THE IMPORTANCE OF KNOWLEDGE MANAGEMENT IN A RESEARCH AND DEVELOPMENT FACILITY: INVESTIGATING PERCEPTIONS AND PRACTICE

by

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Abstract

Research and Development (R&D) facilities have been used to develop new or better products and services for a long time. Organisations utilise knowledge gained from their R&D facilities to gain access to new markets and to improve the organisation’s competitiveness in the market. R&D facilities are referred to as learning organisations that employ people who specialise in specific technologies. These employees are referred to as ‘knowledge employees’. Sasol R&D was formed in 1955 to assist the organisation to develop and improve the Fischer-Tropch (F-T) technology that was adopted by the organisation to produce synthetic fuels from coal. At the time the technology had not been sufficiently proven on a commercial scale and this necessitated that research be conducted to ensure that the processes related to (F-T) technology are efficiently operated.

The use of the knowledge generated by Sasol R&D has resulted in Sasol being recognised as the world leader in F-T technology and has led to joint ventures with other organisations around the world. The management of acquired knowledge has been critical in the development of Sasol and the successes that the organisation has enjoyed. It is therefore important that the employees of Sasol and those of Sasol R&D are well equipped to utilise the knowledge that was generated by previous employees to continuously improve and develop technologies. The objective of this study was to establish the perception that knowledge employees have of Knowledge Management (KM) and what Sasol R&D can improve on in this regard, i.e. business performance and individual employees’ career development.
Respondents generally agree with the importance of KM in Sasol R&D and also indicated that a successful KM strategy can help improve individuals' careers. The respondents also indicated that they were familiar with the concept of KM and the advantages for the organisation in the successful implementation of such a KM strategy. The main recommendations from the study are:

1. Employees should be involved in current the future KM strategies that the management of Sasol R&D wants to implement.

2. The adopted KM strategy’s objectives and benefits should be made clear and understandable to all employees. In addition, all relevant documentation should be made available to the employees.
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CHAPTER 1

INTRODUCTION

1.1 Background to research problem

Research and Development (R&D) facilities have historically been used to enhance knowledge and understanding of different subjects. Encyclopaedia Britannica recorded the first organised attempts to exploit scientific proficiency in the 1790’s, when the revolutionary government of France was defending itself. Organisations use R&D facilities to enhance their products and services in order to gain or maintain the organisation’s competitive edge (Sambamurthy & Subramani, 2005: 1). R&D employees are frequently called “knowledge workers”, because they are usually highly educated (Van der Spek & Kingma, 2000: 21). Since the primary objective of R&D facilities is to utilise knowledge to develop and improve services, R&D employees’ level of education, as well as their experience, is important in sustaining innovation,

An example of such a R&D facility is the one found within Sasol, a global petrochemical group. Sasol was formed in 1950 after the South African government wanted to reduce the country’s dependency on foreign oil supply. The organisation used the Fischer-Tropsch technology (F-T) which used the gasification of coal to produce hydrocarbon products that included synthetic fuels. Currently the
organisation is supplying approximately 35% of South Africa’s fuel needs. In 1955
the organisation’s management commissioned a laboratory and a testing station with
70 technicians and scientists. In 1957 a formal Research and Development (R&D)
facility was formed and was named “Sasol Technology”. Sasol R&D employs
individuals who are qualified in different fields of engineering and science with more
than 500 employees with postgraduate degrees in these fields, working within Sasol
R&D.

Sasol R&D has offices/branches in Sasolburg, Secunda, Netherlands, United States
of America and Scotland. To ensure continuous improvement of technologies and
processes, Sasol R&D has formed collaborations with universities around the world.
Employees are regularly sent to these universities to complete different research
subjects and at the same time obtain post graduate degrees that can benefit the
organisation and the individuals themselves.

R&D facilities are dependent on knowledge to develop new and improve on existing
technologies. Employees’ attitude towards the use and management of knowledge is
important as this is the one source of innovation that is used to generate and
develop new processes and services for the organisation. This study sought to
understand what Sasol R&D employees’ perception is of Knowledge Management
(KM) in the organisation.

1.2 Rationale, aim and objectives of the study
The primary aim and objective of this study was to establish Sasol R&D employees’
perception of the KM strategy that has been adopted by the organisation’s
management as well as their perception of whether this strategy will develop and improve individual employees’ advancement within the organisation. Some questions focused on whether employees thought the adopted KM strategy is advancing individual employees in the organisation, especially since Sasol wants to be a globally respected organisation. The aim was to establish whether employees are committed to the KM strategy wholeheartedly and if they believe it will take the organisation forward.

The recommendations from the results can assist Sasol R&D management to ensure that the KM strategy that has been adopted is effective and can deliver positive results for the organisation. The perceptions that employees have of the current KM strategy can assist the organisation in optimising the strategy and ensure that the benefits that are to be gained from KM are indeed realised. If the employees perceive that they are not sufficiently involved or that their opinions are not accounted, they will not contribute positively to the successful implementation of the KM strategy that is adopted by management. The recommendation of this study will incorporate the views and opinions of the employees to ensure that the KM strategy that is adopted is successful.

1.3 Research problem and sub-problems

The following research problem was formulated:

*To what extent do Sasol R&D employees perceive KM as an integral and important part of their functions?*

The question above has resulted in the following sub-problems that will assist in the
investigation:

1. What is the definition of KM?
2. Why is KM important in R&D?
3. What are the benefits of having an effective KM strategy?
4. What perceptions do Sasol R&D employees have of KM?
5. To what extent are the Sasol R&D employees involved in KM initiatives?

1.4 Research methodology

An in-depth literature study was done to ensure a solid foundation from which the empirical research was conducted. A quantitative research methodology was chosen to measure the extent of the employees’ perception towards KM within the organisation. A non-probability convenience sampling method was adopted. The survey was distributed to employees of varying years of experience, education levels, race and gender. Table 1.1 shows the breakdown of the respondents per gender and race.

The primary objective of this study was to investigate the perception employees of the Sasol R&D have of KM and their perception of what value KM adds to the performance of the organisation. The secondary objective of the study was to assess the employees’ perceived benefits from the KM initiative that is adopted by the organisation. To achieve these goals, the research survey questionnaire utilised for this study consisted of four sections:

1. Section A: Employee biographical details
2. Section B: KM Strategy within Sasol R&D
3. Section C: Employee experience within Sasol R&D
4. Section D: General personal opinion.

**Table 1.1: Demographical distribution of respondents**

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. of respondents</th>
<th>% Participation of total sample</th>
<th>% Participation per gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Females</td>
<td>6</td>
<td>11.1%</td>
<td>24.0%</td>
</tr>
<tr>
<td>Black Males</td>
<td>5</td>
<td>9.3%</td>
<td>18.5%</td>
</tr>
<tr>
<td>White Females</td>
<td>15</td>
<td>27.8%</td>
<td>60.0%</td>
</tr>
<tr>
<td>White Males</td>
<td>17</td>
<td>31.5%</td>
<td>63.0%</td>
</tr>
<tr>
<td>Indian Females</td>
<td>4</td>
<td>7.4%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Indian Males</td>
<td>4</td>
<td>7.4%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>5.6%</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100%</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

The questionnaire was web deployed via Survey Monkey. A Web-based survey was selected as the targeted population have access to the Internet and are computer literate enough to complete the questionnaire online without assistance. The completed questionnaires were then captured by STATCON (the Statistical Consultation Services at the University of Johannesburg) and processed into a numerical format in order to conduct the statistical analysis of the data. This data is presented in graphical format and analysed to give a better understanding of how employees perceive KM in Sasol R&D.

**1.4.1 Literature review**

The literature review is part of the research design and established the basis of the empirical research. Chapters 2 and 3 form the theoretical framework, discussing the various aspects that impact on the central research problem. The following section is a brief summary of the two literature review chapters.
Chapter 2
This chapter investigates the origin and definition of the R&D facility. From there it focuses on the history of Sasol R&D and what the organisation has achieved through the R&D facility. In addition this section analyses the investment made in R&D and the contribution that R&Ds in general have made in the various areas of business.

Chapter 3
Chapter 3 is focused on the definition of KM and what the benefits of having an effective KM strategy can bring to the organisation. It looks at the role players in Knowledge Management. The chapter concludes with a section that looks at Knowledge Management in Sasol R&D.

1.4.2 Empirical research
Chapter 4 starts with the rationale and objectives of the study followed by a discussion of the research methodology which include the research approach for the study, the sample target, data collection and data processing procedures followed. The rest of the chapter is dedicated to the discussion of the empirical research together with the statistical analysis of the survey results and the findings from the questionnaire. As part of the research methodology, the research problem and the sub-problems were explored for better understanding of the researched topic.

Chapter 5 is dedicated to the recommendations and the conclusions based on the findings of the analysis of the results. The conclusion identifies the areas that the management of Sasol R&D have to focus on to improve KM’s success within the organisation.
1.5 Research findings

The research findings presented in Chapter 4 can be used to assist Sasol R&D management to improve the current KM strategy. In addition, the findings can be used to assist Sasol R&D to change the perceptions that the employees have of the KM strategy, as it also highlights what the employees envisage for the future. Some of the major findings of the study are listed below:

1. Regarding the respondents’ knowledge and understanding of KM, 76% of respondents indicated that they were familiar with the concept while 80% and 72% respectively indicated that they believe that KM can assist the organisation to become a learning organisation and aid individual employees’ careers.

2. Generally, the respondents had a positive perception of KM as 69% indicated that KM is a value adding exercise. 76% of respondents believe that each organisation should have a KM strategy and 72% that KM can improve the organisation’s profitability.

3. The majority of respondents did not seem to have a clear understanding of the KM champions’ roles as only 6% understood the roles of the KM champions to a large extent, while 41% responded that they understood the roles to a small extent.

4. As the success of the KM initiative is dependent on the sharing of knowledge between individual employees, it is a positive indication that 24% of respondents voluntarily share information with other colleagues to a moderate extent. For a
knowledge driven entity like a R&D facility, it is encouraging that 35% of the respondents indicated that the senior employees share knowledge with junior employees to a moderate extent.

5. Almost a quarter (24%) of the respondents was of the opinion that the Sasol R&D management is promoting KM to a moderate extent, while 28% are of the opinion that this is achieved only to a small extent. This is an indication that the respondents who are in the employ of Sasol R&D do not perceive that they own the KM strategy but rather that the KM strategy is a “management thing”. The worrying discovery is that 13% of the respondents indicated that Sasol R&D management is promoting KM to no extent.

6. Sasol has six business values of which two are ‘Winning with people’ and ‘Continuous improvement’. Sasol promotes Values Driven Leadership (VDL) as one of the cornerstones of the organisation. However, 43% of respondents indicated that KM has not improved VDL in Sasol R&D. Management of Sasol R&D have to ensure that the KM strategy is aligned to these core Sasol values.

7. There were 46% of respondents that indicated that an effective KM strategy can assist the organisation in improving individual contributions from its employees to a moderate extent. In addition, 44% indicated KM can improve Sasol R&D’s innovation, which is in line with the organisation’s value of “winning with people”. If the KM strategy is correctly implemented, it can assist the organisation to be more innovative through higher employee involvement.

