critical components from the proposed NPD model and an application of the mathematical model for NPD management through the two case studies.

During the NPD management process, the competence of management, management support and commitment, and employee's involvement in NPD is vital to the success of SMEs' NPD process. This requires management give fully support to NPD, and encourages employee's participation in NPD process.

On the other hand, in order to ensure high profits, SMEs need to embed effective techniques such as lean and apply scientific method to forecast the long term impact of existing product on perceived value of new products. This will enable them to manage their NPD management process effectively.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This section endured to answer the research questions that were asked in Chapter One. The answers are based on the research findings that generated from both qualitative data and quantitative data. The qualitative data were collected from the exploration of the currently literature and the questions were utilised during a number of personal interviews with managers from SMEs in the Western Cape. Quantitative data were generated through the research results and findings of the study. A general conclusion and recommendation of the study is made after the sub-conclusion addressed. Finally, the implications of the study and the implications for the further research were pointed out.

6.2 CONCLUSIONS RELATED TO RESEARCH QUESTIONS AND TESTING THE MODEL

The conclusions are made based on the research questions of the study. The following research questions of the study were asked in Chapter One:

- How does the current body of knowledge regarding innovation and NPD impact on NPD management in SMEs?
- How does a SME cope with relatively limited resources when attempting to develop a new product?
- How does the informal nature of a SME impact on NPD?
- What are the critical components in managing NPD processes within SMEs?
- Why it is important for SMEs to follow a structured process to manage their NPD?

6.2.1 Conclusions related to body of knowledge regarding innovation and NPD impact on NPD management in SMEs

Body of knowledge regarding innovation and NPD is based on the key components of NPD management model, such as management support and commitment, people involvement, product strategy, customer satisfaction, quality assurance, and the feedback from new product launch. These key components are derived from relevant literature and are tested in this study. Based on the research findings, the following conclusions can be made:

6.2.1.1 Conclusions related to management support and commitment in NPD management

In successful SMEs, management delegates authority easily and willing to accept employees' ideas and suggestions on product(s). Management does not take personal responsibility to specify the job / process requirements, as this can cause unnecessary restrictions to the NPD process. Management supports decision making on the NPD process, management make available equipment and materials for NPD. This means that management is more likely committed to NPD process in successful SMEs than less successful SMEs. Management in successful SMEs is more likely to offer training opportunities to employees than less successful SMEs.

6.2.1.2 Conclusions related to employee involvement

Employees in successful SMEs are willing to contribute ideas for product and have regular communications with management regarding the improvements of new product. In essence, employees in successful SMEs communicate with management easily. This enables employees to have in-depth involvement in NPD process. Employees are well informed by management about customer requirements in successful SMEs, this indicates that the communication channels between employees and management is open and information flow smoothly.

However, employees do not have strong feelings recognise their companies as same as their home.

6.2.1.3 Conclusions related to product strategy

Management team in successful SMEs have a clear vision of the final product to be developed during NPD process. Resources are always available for NPD in successful SMEs. Successful SMEs are more likely to assess the capability for a new product to be developed than less successful SMEs.

Successful SMEs is more likely to have a NPD management team to support NPD, management is more competent and knowledgeable on NPD in successful SMEs; employees received necessary trainings in successful SMEs, these SMEs seek ideas from customers for NPD actively, they involve outside experts for NPD when there is a necessity. This enables continuous improvement to take place in the NPD process, so that the SMEs can manage NPD effectively and efficiently.

In terms of carrying R&D team for NPD, successful SMEs are more likely concerning the cost of carrying R&D team for NPD than less successful SMEs. Marketing research is more likely concerned by successful SMEs than less successful SMEs. Those successful SMEs are more likely using the results of market research to make decision for product. Successful SMEs often have a good working relationship with suppliers, they seek ideas from suppliers for NPD, this enables them to receive materials or services when develop new products efficiently.

Successful SMEs is more likely to embrace continuous improvement culture in NPD than less successful SMEs.

6.2.1.4 Conclusions related to customer satisfaction

Successful SMEs is more likely to satisfy their customers through the good quality of their product(s) than less successful SMEs. Employees are well

informed by management about customer requirements in successful SMEs, this enables employees to have a good understanding about the customers' needs, and employees will be able to improve the product quality in order to meet customer satisfaction.

6.2.1.5 Conclusions related to quality assurance

Successful SMEs are more likely to be stimulated by customer satisfaction through improving the quality of product(s) continuously. These SMEs are willing to discuss with customers with what improvements need to be made. In addition, management in successful SMEs is more likely to insist on high quality for the products. This ensures the high quality of the products. This enables SMEs constantly maintain their high quality of products and win the loyalty from the customers.

6.2.1.5 Conclusions related to feedback

Successful SMEs constantly enable continuous improvement to take place through the feedback from customers and quality testing from internal process. Additionally, feedback as one of the essential components for continuous improvement embedded in NPD process within successful SMEs.

6.2.2 Conclusions related to SME cope with relatively limited resources when attempting to develop a new product

Due to the lack of resources for NPD, the research findings showed that many SMEs attempted maximally involve employees and seek ideas from customers and suppliers to save cost in NPD process.

However, many SMEs concerned about the cost of involving industrial experts and carrying a R&D team to support NPD and innovation.

6.2.3 Conclusions related to informal nature of a SME impact on NPD

Due to the informal nature of SMEs, many SMEs lack appropriate education, necessary skills and knowledge in NPD. Essentially, the lack of financial resources is one of the major problems amongst SMEs in South Africa. This contributes negative impact on NPD process in SMEs.

On the other hand, SMEs generally have a flat organizational structure; this enables SMEs to have more flexibility in develop new products.

6.2.4 Conclusions related to identification of the key components in managing NPD within SMEs

Based on the study results, the key components of NPD management are identified. These key components formed a basic NPD management model that has discussed in Chapter Four. These key components are as follow:

- Management support and commitment
- Employee involvement
- Product strategy:
 - Resource availability
 - NPD capability
 - Market research
 - Suppliers
 - Continuous improvement
- Quality assurance
- Customer satisfaction
- Feedback from new product launching

6.2.5 Conclusions related to the importance of SMEs to follow a structured process for their NPD management

A comprehensive NPD management process is lengthy and costly. The structure NPD management process with all those key components can provide a clear direction to SMEs in their NPD process. This can enable

SMEs to avoid unnecessary or repeated process and waste. In order to be innovative and competitive in business, SMEs need to adopt innovative approach in their NPD management process.

6.3 GENERAL CONCLUSION AND RECOMMENDATIONS

6.3.1 Conclusion

Based on the findings of this study, applying innovative approaches such as Lean techniques (i.e. continuous improvement) in NPD management process plays a significant role in SMEs NPD process. Management have strong awareness in offering training opportunities to employees, and employees could obtain necessary trainings; customer satisfaction due to the high quality of products; management motivates employees to be involved in NPD process to contribute ideas; management delegates authorities easily, which can boost continuous improvement process.

Beside the positive responses from both management and employees, however, there are some weak areas that need to be addressed. This includes:

- Management does not have strong competency and knowledge in implementing continuous improvement;
- Management does not active sufficiently in seeking expertise from industry for continuous improvement implementation and NPD management;
- Continuous improvement requires information flow effectively and efficiently within an organization, in order to maintain high quality of products and process.
- However, many SMEs do not have an effective communication channel between management and employees; this resulted in poor information flow and ultimately affect on NPD process.
- Employees were not well informed by the management of the progress of continuous improvement project.