8. An advantage that Sasol R&D management has is that the majority of employees
(61%) indicated that KM is important, while only 7% disagreed with the notion. The significance of these specific results is that Sasol R&D management need to implement the KM strategy that the employees invested in, since these employees realise the importance of KM. These results also confirm that Sasol R&D does not have to educate employees about the importance of KM in the organisation.

9. With global competitiveness of the business having increased over the years, it is important that organisations utilise KM as one of the strategies to improve competitive advantage (Von Krogh, 1998: 113). There were 57% of respondents that indicated that KM can improve the competitive advantage of Sasol R&D. Sasol R&D management should ensure that the strategy adopted by the organisation promotes this aspect of the organisation’s development drive.

10. Since a R&D facility is a knowledge driven entity, it is encouraging that almost 70% of respondents indicated that KM can help improve innovation and knowledge sharing within Sasol R&D. Again, this perception may be as a result of the poor KM strategy that has previously been implemented by the organisation. Sasol R&D management has to improve the perception the employees have of the current KM strategy and thereby ensure that the employees are involved in the new or improved strategy to ensure the success of Sasol R&D management’s initiative.

11. Sasol is already a globally trading organisation and it is important that the organisation continuously improves on KM and the organisation’s global
standing. It is therefore significant that a large number of respondents (48%) indicated that a successful KM strategy will improve the organisation’s strategic global position to ultimately venture into new business opportunities.

1.6 Conclusions and recommendations

The results of the research are significant since it inform the management of Sasol R&D what the employees that responded think about the current adopted KM strategy. Since the employees are the ones who are expected to use and benefit from the KM strategy, it is important that they perceive that they own the strategy and have input in the formulation of the strategy. The success of a R&D facility is mostly dependant on the level at which knowledge is shared and utilised by employees and ultimately, the organisation. R&D facilities generally employ knowledge employees because of their abilities to disseminate information to develop new products and services (Abel, 2008: 1). Sasol R&D has an advantage in this respect, since the majority of respondents understand what KM is and what benefits an effective KM strategy can bring to the organisation and individual employees.

The findings indicate that the employees are willing to make the KM strategy a success, as long as they are involved and consulted by management regarding the direction of the strategy. Sasol has an ambition to be a globally respected organisation in Fischer-Tropsch technology (F-T) and have made headway in forming joint ventures around the globe. The majority of respondents indicated that an effective KM strategy can assist the organisation to achieve the objective of being a globally preferred and respected F-T technology supplier. Collaboration between
Sasol’s overseas facilities is seen to have improved to a moderate extent and that the value added by KM in the performance of Sasol R&D in the global environment is significant.

Respondents also indicated that the roles and responsibilities of the KM champions are not clearly understood and they are therefore uncertain as to how these champions can contribute to the KM strategy. The KM champions are the first people to assist the employees with the organisations’ KM strategy and they have to be easily accessible to the employees. The KM champions’ roles must be clearly defined to the employees to assist in the successful implementation of the strategy. This can ensure that the strategy is successful. The clear definition of roles also ensures that the adopted KM strategy is sustainable for the organisation.

The conclusion to the research problem is that the management of Sasol R&D can significantly improve the effectiveness of the organisation’s KM strategy since employees are generally in favour of the functioning KM strategy within the organisation. The employees’ perceptions of KM are positive and they want to be part of the initiative.
CHAPTER 2

RESEARCH AND DEVELOPMENT FACILITY

2.1 Introduction

According to the Encyclopaedia Britannica the first organised attempt to exploit scientific proficiency to communal needs took place in the 1790’s, when the revolutionary government in France was defending itself against most of the rest of Europe. According to the same website, explosive shells, the semaphore telegraph, the captive observation balloon, and the first method of making gunpowder with consistent properties were developed during this period. Many organisations in the world either have internal, external or collaborative research and development facilities. Research and Development (R&D) facilities can give their parent organisations or customers a competitive advantage over competitors if they manage knowledge effectively and efficiently (Farris & Cordero, 2002: 16).

R&D facilities have harnessed the knowledge base of organisations in developing new technologies or improving existing technologies to give organisations a competitive advantage (Sambamurthy & Subramani, 2005: 1). Sources of competitive advantage have shifted from depending on economies of scale to be dependent on expertise possessed by the organisation (Sambamurthy & Subramani, 2005: 1). Sasol R&D has given Sasol a competitive advantage in the Fischer-
Tropsch technology (F-T) by improving the technology. Sasol acquired F-T technology while it was not fully developed and proven on a commercial scale and the R&D facility improved the technology over the years. Sasol has also designed and commissioned plants focusing on F-T technology in different parts of the world. The success of Sasol’s R&D has resulted in it forming joint ventures with different organisations in host countries.

Sasol was formed in 1950 after the government of the day wanted to reduce the country’s dependence on foreign supply of crude oil and to protect the country’s balance of payment. Sasol was to use coal-to-liquid technology (CTL) to gasify coal that was in abundance to produce hydrocarbon products, including synthetic fuels. According to Sasol Investor Relations News, Sasol currently supplies approximately 35% of South Africa’s fuel needs from its coal and gas conversion technologies. Technology used to convert coal and natural gas into liquid fuels was adopted from two German scientists, namely Drs Franz Fischer and Hans Tropsch. This technology was first patented in 1925 and is known as the Fischer-Tropsch (F-T) technology. In 1957 Sasol commissioned a R&D facility to develop and continuously improve the technology to add more value and expand Sasol operations within South Africa, and later globally.

2.2 Definition of a R&D facility

“World class research and development activities represent a knowledge based capability that serves as a competitive advantage for the firms pursuing innovation” (Jackson, Hitt & Denisi, 2003). Organisations that have R&D facilities are interested in developing their knowledge base to continuously improve their knowledge and
thus sustain their competitive advantage. Successful organisations have the ability to create, disseminate and utilise knowledge efficiently and effectively (Sanghani, 2008: 7). The efficient utilisation of R&D generated knowledge resulting in the organisation developing new and innovative products and processes. This makes R&D facilities the core activity ensuring the organisation’s sustainability of innovation and thus its competitive advantage (Huang, 2009).

The ability of an organisation to value, assimilate and apply new knowledge can be referred to as the ‘absorptive capacity’ (Sorensen, 2006). This ability of the firm to use the knowledge and experience generated in a R&D facility assists the organisation in developing and gaining competitive advantage against competitors. The main objective of R&D is to develop systems that can enhance productivity and performance within the organisation (Kumaraswamy, Palaneeswaran, Rahman, Ugwu & Ng, 2006: 681). Organisations have to keep up with advances in the technologies they use to maintain their market share, especially organisations with R&D facilities. R&D facilities are also referred to as Learning Organisation (LO) as they are considered a place where knowledge is utilised fully, with expanded capacity and at the same time competence is gained (Liao, Chang & Wu, 2010).

R&D facilities employ specialists, also referred to as knowledge workers, who are employed because of their specialist knowledge in their respective fields, to give organisations a competitive advantage (Van der Spek & Kingma, 2000: 21). Naturally, R&D facilities require personnel who also have strong academic backgrounds and who are experts in their respective fields of study, understanding the fundamentals of their respective fields. Cooperation between academic
institutions and industry is therefore important in maintaining and ensuring that research projects are successful. This relationship is important for both institutions as both parties can financially benefit and also secure skills of competent researchers. Organisations generally employ postgraduates and postgraduate students in their R&D facilities, as these individuals have a combination of academic and practical knowledge of the subject being researched.

For instance, according to the National Science Forum’s website (www.nsf.com) the Japanese industry in general strengthened its research capacity in the 1980’s by attracting and training top graduates from Japanese universities, together with organisations’ industrial research facilities. As one of the strategies to attract skilled researchers, R&D facilities may allow and finance its employees to complete masters and doctoral degrees by giving them access to the organisation’s resources. However, the employee must research topics that will add value to the organisation’s knowledge about the subject. This strategy ensures that the employee becomes an expert in the subject and also ensures that the organisation can maintain or achieve a competitive edge in that field.

Globalisation has necessitated the need for organisations to invest more resources in R&D facilities. In the ‘borderless’ world, organisations are trying to secure unrestricted access to new knowledge from different parts of the world. Governments of developing countries are embarking on industrialisation of their countries by employing effective and relevant technologies (Mrinalini & Nath, 2008: 38). Figure 2.1 below illustrates that the Asian nations are increasing their investments in R&D, whereas North America and Europe have been reducing expenditure for the same
period of 1996 to 2009.

Figure 2.1: Location of estimated worldwide R&D expenditure (source: National Science Foundation, 2010)

The National Science Forum (NSF) developed a record of national and international’s expenditure on R&D and Table 2.1 is a summary of the global expenditure on R&D from 1996 to 2012 (NSF, 2012). The overall expenditure totalled $1,107 billion, with most of the expenditure spent by first world countries. North America spent 35% ($393 billion) of global R&D, Asia at 31% ($343 billion), Europe with 28% ($313 billion) and the rest of the world, including Africa, accounted for only 5% of the total R&D expenditure.
Table 2.1: Global comparison of R&D expenditures per country (source: Science and Engineering Indicators, 2012)

<table>
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<th>Region/country/economy</th>
<th>GERD (PPP $millions)</th>
<th>GERD/GDP (%)</th>
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<tbody>
<tr>
<td>North America</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States (2009)</td>
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<td>Luxembourg (2009)</td>
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<td>Slovak Republic (2009)</td>
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<td>0.48</td>
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<td>Israel (2009)</td>
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<tr>
<td>Turkey (2009)</td>
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<td>0.85</td>
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<td>Iran (2008)</td>
<td>6,465.2</td>
<td>0.79</td>
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<tr>
<td>Africa</td>
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<td>South Africa (2006)</td>
<td>4,669.3</td>
<td>0.93</td>
</tr>
<tr>
<td>Egypt (2009)</td>
<td>997.3</td>
<td>0.21</td>
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<tr>
<td>Morocco (2006)</td>
<td>765.1</td>
<td>0.64</td>
</tr>
<tr>
<td>Tunisia (2009)</td>
<td>1,048.5</td>
<td>1.21</td>
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<tr>
<td>Central Asia</td>
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</tr>
<tr>
<td>Russian Federation (2009)</td>
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<td>1.24</td>
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<tr>
<td>South Asia</td>
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<tr>
<td>India (2007)</td>
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<td>0.76</td>
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<tr>
<td>Pakistan (2009)</td>
<td>2,055.2</td>
<td>0.46</td>
</tr>
<tr>
<td>East, Southeast Asia</td>
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<td></td>
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<td>Japan (2009)</td>
<td>137,908.6</td>
<td>3.33</td>
</tr>
<tr>
<td>China (2009)</td>
<td>154,147.4</td>
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<td>Singapore (2009)</td>
<td>5,626.5</td>
<td>2.35</td>
</tr>
<tr>
<td>Malaysia (2009)</td>
<td>2,090.0</td>
<td>0.64</td>
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<tr>
<td>Thailand (2007)</td>
<td>1,120.8</td>
<td>0.21</td>
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<tr>
<td>Australia, Oceania</td>
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<td></td>
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<tr>
<td>Australia (2008)</td>
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<td>2.21</td>
</tr>
<tr>
<td>New Zealand (2007)</td>
<td>1,422.5</td>
<td>1.17</td>
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<tr>
<td>Selected country groups</td>
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<td></td>
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<tr>
<td>EU (2009)</td>
<td>297,889.6</td>
<td>1.90</td>
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<tr>
<td>OECD (2008)</td>
<td>965,629.1</td>
<td>2.33</td>
</tr>
<tr>
<td>G-20 countries (2009)</td>
<td>1,181,263.7</td>
<td>2.01</td>
</tr>
</tbody>
</table>

Notes: Year of data listed in parentheses. Foreign currencies converted to dollars through purchasing power parity. Countries with annual GERD of $500 million or more. Countries are grouped according to the regions described by the CIA World Factbook, www.cia.gov/library/publications/the-world-factbook/index.html. No countries in the Central America/Caribbean region had annual GERD of $500 million or more. Data for Israel are civilian R&D only. See sources below for GERD statistics on additional countries.