6.3.2 Recommendations

The recommendation of this case study has been made as follows:

- In respond to the management competency and knowledge regarding continuous improvement, in order implement continuous improvement effectively and productively, the study suggests managers must really understand what continuous improvement is about. Identify the challenges faced by companies and trying to extend continuous improvement into NPD management. Simultaneously, companies should create a continuous improvement culture, which start from management level in terms of a set of key behaviours and daily working styles. Set as a role model, gradually involve employees and carry on further.
- Management need to have a regular communication with employees in order to identify the needs of employees. Once management has a good understanding of employees, then they will be able to provide effective support.
- Management should continuous provide training opportunities to update employees skills and knowledge regarding continuous improvement programme.
- Managers need to recognize the possible blocks and barriers, or disablers of continuous improvement before tying to implement it. This will enable them to avoid unnecessary waste for continuous improvement programme.
- Management should invite experts in continuous improvement implementation when there is a need. This can boost the company's continuous improvement programme on a right track.

6.4 IMPLICATIONS OF THE RESEARCH STUDY

This study provides a basic NPD management model for SMEs to manage their NPD process. The model presents a distinct direction as a guideline for SMEs. The model contains the key components such as management support

and commitment, employee involvement, product strategy, customer satisfaction, quality assurance, and feedback from the product launch. These key components are critical in the process of NPD management within SMEs.

6.5 IMPLICATIONS OF FOR THE FURTHER RESEARCH

This study provides a direction for further research, which may apply the model to manage NPD process in large companies. Another focus of the model can involve other innovative techniques such as forecasting methods to measure the trend of new product life cycle.

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APPENDICES

Appendix A: Dimensions of success NPD

No.	Dimensions of NPD management	Author(s) and Years
The key dimensions of success NPD		
1	Management support and involvement	Barclay (1992)., Anderson (2008)., Song & Noh (2006)., Lester's (1998)., Poolton & Barclay (1998)., Cooper (1999)., Copper (2005)., Bounds et al., (1994)., Kahn et al. (2006)., Swink (2000)., Bonner et al., (2002)., Cooper & Kleinschmidt (1995).,
2	People involvement	Bayo-Morines & Merino-Diaz de Cerio (2004)., Ahmed (1998)., Cooper & Kleinschmidt (1995).,
3	NPD process	Ledwith (2000).,
4	NPD strategy	March-Chorda <i>et al.</i> , 2002., Song & Noh (2006)., Lester's (1998)., Kahn et al. (2006)
4.1	Resource availability	Anderson (2008)., Song & Noh (2006)
4.2	NPD capability	Anderson (2008)., Lester's (1998)., Griffin (1997)., De Brentani (1989)., Gruner & Homburg (1999)., Barton (1992)., Ledwith (2000).,
4.3	Market	Barclay (1992)., Anderson (2008)., Song & Noh (2006)., Kahn et al. (2006)., Griffin (1997)., De Brentani (1989)., Song & Parry (1997)., Atuahene-Gima (1995)., McDaniel & Kolari (1987)., Ledwith (2000).,
4.4	Supplier	Handfield et al., (1999)., Wasti & Liker (1977)., LaBahn & Krapfel (2000).,
4.5	Continuous improvement	Anderson (2008), Bartezzaghi et al., (1997)., Caffyn (1997)., Barclay (1992)., Nilsson-Witell et al., (2005).,
5	Product quality	Barclay (1992)., Anderson (2008)., Song & Noh (2006)., Gruner & Homburg (1999)
6	Consideration of customer(s)	Cooper & Kleinschmidt (1995)., Petrick & Echols (2004:93)., Cristiano et al., (2000)., Goffin (1998).,
Other dimensions for success NPD		
7	Communication	Lester's (1998)., Kahn et al. (2006)., Barclay (1992).,
8	The culture of the organization	Anderson (2008)., Lester's (1998)., Poolton & Barclay (1998)
9	uniqueness of the new product	Barclay (1992)., Anderson (2008)., March-Chorda <i>et al.</i> , 2002., Kahn et al. (2006)
10	NPD portfolio practices	Anderson (2008)
11	Product sales	De Brentani (1989)., Song & Parry (1997).,
12	Technology	Barclay (1992)., Anderson (2008)., March-Chorda <i>et al.</i> , 2002., Song & Noh (2006).,
13	Measuring performance	Anderson (2008)., Lester's (1998)., Cooper (1984)., Song & Parry (1997)., Atuahene-Gima (1995)., De Brentani (1989).,