2.3 History of the Sasol R&D facility

Sasol management commissioned a laboratory and testing station in 1955 with 70 scientists and technicians to provide quality and process control to the plant. In 1957, a formal research division was commissioned and was named Sasol Technology’s Research and Development (R&D). Sasol spent approximately R90 million in 2009 on training and development of its employees and has over 34 000 employees, mostly in South Africa. Because of a large pool of expertise in the Fischer-Tropsch (F-T) technology within Sasol, the organisation can maintain a first-mover advantage of being the leader in the chosen market. This implies that as part of Sasol’s strategy to be a “respected global enterprise and to generate sustainable growth for stakeholders”, it is important that the organisation invests in continued employee development.

According to The Revolutionary World of Synthetic Fuels (2005), Sasol is the world leader in the research and development (R&D) of the F-T technology. It has achieved this market leader status through continuous improvement of current processes and technology to reduce operational costs and through collaboration with other parties. In order to maintain such an advantage in these collaborations, Sasol must ensure that its employees are well trained and can technically contribute to the benefit of the businesses involved. Below are the goals of summarised Sasol R&D’s value proposition and how the different divisions of R&D plan to add value to the whole business (R&D Business Strategy Presentation, 2006):

- Create a pool of fundamental state-of-the-art knowledge in strategically important technologies, with value now and in the future.
- Add value through the development of processes and products by:
- maintaining and improving existing processes,
- ensuring sustainability through reducing environmental footprint and liability,
- developing a competitive Intellectual Property (IP) position,
- establishing and creating new technology opportunities.

- Provide credibility as being a technology driven organisation (through publications, patents and presentations).

From this summary in the table above, it is clear that Sasol’s strategy to be a global player requires that the organisation stay in the lead in technology development and improvement. This requires both the internal employees and alliance partners to be very knowledgeable and experienced. Since Sasol was founded on the technology that was rather ‘untested’ on a commercial scale, value has always been placed on continuous improvement and a thorough understanding of fundamental concepts. After more than 50 years in the R&D business, Sasol has identified a few major projects that address this ‘going back to basics’ approach. Below is the list of these projects in both South Africa and abroad:

- **GTL (Gas-to-Liquid)**
  - *Immediate operational support to Oryx (Iran)*
  - *Catalyst Optimisation*

- **CTL (Coal-to-Liquid)**
  - *China CTL evaluation*

- **Refinery support (South African Operations)**
  - *Project Turbo and mitigations (South African Operations)*

- **Environmental (Global initiatives)**
  - *Anaerobic digestion (Secunda)*
- Atmospheric modelling, CO2 capture and sequestration (Global)
- GTL, CTL water systems (Global).

Sasol Research and Development has a corporate facility in Sasolburg and specialist centres in Secunda, the Netherlands and Scotland. The centres in Scotland and Netherlands collaborate with universities. Sasol’s other R&D activities that deal with applied research are located in South Africa:

- Sasol Fuels Research (Fuels and Lubricants)
- Sasol Waxes
- Sasol Polymers
- Sasol Chemie (Brunsbüttel, Marl, Moers, Paderno)
- Sasol North America (Lake Charles).

Sasol has received a number of awards from local and international industry fraternities for the contribution it has made in the technology development and engineering field. Table 2.2 is the list of awards achieved of R&D from 1993 to 2009; this list excludes internal awards that were achieved by different business units.

This list excludes plants that have been commissioned but have not yet reached full production capability. Sasol was nominated as partner, both in India and China, in 2009 to provide coal-to-liquid (CTL) technology to both these countries for alternative fuel supply as they are the fastest growing economies in the world. These accolades illustrate the valuable contribution that Sasol R&D has made to the field of petrochemistry.
<table>
<thead>
<tr>
<th>Year</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Technology Top 100 Award</td>
</tr>
<tr>
<td>1995</td>
<td>Walter Flowers Achievement Award (American based Council on Alternative Fuels): pioneering work in developing and commercialisation coal conversion technologies; SAS Reactor and Sasol Slurry Phase Distillate Process</td>
</tr>
<tr>
<td>1996</td>
<td>Kirkpatrick Chemical Engineering Achievement International Award for commissioning of improved LTFT Synthesis Process</td>
</tr>
<tr>
<td>1996</td>
<td>Technology Top 100 Award</td>
</tr>
<tr>
<td>1997</td>
<td>Technology Top 100 Award</td>
</tr>
<tr>
<td>1999</td>
<td>SA Institute of Welding Gold Medal Award (outstanding contribution to welding industry for over 40 years)</td>
</tr>
<tr>
<td>2000</td>
<td>South African Institute of Chemical Engineers(SAICHE) (Innovation award for catalytic distillation column and Project Managing a Distillation tower featuring world’s largest partitioned column with trays)</td>
</tr>
<tr>
<td>2000</td>
<td>National Science and Technology Forum (NTFS) Award for Outstanding contribution in the field of Science, Technology and Engineering</td>
</tr>
<tr>
<td>2001</td>
<td>SAICHE Innovation Award for Developing a unique distillation process</td>
</tr>
<tr>
<td>2002</td>
<td>Technology Top 100 Award</td>
</tr>
<tr>
<td>2003</td>
<td>SAICHE Gold Medal for Hydroformylation Technology</td>
</tr>
<tr>
<td>2004</td>
<td>Technology Top 100 Award</td>
</tr>
<tr>
<td>2005</td>
<td>SAICHE Innovation Award for New Reactor Configuration in HTFT</td>
</tr>
<tr>
<td>2008</td>
<td>Southern Africa Industrial Water Association (SAIWA) Biennial Award for outstanding contribution in Industrial Water Technology</td>
</tr>
<tr>
<td>2008</td>
<td>Technology Top 100 Award: Southern African Academy of Engineering Award for Excellence in the Management of Research.</td>
</tr>
<tr>
<td>2008</td>
<td>Technology Top 100 Award: JSE Limited Award for Excellence in the Management of Technology, Innovation and People</td>
</tr>
<tr>
<td>2009</td>
<td>Technology Top 100 Award: Department of Technology for Innovation</td>
</tr>
</tbody>
</table>

### 2.4 Objectives of a R&D facility

The main objective of a R&D facility is to continuously improve existing technologies and processes as well as develop more efficient processes. The management of knowledge that the organisation possesses can be transformed from raw laboratory data into useful and meaningful information that can add value to the operations of
the organisation (Abel, 2008: 1). This transformation of data into information usually begins in a Research and Development (R&D) facility where fundamentals are interrogated and analysed.

All the collaboration efforts that an organisation enters into with other institutions have to be well documented to avoid loss of knowledge, repetition of old work and to ensure the protection of intellectual property. This requires that the R&D facility, driven by management, implement an efficient knowledge management strategy. Effective management of a R&D facility and its knowledge can give an organisation a competitive edge in the market place and industry (King & Zeithalm, 2003: 765). This use of information is also dependant on the organisation’s ability to adapt and implement new and existing technologies.

R&D work is knowledge-intensive and requires that specialised knowledge from team members be continuously applied in developing new technologies and products (Huang, 2009). For teams to be effective, they have to rely on each other’s knowledge and skills (Cummings, 2004). This knowledge sharing promotes team cohesiveness and improves performance because team members share common goals. The team’s cohesiveness can be developed from both the network ties (socialising) and by the collective mind (heedful interrelating) according to Huang (2009).

Research by Kratzer et al (2006) suggests that R&D employees are more willing to work and communicate with each other more frequently in technical investigations and problem solving. This may show that they trust each other’s ability and technical
knowledge to resolve problems and develop new products. Transactive Memory System (TMS) is the combination of individuals’ knowledge with the collective awareness of who knows what within the team (Wegner, 1987). Therefore the cohesiveness of the team, trust between team members and TMS, form the basis for the teams’ performance. Figure 2.2 below is the illustration of how these three components combine to lead to team performance.

**Figure 2.2:** Research Model (adapted from Huang (2009))

Figure 2.2 above illustrates that, if trust and TMS are combined, it will result in knowledge sharing. With the combination of “network tie” amongst team members and collective minds, group cohesiveness is the product. These are all essential in the formation and sustaining of a performing team. Lastly, the combination of knowledge sharing and the group cohesiveness result in team performance. TMS facilitates the sharing and dissemination of knowledge across different domains (Akgun et al, 2006).
If a work environment promotes collaboration and knowledge sharing, employees may take ownership of the knowledge that they have developed. To these knowledge employees, knowledge management (KM) is an important part of their jobs, as it protects the organisation’s information and knowledge. Globalisation has made it easy for local organisations to expand to global markets. However, to ensure success, organisations have to offer technologies or services that are unique and adaptable to new environments. Managing knowledge for these organisations may become an integral part of their expansion and growth strategies. Continuous research and development in new technologies and the management of the new or improved knowledge becomes critical for an organisation. The primary objective of knowledge management (KM) and therefore for a R&D facility, is to create and promote an environment where employees are free to share, innovate, develop and consolidate knowledge (Van der Spek & Kingma, 2000: 21).

Effective KM systems promote information and knowledge sharing among employees, i.e. knowledge transfer from the experienced employees to the inexperienced employees. Reluctance to share knowledge and experiences may be because the KM objectives have not been clarified and explained by management. KM is one of the fundamental requirements for the protection and efficient use of information within any organisation. KM is defined as the “identification and leveraging of the collective knowledge in an organisation to give an organisation a competitive advantage” (Von Krogh, 1998: 113). This definition makes it clear that KM is an integral part of the business strategy, and must be effectively managed to ensure that the business stays successful, which makes KM a key objective in any
R&D facility.

R&D facilities generally employ knowledge workers because of the skills and expertise they possess and because of the knowledge intensive nature of research and development. Not all research projects in R&D are successful or commercially viable, but the data generated from the research should be stored for future reference to avoid repetition and waste of resources. As has been mentioned earlier, effective management of a R&D facility and the knowledge it has generated can give an organisation a competitive advantage in the market place (Von Krogh, 1998: 113).

2.5 Conclusion

Research and Development facilities are the core of any organisation that is technology driven. R&D facilities are the knowledge hubs of the organisations and as a result all the knowledge possessed by the organisation, through its employees or in archives, should be well managed. In a R&D environment, losing information and knowledge is a serious risk and all efforts should be made to ensure that it is preserved within an organisation to guarantee competitive advantage.

The importance of knowledge management in R&D facility has escalated over the years and many companies are implementing strategies to efficiently manage internal knowledge. For any chosen strategy, employees have to understand the value that is added by KM to an organisation both at R&D and corporate level. The success of any R&D facility is measured by the amount of intellectual property generated in the form of patents. These patents can guarantee the company’s long
term survival and relevance in the marketplace. KM also encourages knowledge sharing, this is even more important in an environment where there is high turnover of employees.
3.1 Introduction

Knowledge can be defined as the “integration of information, ideas, experience, intuition, skills and lessons learned that creates added value for a firm” (Dana, Korot & Tovstiga, 2005: 10). Knowledge Management (KM) is defined as the management of this integration of information and ideas to create value for the organisation by facilitating the sharing of knowledge and thus promoting continuous organisational learning (Dana, Korot & Tovstiga, 2005: 10). Robbins (2003) and Van Bereven (2002) define KM as the process that can be utilised to collect and distribute the collective wisdom within an organisation for the relevant people to make critical decisions. Consequently, KM can be used as the process that promote and facilitate the sharing of knowledge within an organisation (Singh, 2008: 5). Organisations that want to maintain or achieve competitive advantage should use knowledge possessed within the organisation effectively and ensure that the KM strategies implemented are managed efficiently and effectively.

In the last decade, knowledge has emerged as a resource that can contribute to the organisation’s sustainable competitive advantage (Lopes, 2008: 7). The current business landscape is fast-changing and dynamic and requires that organisations
utilise the knowledge and skills they possess in an efficient way to ensure their survival. Knowledge has become an important factor in the sustainability of competitive advantage in this ever changing and turbulent business environment (Davis, Subrahmanian & Westerberg, 2005: 109). Most employees are computer literate and have access to technology like the Internet that makes it easy to communicate and acquire information.

Interest in KM has escalated and KM is now considered an important and crucial part of the organisations’ resources (Alavi & Leidner, 2001: 107). Organisations’ top management now acknowledge that KM is an integral part of the organisation’s strategy (Finestone & Snyman, 2005: 128). KM is a process that the organisation embarks on rather than labelling it as an organisational system that management initiates (Edwards & Kidd, 2003: 130). KM is referred to as a process because of the turbulent and continuously changing business environment where knowledge is used as the strategic leveraging point for the growth of the organisation.

KM can be used to combine the “depth and richness” of experience and thus expose people to different ways of doing things and solving problems (Jayawarna & Holt, 2009: 775). A successful KM strategy can yield organisation information, required to get the job done better and more efficiently than before (Call, 2005:20). KM is also important because it can be used as a managerial tool to promote knowledge creation and sharing, which are essential in promoting the innovation process within an organisation (Constantinescu, 2009: 7). The culture within an organisation has to promote knowledge sharing and transfer to, in turn, ensure a successful KM strategy.
Table 3.1 below compares different cultures that exist in organisations, where the knowledge-focused organisation should be and how the knowledge culture fits into the organisation. The significance of networking at an organisational level, customer focus, contributing responsibly to the culture and being effective in the core business of the organisation are essential in creating a knowledge culture (Mukhtar, 2007: 12).

In a knowledge culture, sharing of information is essential in creating the environment that promotes innovativeness. The knowledge culture can range from the highly explicit, visible organisational structures and procedures to the highly tacit (Dana, Korot & Tovstiga, 2005: 11). Explicit knowledge refers to the ‘know how’, while tacit knowledge is the ‘know about’ (experience) possessed in an organisation (Jafari, Akhavani & Mortezaei, 2009: 2).

Table 3.1: Comparative Cultures (adapted from Mukhtar (2007))

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Feudal Culture</th>
<th>Industrial Culture</th>
<th>Knowledge Culture</th>
<th>Creativity Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Territorial</td>
<td>Hierarchies</td>
<td>Networks</td>
<td>Flow</td>
</tr>
<tr>
<td>Culture</td>
<td>Land</td>
<td>Profit</td>
<td>Customer</td>
<td>Innovation</td>
</tr>
<tr>
<td>Key Measures</td>
<td>Quantity</td>
<td>Efficiency</td>
<td>Effectiveness</td>
<td>Quality of Life</td>
</tr>
</tbody>
</table>

Another perception of knowledge management is that when employees share information they lose their importance since ‘information is power’ they fear that this
makes them irrelevant (Mukhtar, 2007: 12). The organisational environment that promotes a knowledge culture can also change employees’ attitudes and behaviours to achieve better collaboration and co-operation (Du Plessis, 2005: 194). In organisation KM activities that encourage or promote a knowledge culture can lead to initiatives that support the organisation’s objectives and vision (NASA, 2002: 2). For any strategy to be successful and sustainable, there are support activities and processes that have to be in place and fully functional. Figure 3.1 outlines the necessary structures and activities that promote a knowledge sharing culture.

The organisation’s success in the competitive market place, to a large extent, depends on the quality of knowledge that the organisation applies to its key business processes (Ndlela & Du Toit, 2001: 152). The above activities constitute the foundation of the successful KM strategy and ultimately a progressive organisation. A KM strategy can only be successful when employees buy into the process and share the same values and goals as the organisation.

Figure 3.1: Knowledge management activities (adapted from NASA (2002))
The quality of knowledge that an organisation possesses is critical in determining the success of the R&D facility and later the organisation. There are drivers that have been identified as the major contributors to the success of any KM strategy and that can promote the culture of knowledge sharing within an organisation, especially the R&D facility. Macintosh in 1998 (in Ndlela & Du Toit, 2001: 152) identified these drivers of KM as:

- **Competition**: knowledge must evolve to maintain innovative ways of being a market leader.
- **Customer focus**: customers have more choices now and an organisation must focus its knowledge base to better meet customer requirements.
- **The challenge of a mobile workforce**: employees move between organisations more frequently and the organisation must be able to capture this knowledge base.
- **Equity in the workplace**: more applicable to South African, organisations may offer severance packages to employees to promote equity in the workplace.
- **The global imperative**: most organisations have become global and require strong organisational communication and knowledge retention capabilities.

There are people who take KM as just another way of formally doing something that has already been done in organisations (Wilson, 2002: 199). Some have criticised KM as an ‘umbrella’ term that is used to cover various different organisational activities of which none have anything to do with the management of knowledge (Wilson, 2002: 199). Sceptics of Knowledge Management Processes (KMP) observe KM as a prescriptive process for an ineffective usage of knowledge and information.
in organisations while supporters perceive KM as a necessary tool to reduce redundant knowledge and eliminate duplication of research (Su, Wilensky & Redmiles, 2007: 198). In addition, the optimists see KM processes as a tool that can help employees and organisations learn from their different successes and failures. This can be crucial in avoiding waste of resources and help shape the future of the organisation.

The success of any KM strategy that an organisation adopts, depends on a number of internal factors that the organisation has to identify. The factors that can directly influence the organisation’s KM are known as knowledge management enablers (Yeh, Lai & Ho, 2006: 793). The top management’s understanding of the important aspects regarding KM, is important to ensure that the strategy that is adopted will be successful and address important concerns of the organisation. KM enablers are the instruments that generate and stimulate the development of knowledge, sharing and protection of knowledge within an organisation (Yeh, Lai & Ho, 2006: 794).

### 3.2 Role players in Knowledge Management

The KM strategy successes’ adopted by the organisation is dependent on the employees and to a large extent on the individuals who manage the processes. Woods and Sheina (1998) have identified key positions and their role to the success of the KM initiative (see table 3.2).

These main role players can be considered facilitators of the KM initiatives, but the most important stakeholders are the employees. The role of these positions is to ensure that all the systems that have to be in place for the successful
implementation of the project are in place and that the employees’ needs are considered. The interaction of major role players with other departments is important as it ensures that the KM initiatives are successful. One of the important factors in the success of KM is the Information Technology (IT) department since they are the people that will be charged with maintaining the technical aspects of Knowledge Management Systems (KMS) within an organisation. IT can be considered a tool that can be used to improve the processing of the large volumes of data, information and knowledge in an organisation’s quest to improve performance (Nambisan, 2003: 12).

**Table 3.2: Main role players in implementation of KM strategy (adapted from Woods and Ovum (2008))**

<table>
<thead>
<tr>
<th>Role Player</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| **1. Chief Knowledge Officer (CKO):** | • provide strategic importance of KM to organisation’s goals;  
|                                    | • ensure required resources are allocated (including IT);  
|                                    | • act as a conduit between top management and rest of the company;  
|                                    | • manage KM specialist in the project. |
| **2. Knowledge Project Managers:**  | • have project management skills and experience;  
|                                    | • understand business objectives of the project;  
|                                    | • manage different cultural and behavioural elements of the organisation;  
|                                    | • must be comfortable with different technologies, especially IT. |
| **3. Subject Managers:**            | • manage daily activities of the project as they are content experts;  
|                                    | • encourage other employees to participate in the project;  
|                                    | • study proposals made by other colleagues. |
| **4. Knowledge Brokers:**           | • act as the link between knowledge users and suppliers;  
|                                    | • they are information specialists;  
|                                    | • they are market makers. |
| **5. Knowledge Management Facilitators:** | • provide support to projects at initial stages;  
|                                    | • ensure corporate standards are complied to;  
|                                    | • support KM initiatives that are technology specific. |
3.3 Benefits of Knowledge Management

KM aims to promote innovation in the development of new products and methods of solving problems. Knowledge exploitation is about efficiency, selection and implementation that can be extended to improve existing capabilities and skills (March, 1991: 72). An organisation can use the vast knowledge it possesses to empower employees to take the initiative, innovation and ownership of their work. The use of knowledge capabilities as the strategy to create and add value to the organisation is evident in the rate at which new and innovative products are launched by organisations (Mallick & Schroeder, 2005: 142).

Product development tries to advance the two knowledge capabilities: knowledge exploration and knowledge exploitation (Revilla, Rodriguez-Prado & Prieto, 2009: 347). Knowledge exploration is the continuous improvement and renewal of the organisation’s competencies and expertise that are required to sustain and maintain competitiveness. Knowledge exploitation is the way the organization gathers and incorporates the existing expertise and competencies to the operations to not only improve efficiencies but to also create new products and/or services. KM can assist organisations in ensuring that knowledge is transferred from experienced and knowledgeable employees to the other employees, especially junior employees.

For an organisation to successfully maintain its competitive advantage, it has to ensure that its intellectual capital is developed and managed efficiently. Business has become knowledge driven as opposed to being labour intensive and the accumulation of knowledge (i.e. intellectual capacity) can ensure that organisations
become sustainable and competitive. Organisational learning can assist an organisation to achieve above average performance over an extended period of time (Njuguna, 2009: 37). Organisational learning involves three key aspects that are 1) acquisition of knowledge, 2) distribution of knowledge and 3) application of knowledge. Figure 3.2 illustrates a model that combines organisational learning and intellectual capital for a sustainable competitive advantage of the organisation.

**Figure 3.2**: Organisation learning as a competitive strategy (adapted from Njuguna (2009))

KM can play a significant role in organisations that are globally dispersed, especially R&D facilities. This is because different countries have different cultures and
different approaches to the sharing, dissemination and storage of knowledge. Organisations that have successful KM strategies require high standards of quality of its knowledge databases and communicate where this information is found to its employees. The quality of communication in an organisation determines the organisation’s performance (Brockhoff & Medcorf, 2007: 99). The communication of knowledge between different units promotes learning in an organisation and results in new and innovative ways of solving problems and challenges (Jiang & Li, 2009: 359). The success of a global organisation depends on the quality of knowledge possessed within the organisation and how this knowledge is shared among different locations.