Appendix B: Questionnaire for management



Bingwen Yan
Department of Mechanical
Engineering
Belleville

August 2009

Dear Sir/Madam

RE: Managing new product development in SMEs questionnaire

I am a postgraduate student at Cape Peninsula University of Technology (CPUT), Cape Town in the department of Mechanical Engineering. I am conducting a research project on new product development (NPD) procedures in small to medium enterprises (SMEs) in the Western Cape, South Africa.

For South African SMEs to keep up with new emerging markets and to become competitive globally, it is important to ensure predictable success with the development of new products. NPD is a complex and costly process with many potential pitfalls. Thus, this research attempts to identify the key components of the NPD process for local SMEs in South Africa in order to provide a basic model. This model will contain the minimum requirements for the new product development process.

Data will be collected from willing participants (industry) in the form of answers to questionnaires and personal interviews.

In order to make it easy for the participants, the questionnaires are divided into three sections as shown below:

Part One was designed as close-ended questions, where participants can choose the appropriate answer with a **"tick"**.

Part Two was designed as close-ended questions of the **"Yes"** and **"No"** type, where participants can choose the appropriate answer with a **"tick"**.

Part Three contains open-ended questions. This section provides an opportunity for the participants to give **brief answers** which will be recorded by the interviewer.

There are no "correct" answers. All the answers are based on actual individual and company's information.

Thank you very much for your cooperation. your participation in this research project is highly appreciated.

Yours sincerely

Bingwen Yan
Cell: 072 613 6286
E-mail: YanB@cput.ac.za

PART 1: Individual and company's information

1.1 Gender

Male	
Female	

1.2 Position held in the organization

Top management	
Senior manager	
Junior manager	
Administrative staff	
Team leader / Supervisor	
Shop floor employee	

1.3 Years of working experience

Less than 2 years	
2-5 years	
5-10 years	
10 -15 years	
More than 15 years	

1.4 Number of employees in the company

5-10	
11-20	
21-50	
51-100	
101-150	
151-200	

1.5 Your highest qualification

1. School	
1.1 Primary school	
1.2 Secondary school	
1.3 High school	
2. College Certificate	
3. University Degree	
3.1 National diploma	
3.2 Bachelors	
3.3 Masters	
3.4 Doctorate	
4. Others (Please indicate)	

1.6 Sectors

1	Manufacturing Activity	
2	Repair and Maintenance Services	
3	Construction	
4	Mining	
5	Communication	
7	Transportation	
8	Others activities (please indicate)	

PART 2: Close-ended questions

NO.	Questions	Yes	No
1	Do you delegate authority to others in the company?	<input type="checkbox"/>	<input type="checkbox"/>
2	If "No", do you take personal responsibility to specify the job / process requirements?	<input type="checkbox"/>	<input type="checkbox"/>
3	Do you listen to employees' ideas and suggestions on your processes / products?	<input type="checkbox"/>	<input type="checkbox"/>
4	Do you provide training opportunities to develop individuals?	<input type="checkbox"/>	<input type="checkbox"/>
5	Do you have regular internal communication channels operating in the company?	<input type="checkbox"/>	<input type="checkbox"/>
6	Do you have a clear vision of what the final product will be?	<input type="checkbox"/>	<input type="checkbox"/>
7	Do you assess if your company has the capability for a new product to be developed?	<input type="checkbox"/>	<input type="checkbox"/>
8	Do you seek any ideas from your customers for continuous improvement in NPD?	<input type="checkbox"/>	<input type="checkbox"/>
9	Do you seek any ideas from relevant industry for continuous improvement in NPD?	<input type="checkbox"/>	<input type="checkbox"/>
10	Does your company have a R&D team to support NPD continuous improvement?	<input type="checkbox"/>	<input type="checkbox"/>
11	If "No", are you concerned about the cost of carrying a R&D team for continuous improvement?	<input type="checkbox"/>	<input type="checkbox"/>
12	Do you consider key governmental institutes, Universities researchers, and private experts from industry for expertise?	<input type="checkbox"/>	<input type="checkbox"/>
13	Do you embark on market research on a new product?	<input type="checkbox"/>	<input type="checkbox"/>
14	Do you embark on market research actively for continuous improvement?	<input type="checkbox"/>	<input type="checkbox"/>
15	Is market research used as input into design decision making?	<input type="checkbox"/>	<input type="checkbox"/>
16	Are your customers satisfied with the quality of the product(s) that you delivered to them?	<input type="checkbox"/>	<input type="checkbox"/>