3.4 Knowledge Management in Sasol Research & Development

The main objective of KM in a R&D facility is to facilitate the sharing and transfer of information and knowledge. The fast changing and increasing degree of competition and the accelerated rate of technological changes, makes the management of a R&D facility difficult and complicated (Park & Kim, 2005: 34). Knowledge management is in itself, like R&D, not a guaranteed investment. KM is a “semi-paradigmatic discipline” that is introduced into existing systems (Ricardo, 2001: 217). R&D facilities have also evolved over the years and have become competitive and complex. To have a successful and effective KM system, there has to be a change in the culture of an organisation.

KM in a knowledge organisation such as Sasol R&D can be complex because of the nature of the organisation. However, knowledge is inseparable from knowing how to get things done for the benefit of the organisation (Guo & Sheffield, 2007: 674). In a
R&D environment, the knowledge that is possessed by the organisation is not a tangible asset but an intellectual asset. The amount and quality of knowledge generated from research can give an organisation a commercial advantage, especially in a technology driven business environments like Sasol. Knowing how to get things done in a R&D facility is critical because of the nature of the business and therefore makes KM an integral part of the success of the R&D facility. In a knowledge driven environment, for an organisation to maintain competitive advantage, it has to have a knowledge advantage (Mranalini & Nath, 2008: 38).

Sasol R&D criteria for the KM strategy were based on internal (within Sasol) and external organisations’ best practices (Best Practices in KM, 2006). The chosen criteria were:

- Must be better than practices before it.
- Must be proven.
- Must be applicable across Sasol.
- Must be affordable, implementable and sustainable.
- Must add ‘obvious and desired’ values.

These criteria were a combination of internal and external organisational experiences and recommendations from academic publications. The benchmarking exercise was chosen because it made it easy to compare organisations on the same basis and make it easier to draw an informed decision. The KM pyramid of excellence in Figure 3.3 below is an illustration of the ‘definition of victory’ (De Wet-Viljoen, 2006) for the implementation of the current KM strategy in Sasol R&D.
As mentioned, for a KM strategy to be successful within an organisation there has to be a culture that will promote knowledge sharing. Figure 3.3 above illustrates a change in organisational culture in different stages. The first stage is to clearly define the organisational strategic position in order for the team to develop a business case. On the last stage, after the intellectual capacity has been developed, the business values should have been achieved, to have an admired knowledge enterprise.

The KM pyramid of excellence currently used by Sasol ensures that all aspects of KM implementation are addressed and that they can contribute to the growth of the organisation in the long term. It emphasises the importance of knowledge transfer to the improvement of knowledge levels within Sasol. After improving knowledge levels, the next step is to create and promote a learning organisation that will lead to
development of competency levels of the employees. If the competency of employees is continuously improved, employees will be willing to be part of the organisation and its success.

The ability of an organisation to utilise knowledge to get things done and maintain a competitive advantage, is more important for organisations with “global ambitions” (Massa & Testa, 2009: 129). One of the strategies of expanding organisations like Sasol is the formation of joint ventures with local and foreign organisations to enter new markets. The skills and knowledge in the appropriate selection of partners and the management thereof into an alliance can make an important positive contribution to the success of the collaboration (Draulans, 2003: 155). The successful formation and management of the joint venture requires that organisations “bring to the table” different expertise, both technical and business. Proper and efficient KM in a R&D can give an organisation a ‘bargaining chip’ during the formation of these joint ventures.

For an organisation to realise its innovative capacity, it should be able to continuously “identify new ways of doing business, develop new technologies and products and enter new markets in new organisational forms” (Teng, 2007: 119). This is critical in Sasol R&D because innovative ways of doing things and producing new and improving existing products has always to be cost effective. The other main objective of a KM strategy is to facilitate effective and efficient knowledge sharing within the organisation’s employees (Shin, 2004: 179). If employees share knowledge and experiences, the new and old ideas and procedures of doing things can be combined to result in new and improved production processes and products.
Therefore, the feelings and perceptions of employees towards the adopted KM strategy are important in ensuring the success of the initiative and knowledge sharing in the organisation. The perception that employees have of the adopted KM strategy can motivate or demotivate employees to being creative and innovative. This aspect of KM is especially important in an environment like R&D.

Many organisations are implementing KM strategies under the assumption that competitiveness and efficiency will increase (Schultze & Leidner, 2002: 219). Researchers and practitioners alike agree that structuring and enlargement of the knowledge base can improve its contribution to the effectiveness of the R&D processes (Lee, Kim & Koh, 2009: 3662). The availability of knowledge to the employees, as was mentioned earlier, can enable employees to be innovative and ensure that the organisation achieves the best from its employees. The KM strategy that was previously adopted by Sasol tries to ensure that the significance of KM is communicated from the low level employees of the organisation to top management.

3.5 Conclusion

KM is, in essence, the combination of an organisation’s tacit and explicit knowledge, where the knowledge and experience possessed by its employees is combined with the archived knowledge within and outside the organisation. This combination of the two knowledge bases results in the integration of information, ideas, experience and skills that can be used to create value for the organisation and ensure sustained competitive advantage. This advantage is crucial to organisations especially in the borderless business environment where changes are frequent and unpredictable. However, before these benefits can be realised, a culture of knowledge sharing has
to be created and maintained within the organisation.

Employees have to network and share knowledge to better focus on the requirements of the customers. The organisational culture should also promote an environment where employees are responsible and accountable for their actions. A knowledge culture will promote the sharing and effective usage of knowledge that will involve employees, processes and technology. As employees of a R&D facility are knowledge workers, there will be experts that will ensure that the technology used is still efficient and economical and compliments KM. The processes used to capture knowledge are critical because they ensure the continuity of possessed knowledge.

The last driver in achieving the sharing and usage of knowledge are the people (employees) of the organisation. The ‘buy-in’ of the employees to the organisation’s KM strategy is important because it can facilitate remote cooperation. The identification of the relevant KM role players and the alignment of the KM strategy to the organisation’s strategy are important for the success of the initiative and the creation of the right employee perception towards the process.

Sasol’s R&D strategy identified the success objectives and how these will impact on the strategy of the organisation. Sasol developed a ‘definition of victory’, a pyramid for KM implementation starting from the strategic positioning of the organisation to the image of the organisation at the end of the strategy’s implementation. This is critical for an organisation like Sasol since strategically the organisation wants to be a “globally recognised” organisation.
CHAPTER 4

EMPIRICAL RESEARCH

4.1 Introduction

Sasol R&D has been in operation for more than 60 years and has improved the Fischer-Tropsch (F-T) technology to be an acceptable and competitive technology in converting coal and natural gas to liquid fuels and other chemicals. Sasol adopted the F-T technology while it had not been proven to be commercially viable and developed it to be the globally recognised solution to countries with an abundance of natural resources like coal and gas. As a result, the organisation invested in its R&D facilities and the development of its employees. As was mentioned in Chapter 2, R&D employees are knowledge employees and R&D facilities are knowledge driven environments. This implies that the knowledge that is generated in the organisation is utilised effectively and is shared among employees to ensure continuous sustainability and competitiveness of the organisation.

The perception that Sasol R&D employees have regarding knowledge management and knowledge sharing is important in ensuring that the organisation remains competitive. If employees have a positive perception of the KM strategy that is implemented by the organisation, it can give the organisation a competitive advantage and ensure the sustainability of the organisation (Mranalini & Nath, 2008: 38). This chapter will focus on the empirical research that was done for this study. In
addition, the research methodology applied for this research will be discussed. The results obtained from this research can be used by the management of Sasol to review the current KM strategy's effectiveness in achieving the desired results.

4.2 Aim and objectives of the study
The primary objective of this study was to investigate the perception employees of the Sasol R&D facility have of KM and what value KM adds to the performance of the organisation. This perception can contribute to the success of the organisation and assist in directing the relevant resources to the development of the organisation’s growth strategy. The secondary objective was to assess the employees’ perceived benefits from the KM initiative that is currently applied in the organisation. The opinion that employees have of what they can personally gain from the KM initiative is important in understanding the level of participation in the KM strategy. Understanding the perception of KM for employees of Sasol R&D can assist in improving the added value of the process and align objectives of the organisation to those of the employees.

4.3 Rationale of the study
The importance of KM over the past decade has increased and more focus has been placed on the initiatives that organisations implement to improve knowledge sharing and utilisation (Lopes, 2008: 7). Sharing of knowledge in a R&D organisation is crucial. When information and knowledge is shared between established and new employees it ensures the sustainability of the organisation (Shin, 2004: 179). Sasol R&D recruits new graduates every year through their bursary schemes and recruitment processes. This exerts pressure on the organisation to ensure that the
knowledge and experience gained by the existing employees is retained and shared with the new employees. This approach ensures that the resources are effectively engaged in productive tasks and products.

The perception that employees have of sharing knowledge and experiences will influence knowledge sharing in the organisation (Shin, 2004: 179). The employees’ willingness to share and participate in knowledge sharing is important to the executive management so that they can assess the effectiveness of the strategies that have been put in place. Therefore, the perception that Sasol R&D employees have of KM and their KM initiatives can assist management in shaping and ensuring that the implemented KM initiative are correct and that the results lead to the improvement in the knowledge sharing culture within the Sasol R&D facility.

4.4 Research methodology

The following sections will deal with the research problem, research approach, sampling method, data collection and procedure for analysing the data.

4.4.1 Research problem

For this research the following research problem was formulated:

To what extent do Sasol R&D employees perceive KM as an integral and important part of their functions?

The question above has resulted in the following sub-problems that will assist in the investigation:
1. What is the definition of KM?
2. Why is KM important in R&D?
3. What are the benefits of having an effective KM strategy?
4. What perceptions do Sasol R&D employees have of KM?
5. To what extent are the Sasol R&D employees involved in KM initiatives?

4.4.2 Research approach

Research is defined as the investigation, testing and evaluation designed to develop or contribute to generalizable knowledge. This investigation and testing of ideas should result in a better understanding of the research subject and improvement of the process or technology. However, the research study must be systematic and have clear objectives in order to achieve the intended study objectives. According to the Iowa State University’s Institutional Review Board (2009), for the research study to obtain generalised objectives it has to achieve the following:

- Attempt to make comparisons or draw conclusions from the gathered data.
- Attempt to reach for generalizable principles of historical or social development.
- Seek underlying principles or laws of nature that have predictive value and can be applied to other circumstances for the purpose of controlling outcomes.
- Create general explanations about all that has happened in the past.
- Predict the future.

These objectives of a research project/study have to contribute to the basics of research which is problem solving and the expansion of the knowledge base of humanity (Taylor, 2000). The research study’s success depends on the systematic planning and execution of the research survey. There are characteristics that were
identified by Taylor that must be adhered to:

- The research begins when there is a question in the researcher’s mind.
- A research problem has to clearly identified and stated.
- There has to be an action plan.
- The primary research problem should be addressed by the sub-problems.
- It has to seek direction in applicable hypotheses and be based on obvious assumptions and beliefs.
- It has to deal with fact and correctly interpret the available facts.
- Research is secular and is thus a combination of different theories.