No	Questions	Yes	No
17	Does customer satisfaction push your to maintain the high quality of new products	<input type="checkbox"/>	<input type="checkbox"/>
18	Do you have a good relationship with your suppliers?	<input type="checkbox"/>	<input type="checkbox"/>
19	Do your Suppliers often contribute valuable ideas for continuous improvement in NPD?	<input type="checkbox"/>	<input type="checkbox"/>
19	Do you discuss with potential customers what improvements need to be made?	<input type="checkbox"/>	<input type="checkbox"/>

Appendix C: Interview Questions for management

PART 3: Open-ended Questions (Please briefly answer the following questions)

1. How many new products have you introduced to the market during the last five years?

2. What is the turnover (end of 2009) of your company?

3. How do you communicate with your employees?

4. Do you have an “open-door” policy for your employees? Please give an example.

5. How do you accommodate ideas that are contributed by your employees?

6. How do you overcome “the resistance to changes”?

7. How do you do your market research?

8. How are decisions made and by whom on the company's NPD processes / products?

Appendix D: Questionnaire for employees



Bingwen Yan
Department of Mechanical
Engineering
Belleville

August 2009

Dear Sir/Madam

RE: Managing new product development in SMEs questionnaire

I am a postgraduate student at Cape Peninsula University of Technology (CPUT), Cape Town in the department of Mechanical Engineering. I am conducting a research project on new product development (NPD) procedures in small to medium enterprises (SMEs) in the Western Cape, South Africa.

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Data will be collected from willing participants (industry) in the form of answers to questionnaires and personal interviews.

In order to make it easy for the participants, the questionnaires are divided into three sections as shown below:

Part One was designed as close-ended questions, where participants can choose the appropriate answer with a **"tick"**.

Part Two was designed as close-ended questions of the **"Yes"** and **"No"** type, where participants can choose the appropriate answer with a **"tick"**.

Part Three contains open-ended questions. This section provides an opportunity for the participants to give **brief answers** which will be recorded by the interviewer.

There are no "correct" answers. All the answers are based on actual individual and company's information.

Thank you very much for your cooperation. your participation in this research project is highly appreciated.

Yours sincerely

Bingwen Yan
Cell: 072 613 6286
E-mail: YanB@cput.ac.za

PART 1: Individual and company's information

1.1 Gender

Male	
Female	

1.2 Position held in the organization

Administrative staff	
Team leader / Supervisor	
Shop floor employee	
Others (Please indicate)	

1.3 Number of years experience

Less than 2 years	
2-5 years	
5-10 years	
10 -15 years	
More than 15 years	

1.5 Your highest qualification

1. School	
1.1 Primary school	
1.2 Secondary school	
1.3 High school	
2. College Certificate	
3. University Degree	
3.1 National diploma	
3.2 Bachelors	
3.3 Masters	
3.4 Doctorate	
4. Others (Please indicate)	