There are two broad types of research, basic and applied research. Basic research is conducted to gain an understanding of the subject and the understanding of the matter is of no practical use most of the time (Hood, 2003). The objective of applied research is to gain knowledge and understanding that will result in devising the means of solving a problem. The research for this study focused on applied research to gain a better understanding of the employees’ perception of KM within Sasol R&D.

Applied research requires that there be a defined problem statement to ensure that the objectives of the research are clear. Stokes (1997) defines applied research as the research that is directed at solving a specific problem. In addition, Stokes developed a four quadrant classification system to research approaches that are either inspired by ‘consideration for use’ or by ‘quest for fundamental understanding’ of the subject as depicted in Figure 4.1.

The top left hand quadrant (Bohr’s) is research that is driven by need to understand
the subject without consideration for practical use. The upper right quadrant is Pasteur’s quadrant that represents research that is driven by desire to solve real and practical problems that will result in useful solutions. The bottom right quadrant is the pragmatic engineering quadrant, also known as Edison’s quadrant, that classifies research that is based on lessons learned and tried. The bottom left cell is the random walk research where the problem is chosen by inaccuracies by the last answer (Landauer, 2002). For the purpose of this research, the Pasteur’s quadrant is relevant, as this research will address the peoples’ perception of the KM initiatives and as a result determine the success or failure of these initiatives.

<table>
<thead>
<tr>
<th>Quest for fundamental understanding?</th>
<th>Consideration for use?</th>
<th></th>
</tr>
</thead>
</table>
| Yes | No | Pure Basic Research (Bohr)  
Research is driven by desire to understand without practical use |
| Yes | Yes | User Inspired Basic Research (Pasteur)  
Research is driven by the desire to solve practical problems |
| No | Yes | Pragmatic Engineering (Edison)  
Research based on lessons learned from past successes and failures |
| No | No | Random Walk Research (Passive)  
Research problem is selected by faults in the answer to the last |

**Figure 4.1:** Stoke’s research classification quadrants (adapted from Landauer (2002))

The Emory and Cooper (1995) Question Hierarchy model ensures that the researcher focuses on the research question. Figure 4.2 below is an illustration of
the three phases that are needed for the research study to be effective.

**Figure 4.2:** The question hierarchy (Emory & Cooper, 1995)

In addition, research can be classified under two general categories, namely quantitative and qualitative. Quantitative research is the collection of data that is absolute and is analysed using statistical methods to ensure that the data analysis is relatively unbiased. The research problem has to be well understood and defined for the quantitative method to be effective and to get useful results from the research and as a result it comes in towards the end of the research cycle. Qualitative research is a subjective form of research because it introduces the researcher's biasness in the analysis of the results.

Qualitative research techniques can be used where the research problem is not yet clearly defined; therefore it is used to explore the subject. Qualitative research often tells a story as compared to quantitative research that will present results in the form of numbers. This research study is based on a quantitative method to ensure that the data gathered can be analysed and practical solutions be formulated and implemented. Table 4.1 (Ashley & Boyd, 2006: 73) compare the two methods.

**Table 4.1:** Quantitative and Qualitative research compared (adapted from Ashley
### 4.4.3 Sampling
There are two different methods of sampling, the probability and the non-probability methods. Both these methods have different sub-sections and they are explained below (Zikmund, 2002):

1. **Probability sampling**: is the method that uses random selection to ensure that each member of the population has an equal probability of being selected. Since the members of the population have an equal probability to be selected, it means that the sampling error can be calculated and the sample is an outlier from the general population. There are different types of probability sampling:
   
a) **Simple random sampling**: is the simplest form of random sampling wherein members within the target population stand an equal chance of being selected (Sampath, 2005).

b) **Systematic sampling**: is similar to simple random sampling but there is a systematic approach in selecting the sample. For example, in a target population of 100 units, the sample will be taken after every 20 units.

c) **Stratified sampling**: is also called proportional random sampling. In this method the population is divided into homogeneous sub-groups and a random sample taken from each sub-group.

2. **Non-probability sampling**: with this method, the units of the sample are chosen based on the researchers’ personal judgement and convenience. With non-probability sampling, the sampling error cannot be quantified because of the random selection of the sample. Non-probability sampling has different sub-categories, as listed below (Zikmund, 2002):

a) **Convenience sampling**: also called haphazard sampling, is the selection of people that are conveniently available to the researcher. Researchers use this method to obtain a wide ranging responses economically.
b) **Quota sampling**: ensures that the chosen sample has certain characteristics that the researcher wants. The researcher identifies the strata and the proportions that it represents in the target population. Convenience sampling is then applied to select the needed number of subjects from individual stratum.

c) **Purposive sampling**: also known as the judgement sampling. A researcher chooses the sample based on specific characteristics of the sample members. The researcher has a specific purpose in mind that he or she wants to get a certain opinion from (Doherty, 1994).

d) **Snowball sampling**: in this sampling method the researcher first identifies the respondents by a probability method and the extra respondents are referred by the initial respondents. This method is useful when the intended sample population is difficult to access or find.

For the purpose of this research, non-probability convenience sampling was chosen so as to test if the perceptions of employees regarding KM are effected by their age, level of education and level of seniority. The method of convenience sampling was selected to ensure that the sample of the target population represents Sasol R&D’s employees perception of KM. The target population for this research was the different levels of seniority and education in Sasol R&D, a maximum of 200 that are based in Sasolburg.

The sampling approach tried to represent all selected categories of employees and to establish whether there are any links that can contribute in shaping the employees’ perceptions towards KM within Sasol R&D. The questionnaire was
distributed to over 150 employees in Sasol R&D and those who work closely with R&D as support functions but are still part of the Sasol Technology organisation. Table 4.2 below is the presentation of the 54 employees who responded. Three of the employees preferred not to disclose their gender. The response rate was 36%.

**Table 4.2: Demographical distribution of respondents**

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. of respondents</th>
<th>% Participation of total sample</th>
<th>% Participation per gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Females</td>
<td>6</td>
<td>11.1%</td>
<td>24.0%</td>
</tr>
<tr>
<td>Black Males</td>
<td>5</td>
<td>9.3%</td>
<td>18.5%</td>
</tr>
<tr>
<td>White Females</td>
<td>15</td>
<td>27.8%</td>
<td>60.0%</td>
</tr>
<tr>
<td>White Males</td>
<td>17</td>
<td>31.5%</td>
<td>63.0%</td>
</tr>
<tr>
<td>Indian Females</td>
<td>4</td>
<td>7.4%</td>
<td>16.0%</td>
</tr>
<tr>
<td>Indian Males</td>
<td>4</td>
<td>7.4%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>5.6%</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100%</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

4.4.4 Data collection and research instrument

The research instrument used for this study consisted of a close ended questionnaire and was used to gather information from the Sasol R&D employees of different seniority and experience levels. The questionnaire was Web deployed via Survey Monkey, an online application specialising in surveys. The questionnaire consisted of four sections:

- Section A: Employee biographical details
- Section B: KM Strategy within Sasol R&D
- Section C: Employee experience within Sasol R&D
- Section D: General personal opinion.

The questions were designed to establish the perception that Sasol R&D employees
have of KM in general and within the organisation. All ethical requirements as required by the University of Johannesburg have been adhered to. In the next section the results of the data analysis are discussed and enhanced with graphical presentations.

4.5 Analysis and interpretation of results
The relationship between employees’ responses and questions will be correlated to gain a better understanding of their perceptions. Mathematical and statistical analysis was used to identify trends and common patterns in the responses from respondents.

4.5.1 KM strategy within Sasol R&D
Most of the respondents (67%) indicated that they have knowledge of the current KM strategy within Sasol R&D, while only 15% indicated no knowledge of KM or uncertainty relating to KM. Generally, employees are both knowledgeable and positive about KM and the benefits that KM can result in for the organisation and individual employees. The majority of the respondents (76%) indicated that they are familiar with the concept of KM (see figure 4.3). In addition, 80% of respondents indicated that KM can assist the organisation in becoming a learning organisation while 72% indicated that KM can aid their careers.
The respondents’ years of experience varied from one year or less to 23 years, while their ages ranged between 24 and 60 years old. The overall positive results indicate that the majority of employees over a varied period of employment and age felt that KM is an important aspect of the organisation. Most of the respondents (69%) indicated that KM is not a non-value adding exercise, thereby indicating a positive perception that employees have of KM. In fact, 76% of respondents’ perception of KM was that the organisation should have a KM strategy. In addition 72% of the respondents indicated that KM can help improve the organisation’s profitability. The fact that respondents believe that KM can enhance and grow an individual’s career and the organisation’s profitability is important as it points to the long term sustainability of KM in the organisation. This positive perception of KM is to be expected as the organisation is technology driven and most of its employees are qualified and experienced in the technology development fields.
The R&D facility of an organisation embodies the knowledge based capability of an innovative organisation that wants to maintain and sustain competitive advantage (Jackson, Hitt & Denisi, 2003). An innovative organisation requires that the organisation be continuously learning and improving the employees’ capabilities and skills to ensure that the competitive advantage of the organisation is sustained. Most of the respondents (80%) agreed that KM is the foundation of a learning organisation while 72% indicated that KM can help the organisation’s competitive advantage. The majority of respondents (70%) indicated that KM can improve knowledge sharing within Sasol R&D. The overall perception that is reflected by employees’ responses is that KM is a valuable strategy to have within Sasol R&D because it can improve the employees output and therefore, the organisations’ competitive advantage and profitability.

Figure 4.4 represents the questions where respondents were asked about the extent to which they understand the KM strategy within Sasol R&D. The objective of this section was to establish the extent to which employees perceive KM within Sasol R&D. The responses are aligned to the first section about what employees think of KM and its benefits. A large group (34%) of the respondents indicated that KM can improve knowledge sharing to a “moderate extent” while 22% indicated to a “small” and “large extent”, respectively.

The duties of the KM champions are not clearly understood by most Sasol R&D employees that participated in the survey, as 41% indicated that they understood the duties of the champions to a “small extent”, while 19% indicated to “no extent”. Only 17% and 6% responded that they understood the duties of the KM champions to a
“moderate” and “large extent”, respectively. As was established above, the employees of Sasol R&D that responded are generally positive about KM. The responses to this question may be an indication that the current adopted KM strategy is not yet successfully implemented throughout the organisation.

Figure 4.4: Extent of employees’ perception towards KM within Sasol R&D

Those surveyed responded positively regarding the benefits that KM can bring to the organisation and individual employees. This is also reiterated by the fact that 46% and 24% of respondents respectively indicated that KM can help improve individual employees’ contribution to a “moderate” and “large extent”. It is evident that respondents do not have a clear understanding of the role of the KM champions, but the majority of respondents indicated that KM can improve employees’ individual contribution. These responses are an indication that more awareness sessions should be held and that the strategy be explained to all employees of different levels and seniority.
4.5.2 Employees’ experience within Sasol R&D

In order to establish the overall perception that employees have of KM, it is important to understand the individual and collective employees’ experiences with KM within Sasol R&D. This section explores the individual experiences of respondents and how that has potentially shaped their thinking regarding KM and the way they interact with colleagues in sharing knowledge. In Figure 4.5, it is shown that 24% of the respondents indicated that they voluntarily share information with colleagues to a “moderate extent”. This is positive since Sasol R&D is knowledge and technology driven. This positive response can be an important indication of the employees’ general perception of KM within the organisation.

![Figure 4.5: Extent of employees’ experiences of KM within Sasol R&D](image)

However, a large number of the respondents indicated that KM has not improved equity within Sasol R&D; with 26% indicating it has to “no extent” improved equity.
There were 22% and 19% of respondents who indicated that KM can improve equity to a “small” and “moderate extent”, respectively. This result may be an indication that the KM strategy currently adopted by Sasol R&D has not matured to a level where KM can be considered part of the culture of the organisation. For long term sustainability of the organisation in a South African business and social environment, equity has to be addressed and improved and one way to achieve this is to ensure that KM is efficiently managed, while involving employees in the process. This will help Sasol R&D in ensuring that employees that are ‘fast tracked’ have the necessary skills and knowledge to perform at expected levels.

Generally, respondents are of the view that employees do share information among each other at all levels as there was also a positive response to both questions regarding knowledge and information sharing. There were 35% of respondents who indicated that senior or experienced employees share information with junior employees. In addition, 2% and 30% of respondents respectively, indicated that experienced employees share information with junior employees to “no extent” and to a “small extent”. As was mentioned above, this is important as it can ensure that Sasol R&D continues to be a learning organisation and maintain its competitive advantage as there is continuous transfer of knowledge and experience from the experienced to junior employees.
For a KM strategy, or any strategy within an organisation to be successful, management have to promote and live that strategy to get a buy-in from employees. Sasol, as a group, has embarked on Values Driven Leadership (VDL) and all employees, especially management, are expected to live the Sasol values. The objective is to align all employees to one common set of values that represent the organisation’s values and beliefs. Regarding KM within Sasol R&D, the employees expect that management should promote and drive a culture of KM. However, 24% of respondents indicated that Sasol R&D management is only promoting and not driving a KM culture, with 28% indicating to a “small extent” and 13% to “no extent”.

The responses to the question of the extent to which management promotes a culture of KM can be linked to the extent to which employees are involved in the KM initiatives. If employees feel that they are not adequately involved in the initiatives
adopted by management the strategy will not be successful because employees do not feel that they own the initiative. There were 30% of the respondents that indicated that management only involves employees to a “small extent”, with 26% to “no extent” and 9% to a “moderate extent”. The results are concerning because earlier respondents indicated that KM can improve employees’ individual contribution and improve the organisations’ profitability. Management have to involve employees to ensure the success of the KM initiatives and to reap the benefits that KM can bring to the organisation.

Two of Sasol's values are 1) Winning with people, and 2) Continuous improvement. The Sasol R&D employees are expected to work by these values. The role of KM in ensuring that employees and managers promote Values Driven Leadership (VDL) is that employees of all levels share information and knowledge to sustain the organisation’s competitive edge. However, 43% of the Sasol R&D employees that responded indicated that KM has not improved VDL (see figure 4.6). This response could be as a result of the KM strategy not being sufficiently driven by management and employees perceiving that management are not promoting the KM culture.

In two of the questions, 35% of the respondents indicated that KM improves knowledge sharing amongst employees and 46% indicated that KM can aid in improving individual employees’ contribution to a “moderate extent”. In the question whether KM can improve Sasol R&D employees’ innovation, 44% responded “Yes” with 24% responding “No”. This positive response confirms the previous responses of respondents who are of the opinion that the employees are generally positive about the benefits of KM to the organisation and to individual employees. Since
Sasol was formed using a technology (i.e. Fischer-Tropsch technology) that had not been proven on an economical scale, it is important that employees’ innovation is continuously enhanced. The fact that Sasol R&D employees perceive KM as the tool that can help improve employees’ innovation is very positive and should be used to enhance its KM strategy.

Asset management has become an important focus for many organisations since both tangible and intangible assets of the organisation are used to produce products and increase profits for the organisation. Of the employees of Sasol R&D that responded, 37% indicated that KM has improved asset management while 31% indicated it has not improved asset management (see figure 4.6). There was no significant difference between those who agreed and disagreed, which can be alluded to the understanding of the assets in the R&D environment. R&D facilities are there to develop and improve technologies to enhance productivity and understanding of specific items. Knowledge that is possessed by the R&D facility is then referred to as the intangible assets and the equipment that is used in developing this knowledge as the tangible assets. KM can then be used to ensure that the expertise for the operation of equipment is passed down from more experienced to less experienced employees.

When technology is utilised efficiently it will benefit the organisation, especially in a R&D facility. Sasol R&D uses different technologies to keep abreast of the technology world and ensure that the organisation maintains and sustains its competitive edge. With research facilities across the world, it is important that these facilities can easily share information and knowledge. The majority of respondents
(61%) perceived KM as important while only 7% disagreed with this notion. This question also addressed the importance of KM tools such as access to the Internet, intranet, e-mail and Livelink (internal information storage platform). These tools can be used to distribute information to individuals and groups who can use the information to enhance processes and to store information for later referencing. Access to the Internet and the Web specifically allows employees to keep track of the global developments in any specific technology in the market place. This can assist the organisation to allocate the correct resources to develop certain technologies that are in demand.

In previous questions, respondents indicated that management was not sufficiently promoting a KM culture and were to a “small extent” involving employees in KM initiatives. However, 41% of respondents indicated that management take KM initiatives seriously, while only 28% indicated that management were not taking KM seriously. This could be as a result of the KM initiatives that are not clearly defined to the employees of Sasol R&D and the fact that the employees do not perceive that they are part of the KM initiatives within the organisation. In addition, this response may be an indication of the current KM initiative that has not yet matured to be visibly appreciated by the employees.

With all the benefits that KM can bring to the organisation and individual employees, as envisaged by employees, respondents still indicated that KM has not reduced the employees’ turnover rate. There were only 11% of respondents that indicated that KM has reduced the employee turnover rate in Sasol R&D while 56% indicated that KM has not reduced the employee turnover rate. The departure of experienced
employees can create a knowledge vacuum within an organisation if the knowledge and information is not stored in a central location that is accessible to relevant employees. KM may not reduce the employee turnover rate, but an effective KM strategy can reduce the negative impact that departing, experienced employees can have on the organisation. KM can thus be used to ensure that knowledge and information is successfully transferred from one employee to the other.

4.5.3 General personal opinion

In order to establish the perception that employees have of KM within Sasol R&D it was also important to establish employees’ own personal experiences and general opinions of KM, both within and outside Sasol R&D. These personal experiences have been analysed in the previous section and now the general personal opinion will be discussed. Generally, respondents were positive about KM within Sasol R&D and 57% were in agreement that KM can aid Sasol to sustain its competitive advantage while only 7% disagreed with this notion (see figure 4.7 below). These responses are in line with the previous opinions that respondents have expressed in other questions.

A large group of respondents (70%) were of the opinion that KM can help improve knowledge sharing. However, 35% indicated that KM has improved knowledge sharing among Sasol R&D and 31% indicated that KM has not improved knowledge sharing within Sasol R&D. This may be due to the fact that the KM initiatives have not been implemented and utilised effectively by the organisation. This perception indicates that the respondents are of the opinion KM can benefit the organisation but their experiences with KM in Sasol R&D indicate that the KM initiatives have not yet
taken effect or are ineffective.

The role of the KM champions within Sasol R&D is also not clearly understood by the employees as only 19% of the respondents indicated they were aware of the KM champions and 48% were not. This is in line with the previous responses where 6% understood the duties of KM champions to a “large extent” compared to the 41% that only understood it to a “small extent”. For the KM strategy to be successful management has to ensure that the roles of key players are clearly defined and explained to the employees and that employees are made part of the initiatives.

**Figure 4.7:** Employees personal opinion of KM in Sasol R&D’s performance

Considering that Sasol has grown to be a globally respected organisation by selling technology that has been developed by Sasol R&D, this clearly demonstrates that the use of knowledge can benefit the organisation. Sasol R&D has refined the F-T
technology over the years and during this time Sasol has formed joint ventures with different organisations around the world. Subsequently, 17% and 36% of the respondents were of the opinion that KM has improved Sasol’s global strategic position to a “large” and “moderate extent”, respectively; whereas 13% and 6% to a “small” and to “no extent” (see figure 4.8 below). The positive response is in agreement with Sasol’s successes in entering new global markets and its continuous improved profits by entering into joint ventures with the local organisations.

![Figure 4.8: Extent of employees’ general personal opinion of KM in Sasol R&D](image)

The key element in the KM strategy’s success is the involvement of employees. Unfortunately, only 19% of respondents indicated that Sasol R&D’s KM strategy is actually reaching the employees and 48% respondents were of the view that it is not reaching the employees at all. This response is in support of the previous responses where respondents indicated that management involves employees to “no extent”
(26%) in KM initiatives the 28% indicating that management promoted a KM culture to a "small extent". This is cause for concern as Sasol R&D has a KM strategy. Management will have to revive the strategy and involve employees in the re-structuring of the new or revised KM strategy. This can be seen from the responses that the employees have a belief that KM is the required strategy and it can deliver positive results for the organisation.

Previously, 76% of the respondents indicated that they were familiar with the concept of KM but on the personal level within Sasol R&D, 44% of respondents indicated they did not understand the Sasol R&D's KM objectives with an additional 26% indicating that they understood the objectives. Again, this is in agreement with the disconnect that has been established to exist between the organisation's KM strategy and the employees' personal experiences of KM within Sasol R&D. As was mentioned before, management has to make sure that the revitalisation of the KM strategy involves the employees at all levels and align the benefits of KM to the organisation to those of the employees.

Since respondents are familiar with the general concept of KM, it is expected that the respondents will be familiar with their organisation’s KM strategy. However, Sasol R&D employees that responded indicated that only 20% are familiar with the organisation’s KM strategy with the majority (52%) not being familiar with Sasol R&D’s KM strategy. This again is a validation of the respondents’ non-involvement in the implemented KM strategy. The disconnect between the organisation’s strategy and the employees can be rectified when implementing the KM strategy that is owned by the employees.
The extent to which employees think of KM within Sasol R&D at a personal level is important in determining the perception that they will have of KM in general. KM, when implemented and managed effectively, will improve knowledge sharing among employees and ultimately improve the organisation’s and employees’ performance. Since Sasol has facilities around the globe, it is essential that these facilities continuously share information to reduce duplication of efforts. There were 6% of respondents that indicated that KM has improved collaboration between different global facilities to “no extent”, 24% to a “small” and “moderate extent”, respectively and 11% agreed to a “large extent”. This variation in the responses could be an indication of individual employee’s involvement and exposure to high level decisions that are handled at senior management level.

The extent to which respondents indicated that KM has added value to the performance of Sasol R&D’s KM strategy was also tested in this section. In the question of the extent to which individual employees think KM has added value to the organisation’s global performance, 30% of the respondents indicated that it has added value to a “moderate extent”, 17% to a “large extent” and 6% and 13% indicated it was to “no extent” and to a “small extent”, respectively. This response could be because the employees were not exposed to the benefits that are derived from KM and how the objectives of KM are to the benefit of Sasol R&D and the Sasol group at large.