PART 2: Close-ended questions

NO.	Questions	Yes	No
1	Does management delegate duties in the company?	<input type="checkbox"/>	<input type="checkbox"/>
2	Do you think management is competent and knowledgeable?	<input type="checkbox"/>	<input type="checkbox"/>
3	Does management take personal responsibility to specify the job requirements?	<input type="checkbox"/>	<input type="checkbox"/>
4	Does management control decisions on the company's NPD process?	<input type="checkbox"/>	<input type="checkbox"/>
5	Have you contributed ideas or suggestions towards products since you joined the company?	<input type="checkbox"/>	<input type="checkbox"/>
6	Does management make available specialized equipment and materials for NPD?	<input type="checkbox"/>	<input type="checkbox"/>
7	Does the company offer training to employees?	<input type="checkbox"/>	<input type="checkbox"/>
8	Do you have feelings about your company equivalent to those for your own family?	<input type="checkbox"/>	<input type="checkbox"/>
9	Can you communicate with management easily?	<input type="checkbox"/>	<input type="checkbox"/>
10	Does management keep you informed about customer requirements when you are involved in NPD?	<input type="checkbox"/>	<input type="checkbox"/>
11	Does management employ outside experts when necessary?	<input type="checkbox"/>	<input type="checkbox"/>
12	Does management insist in high quality for the company's products?	<input type="checkbox"/>	<input type="checkbox"/>

Appendix E: Open-ended Questions for employees

PART 3: Open-ended Questions (Please briefly answer the following questions)

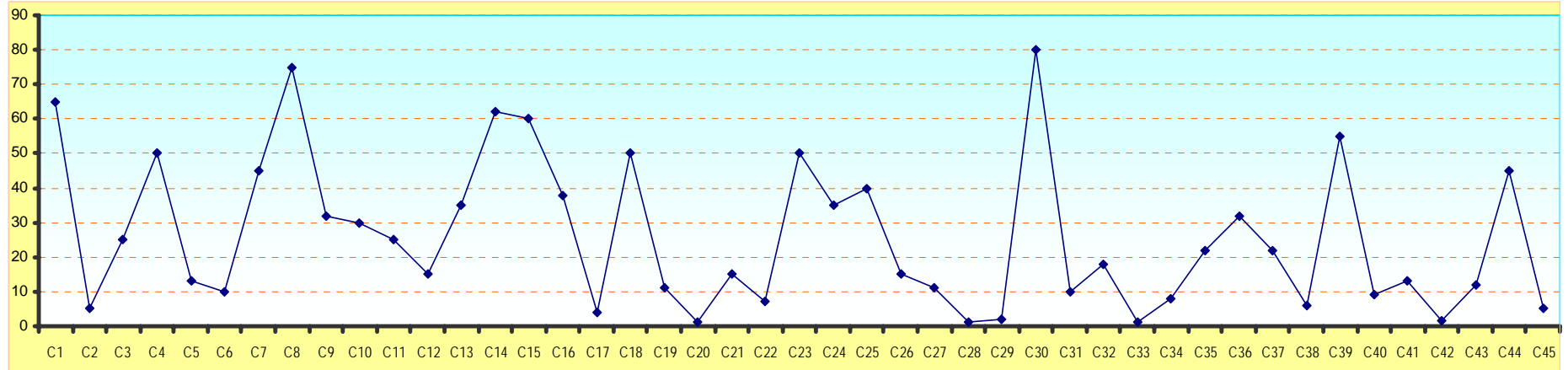
1. How do you communicate with management?
2. Does your company have an “open-door” policy for employees to communicate with management? Give an example.
3. How does management accommodate ideas that are contributed by employees?
4. How does management deal with “the resistance to changes” in your company?
5. Can you comment on the morale of your co-workers?