4.5.4 Conclusion

The results from the survey indicated that the majority of respondents (76%) were
familiar with the concept of KM; however, the respondents were not familiar with the Sasol R&D’s KM strategy. The breakdown of the employees sample by race indicates that the white employees are more aware of KM concepts than their black and Indian colleagues. From the results it can be seen that, in general, employees are positive about the contribution that an effective KM strategy can make, both to the organisation and to the individual employees.

The discussion above has demonstrated that the respondents’ perception of KM is different from the reality of KM in Sasol R&D. Knowledge employees’ major driver is the ability to keep up to date with advances in technology and sharing that knowledge with colleagues at different levels. Sasol was formed using a rather new and expensive technology in the 1960’s and the organisation has transformed and developed the technology to be globally recognised and utilised (Sasol Investor Relations News, (2011)). KM was the key success factor in the development of the technology and ensured the sustainability of the organisation throughout the years.

Sasol R&D employees that responded to the questionnaire were in agreement that KM helps improve knowledge and information sharing among employees, especially from more experienced to less experienced employees. This transfer of information and knowledge helps reduce repetition and delays in the research and development of different technologies. On sharing of information, most respondents agreed to a “moderate extent” that employees shared information and that KM can help improve individual employees’ contribution. However, the perception that respondents have of the management’s commitment to KM is not very positive as respondents indicated that management did not take KM seriously and that management are not
sufficiently involved in the KM initiatives.

On a personal level, the majority of respondents are positive about the benefits that KM can deliver and that these benefits can help the organisation to maintain its position in the global markets. The respondents also indicated that the KM initiatives are not reaching all employees and that they neither understand nor are familiar with the Sasol R&D KM strategy. This response is in line with the previous responses where employees are familiar with the concept of KM but are not familiar with the organisation’s KM strategy. The disconnect between the respondents’ familiarity with the KM concept and Sasol R&D’s KM strategy can be an indication that the current strategy was not implemented effectively or that employees were not adequately involved in the strategy. Employees’ lack of involvement in KM initiatives can result in employees developing a negative perception towards KM within Sasol R&D, even though respondents are generally positive about KM as a useful tool for the organisation.
CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The literature analysed in the previous chapters established the importance of KM in an organisation and the value that KM can add to the organisation. The aim of this research was the perception that the employees of Sasol R&D have of KM and the benefits that KM initiatives can render to the organisation and individual employees in the organisation. The following is a summary of what was discussed in the chapters.

Chapter 2 discussed the definition and the brief history of R&D operations. R&D facilities are the generators of knowledge from the innovative ideas of employees. Organisations that continuously improve their innovative ideas have the potential of developing market leading products, thus giving the organisation a competitive edge. Employees of R&D organisations are usually professionals who are capable of utilising knowledge to generate new ideas and processes. These employees are generally referred to as ‘knowledge employees’ because of their ability to use existing knowledge and experience to generate better and innovative ideas. R&D organisations are also referred to as Learning Organisations because of their ability to fully utilise knowledge while simultaneously generating competency.
Chapter 3 defines the meaning and concept of KM and the benefits of KM in Sasol R&D. Knowledge is defined as the integration of information, ideas, experience and intuition to create added value for the organisation. KM is therefore an integration of information and ideas to create value for the organisation through knowledge sharing. The sharing of knowledge results in a continuous learning organisation, which in turn results in an innovative organisation. The more innovative the organisation, the more products or services the organisation can successfully develop and market. This ensures that the organisation achieves and sustains a competitive advantage in the global business landscape, especially during times of economic “slow-down”. Research have identified the need for KM strategy to be part of the organisation’s strategy in order for KM initiatives to be successful. This will ensure that management and employees proactively work on the strategy.

Chapter 4 discussed the research methodology followed in this study. The chosen sampling method for this research was non-probability convenience sampling, to establish a representative perception that employees have of KM within Sasol R&D. The results of the online survey indicated that Sasol R&D employees are aware of the concept of KM. This is to be expected since R&D employees are regarded as knowledge employees. However, Sasol R&D employees are not very knowledgeable about Sasol R&D’s KM strategy. Respondents also indicated that they believe that an effective KM strategy can help both the organisation and individual employee’s career advancement. The advancement of individual employee’s career can assist in ensuring the organisation’s competitiveness and sustainability. Sasol R&D employees believe that knowledge sharing is important and it explains why the organisation has been successful over the years.
5.2 Recommendations

The information gathered from the research has led to the following recommendations for the management of Sasol Research and Development’s KM strategy and other KM initiatives within the organisation:

- Any KM strategy and initiatives that the management of Sasol R&D wants to implement must involve the input of employees. The fact that the employees are familiar with the concept of KM and the associate benefits can be an advantage in the successful implementation of the strategy.

- Management should make the KM strategy clear and understandable to the employees. The major benefits of KM to the organisation must be made clear since employees seem to understand the benefits that they can individually gain by having an effective strategy.

- Further research should study interaction between KM initiatives and the long term and short term management initiatives.

5.3 Conclusion

It has been established from the respondents’ responses that they are aware of the concept of KM and the benefits KM can provide for both individual employees and the organisation. This is to be expected since, as was mentioned earlier, R&D employees are knowledge driven and use knowledge to generate new innovative ideas. Sasol R&D has the advantage in that the organisation does not need to first explain what KM is and what benefits KM can bring. Sasol R&D does have a KM strategy in place, however, this strategy and initiative does not seem to have been
effectively rolled out and explained to the majority of employees.

Since Sasol R&D management require an effective KM strategy, the organisation must investigate alternative methods of implementing the strategy. The area of focus should be to establish why the strategy is not successful when employees understand KM and the benefits KM can bring. It is critical that this misalignment be understood since the success of the R&D facility is mainly dependant on the use of knowledge by employees, both old and new. The other area to focus is the introduction of KM to new recruits to Sasol R&D. This will ensure that there is continuity and that the wider audience of Sasol R&D understand the organisation’s strategy and objectives.

For the strategy to be effective, management should ensure that the role players involved in the KM strategy are known and their exact duties clearly explained to employees. This is important in ensuring that employees do not struggle to find information relevant to KM and thus waste time, which will eventually lead to employees losing interest in the initiative. In an environment like Sasol R&D, there should be a Management Sponsor, KM Champion, KM Co-ordinator and KM Specialist. These individuals should be responsible for the day-to-day running of the KM strategy and aim to reach as many as possible employees. They should also ensure that required information is readily available to all employees.
REFERENCES


**APPENDIX 1: QUESTIONNAIRE**

**SECTION A: BIBLIOGRAPHICAL**

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<td>2</td>
<td>Gender</td>
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<td>3</td>
<td>Your Section within Sasol R&amp;D</td>
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<tr>
<td>4</td>
<td>Length of employment at Sasol</td>
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<td>5</td>
<td>Race</td>
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**SECTION B: KM STRATEGY WITHIN SASOL R&D**

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<tr>
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<th>Question</th>
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<tr>
<td>6</td>
<td>Are you familiar with Sasol Research &amp; Development’s (R&amp;D) KM strategy?</td>
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<tr>
<td>7</td>
<td>Do you understand Sasol R&amp;D’s KM objectives?</td>
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<td>8</td>
<td>Do you think Sasol R&amp;D’s KM strategy reaches employees?</td>
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<td>9</td>
<td>Do you think KM has improved Sasol’s global strategic position?</td>
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<td>10</td>
<td>Are you aware of KM champions within Sasol R&amp;D?</td>
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<td>11</td>
<td>Do you think KM has improved knowledge transfer among Sasol R&amp;D employees?</td>
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<td>12</td>
<td>Do you think KM can assist Sasol in sustaining its competitive lead?</td>
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<td>Question</td>
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<tr>
<td>13</td>
<td>To what extent do you think KM adds value to Sasol R&amp;D’s performance in the global environment?</td>
<td>To no extent</td>
<td>To a small extent</td>
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<td>14</td>
<td>To what extent do you think KM has improved Sasol R&amp;D’s collaboration with other facilities around the world? (e.g. St Andrews in Scotland, American operations)</td>
<td>To no extent</td>
<td>To a small extent</td>
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<td><strong>SECTION C: YOUR EXPERIENCE WITHIN SASOL R&amp;D</strong></td>
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<td>15</td>
<td>To what extent does management involve you in Sasol R&amp;D’s KM initiatives?</td>
<td>To no extent</td>
<td>To a small extent</td>
</tr>
<tr>
<td>16</td>
<td>Do you think that Sasol R&amp;D management promotes a KM culture? To what extent?</td>
<td>To no extent</td>
<td>To a small extent</td>
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<tr>
<td>17</td>
<td>To what extent do you think experienced employees share knowledge with junior employees?</td>
<td>To no extent</td>
<td>To a small extent</td>
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<td>18</td>
<td>Do you think KM has improved equity in Sasol R&amp;D? To what extent?</td>
<td>To no extent</td>
<td>To a small extent</td>
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<tr>
<td>19</td>
<td>To what extent do you voluntarily share information with your colleagues?</td>
<td>To no extent</td>
<td>To a small extent</td>
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<tr>
<td>20</td>
<td>Do you think KM has improved Sasol R&amp;D’s employees’ VDL characteristics?</td>
<td>Y</td>
<td>N</td>
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<tr>
<td></td>
<td>&quot;Values Driven Leadership&quot; (VDL) is leadership that represents Sasol values and behaves as a role model to other employees? Additionally, leaders are required to shape the future, continuously develop themselves and others, coach and mentor others.</td>
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<td>21</td>
<td>Do you think KM has improved the innovation of Sasol R&amp;D employees?</td>
<td>Y</td>
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<td>22</td>
<td>Do you think KM has improved the asset management of Sasol R&amp;D?</td>
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<td>23</td>
<td>Do you perceive KM as important in Sasol R&amp;D? (This includes KM tools like the Internet, email, intranet, memos/reports, etc.)</td>
<td>Y</td>
<td>N</td>
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<td>24</td>
<td>Do you think management takes KM initiatives within Sasol R&amp;D seriously?</td>
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### SECTION D: GENERAL PERSONAL OPINION

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<td>Are you familiar with the concept of Knowledge Management (KM)?</td>
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<td>Do you think KM has reduced Sasol R&amp;D’s employee turnover?</td>
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<td>Do you feel that KM can aid your career?</td>
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<td>Do you think KM can be a foundation of a ‘learning organisation’?</td>
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<td>(A ‘Learning Organisation’ (LO) is an organization that uses (utilises)</td>
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<td>knowledge and employees’ skills and experience to continuously improve</td>
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<td>their competencies)</td>
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<td>Do you think KM improves knowledge sharing?</td>
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<td>Do you think KM can help improve employees’ skills and knowledge?</td>
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<td>Do you think KM can improve an organisation’s profitability?</td>
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<td>Do you think that organisations should have a KM strategy?</td>
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<td>Do you think KM is just another way of creating non-value added jobs?</td>
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<td>Do you think KM can improve employees’ individual contribution? To what extent?</td>
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<td>To what extent do you understand the duties of KM champions?</td>
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<td>To what extent do you think KM improves knowledge sharing?</td>
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