Appendix F: Frequency of overlapped components in NPD process from literature

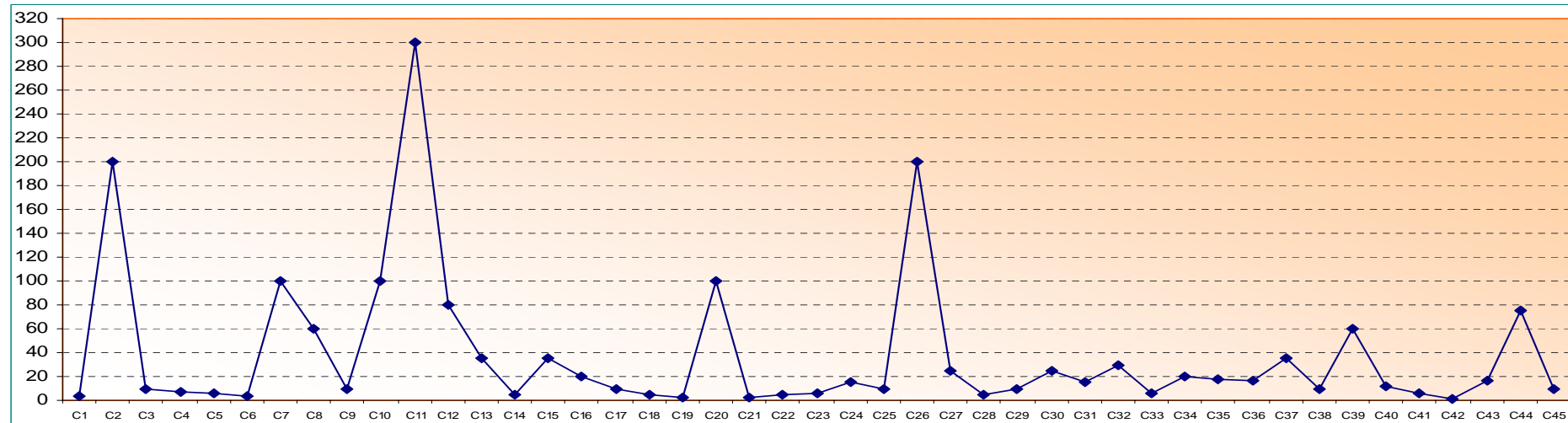
Key Elements	Authors & Years	Booz, Allen & Hamilton, Inc., 1982	Shrivastava et al. (1987)	Kotler (1991)	Thomas (1993)	Gerwin (1993)	Stanton et al. (1994)	Ulrich & Eppinger (1995)	Schilling & Hill (1998)	ACOA (2001)	Rainey (2005)	Cooper et al., (2006)	Mowry (2007)	<i>f</i>	Total- <i>f</i>
Ideas	Idea definition		*											1	14
	Idea for product or service									*				1	
	Idea Generation	*		*	*		*				*	*		6	
	Screening	*		*	*		*					*		5	
	Does the idea fit with philosophy?										*			1	
Marketing strategy	Marketing strategy	*		*										2	12
	Market Research & Technical Feasibility									*				1	
	Business analysis	*		*	*		*				*	*		6	
	Business case											*		1	
	Is there a market for the product & can it be produced?										*			1	
	Decision on business case											*		1	
Concept & Design	Product concept	*	*	*		*		*	*		*			7	16
	Design and development		*		*	*		*	*	*	*	*	*	9	
Prototyping & Testing	Protocol Development Process	*		*			*	*		*			*	6	15
	Product testing and production	*	*	*	*	*	*			*			*	8	
	Validation										*			1	

* *f*: frequency

Appendix G: Annual Turnover (by the end of 2009)



Appendix H: Number of New products developed during 2005~2009



Appendix I: General Data of the 45 SMEs

Items		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24
Gender	Male	8	4	5	7	15	25	13	2	4	34	16	8	12	36	17	7	20	2	15	6	1	1	2	20
	Female	1	1		6	2		7			5	2	2	0	4	4	5	1		2			1		1
Position	Top manager/owner	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1		1	1	1	1	1	1	1	1
	Senior manager		1	4	3			4			1			1		3	1				1		1		
	Junior manager	1				1	2	5	1				1		3		2								3
	Administrative staff	1	1		2	1		3			5		1		4		4		1	1	1				1
	Team leader / Supervisor		2		2	1	2	1		1	2	2	2	7	3	2		2			1	1			
	Shop floor employee	6			5	13	20	6		3	30	14	2	3	29	15	5	18			14	2			1
Years of Experience	Less than 2 years	1			1			1			2	5			5	3		6	1	1					3
	2-5 years	6	2		2	7	5	1			7	7		1	20	5	4	4		4			1	1	8
	5-10 years	1	2	1	3	8	8	3	1		12	2	3	2	10	5	5	8	1	7	4	1	1	1	3
	10 -15 years	1	1	1	5	2	2	5	1	2	12	1	3		3	1	2	2		2	2				4
	More than 15 years			3	2		5	10		3	6	3	2	1	3	6	1								3
number of members	Less than 10		1						1												1				
	11-20	1								1															
	21-50			1	1							1	1				1		1				1		
	51-100					1	1											1						1	
	101-200							1													1				
	More than 200													1	1	1						1			1
	Secondary school	1				3	1				2	5	2				1	4		1					
	High school	7			2	5	10	7		3	15	8	1	4	10	3	2	12		8					11
	College Certificate		1	4	2	7	5	4		1	10	5	2	3	5	3	4	2		6				1	3
	National diploma	1	2	1	3	2	5	6	2	1	8		3	2	5	10	3	2	1	1	4			1	6
	Bachelors		2		6		1	2			4			3		5	2				2	1	1		1
	Masters							1						1						1				1	
	Doctorate																				1				
	Others															18									
Sectors	Manufacturing Activity	1		1		1		1	1		1	1	1	1		1	1	1		1		1		1	1
	Repair &Maintenance services				1					1															
	Construction														1										
	Mining																								
	Communication																								
	Transportation																								
	Others activities		1																	1		1		1	
Others	No. of new products	3	200	10	7	6	3	100	60	10	100	300	80	35	5	35	20	10	5	2	100	2	5	6	15
	Turnover (million)	65	5	25	50	13	10	45	75	32	30	25	15	35	62	60	38	4	50	11	1	15	7	50	35

Appendix I: General Data (Continue)

Items	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	Σ	
Gender	Male	1	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	309
	Female		2						1	1				1	1			1					51
Position	Top manager/owner	1	1		1			1		1	1				1	1		1			1	1	35
	Senior manager		1			1	1	1		1			1	1	1			1					29
	Junior manager			1																1			21
	Administrative staff		1																				27
	Team leader / Supervisor		1							1	1	1	1	1	1								39
	Shop floor employee		8																				209
Years of Experience	Less than 2 years																						29
	2-5 years		2																				87
	5-10 years	1	7	1						1													102
	10 -15 years		3		1			1	1		1		1	1				1	1				63
	More than 15 years					1	1				1			1	1	1				1	1	1	57
number of members	Less than 10					1												1	1				6
	11-20							1	1	1				1	1	1						1	9
	21-50	1			1					1					1					1			12
	51-100			1			1				1		1								1		9
	101-200																						2
	More than 200		1																				6
	Secondary school						1																21
	High school		5		1	1				1	1		1	1	1	1		1				1	122
	College Certificate	1	3		1	1	1			1		1	1	1	1			1			1		81
	National diploma			1				1							1	1							73
	Bachelors		4						1														35
	Masters																						4
	Doctorate																						1
Others																						18	
Sectors	Manufacturing Activity	1	1	1			1	1		1	1	1	1		1	1	1	1	1	1	1	1	33
	Repair &Maintenance																						2
	Construction																						1
	Mining																						0
	Communication				1				1						1								3
	Transportation																	1	1				2
	Others activities					1																	5
Others	No. of new products	10	200	25	5	10	25	15	30	6	20	18	16	35	10	20	12	6	1	16	75	9	
	Turnover (million)	40	15	11	1	2	80	10	18	1	8	22	32	22	6	55	9	13	1.5	12	45	5	

